COSTS AND BENEFITS OF THE PAYMENTS FOR ENVIRONMENTAL SERVICES PROGRAM IN COSTA RICA: THE TRADE-OFF BETWEEN POVERTY REDUCTION AND ENVIRONMENTAL CONSERVATION

Kimberly Lyon, Odette Mucha and Hannah Skelly
Tufts University,
Fletcher School of Law and Diplomacy

The Payments for Environmental Services (PES) program in Costa Rica employs an incentive-based model to compensate landholders for the valuable environmental services their land provides. The objective of the program is to contribute to the protection and improvement of the environment, and since 2001 has also included poverty reduction in rural areas as one of its priorities. In addition to improving the ecosystem services provided by its forests, PES provides income for its participants while improving land tenure and building local capacity through the work of NGOs. Despite these potential benefits, the participation of small and low-income landholders remains proportionally lower compared to wealthier, large landholders. The government of Costa Rica often faces a trade-off between the primary objective of effectively providing environmental services and the secondary objective of significantly impacting rural poverty. Due to obstacles inherent in the program design, the poor are less likely to be eligible to participate. Even if they are, the costs associated with participating may not be worth the perceived benefits.

Introduction

Scholars, policymakers and conservationists often praise Costa Rica's commitment to sustainable development practices and its concurrent determination to integrate sustainability into its national development strategy.[1] The government of Costa Rica is one of the first to successfully implement on such a wide scale a program of Payments for Environmental Services (PES). This program has been noted as tak-

1 For the purpose of this paper, we shall use the definition of "sustainable development" used in the 1987 Brundtland Report, whereby sustainable development "meets the needs of the present without compromising the ability of future generations to meet their own needs." See World Commission on Environment and Development, *Our Common Future* (Oxford: Oxford University Press, 1987).

ing a revolutionary approach to addressing the challenge of deforestation. The PES program, premised on a market-based model for natural resource management, compensates landholders for protecting and sustainably managing the environment specifically by preserving and/or improving the quality of land, forests and rivers. Compensation for participant landholders is funded by levying a charge on the "users" or "beneficiaries" of the environmental services that accrue from the protection and maintenance of the natural environment. Such beneficial services include water filtration and availability, biodiversity maintenance, natural landscape preservation and carbon sequestration.

Apart from its primary purpose of delivering environmental benefits, the program has also been commended as a tool for rural development and poverty reduction, and other Latin American countries and international aid organizations are increasingly attempting to emulate Costa Rica's PES program as a means to address the problem of deforestation while simultaneously alleviating poverty. However, little research has been carried out on the program's actual impact on poverty. Given the numerous replication efforts and the optimistic praise PES receives, it remains an important task to evaluate the precise effects this program has had on program participants and the intended beneficiaries of environmental services in Costa Rica.

After a brief exposition on the relevant facts of the program, this paper will analyze both the environmental and economic costs and benefits of the program while examining the inherent trade-off between the program's environmental and poverty reduction objectives. Finally, the paper will conclude with a brief assessment of possible avenues for reform.

Background

Throughout the latter half of the twentieth century, Costa Rica's natural ecosystems, and consequently its rich and unique biodiversity, have been under serious threat due to increasingly high rates of deforestation. A study conducted by Sader and Joyce in 1988 estimated that from 1940-1984, forest cover declined by 50 percent in Costa Rica.[2] The dangerously high rates of deforestation affected not only the integrity of natural ecosystems and the quality of the environment but also had a negative effect on economic growth. Total net monetary losses related to deforestation were estimated at 167 million dollars in 1984, and public external debt increased as a result of the depreciation of valuable forest assets.[3]

Once it became clear that the changes in land use were environmentally and economically unsustainable, the government undertook a series of progressively proactive initiatives aimed at reforestation and avoiding deforestation, cul-

2 Steven A. Sader and Armond T. Joyce, "Deforestation Rates and Trends in Costa Rica, 1940 to 1983," *Biotropica* 20, no. 1 (1988): 11-19.

3 All amounts are quoted in US dollars. G. Sánchez-Azofeifa, Robert Harris, and David L. Skole, "Deforestation in Costa Rica: A Quantitative Analysis Using Remote Sensing Imagery," *Biotropica* 33, no. 3 (2001).

minating in the current PES program.[4] In 1996, Forestry Law 7575 institutionalized PES and granted power over its administration to the Fondo Nacional de Financiamiento Forestal (FONAFIFO), a semi-autonomous government agency comprised of eight regional offices.[5] The first phase (1997-2001) of this national program had a focused environmental objective. The second phase, initiated in conjunction with the World Bank in 2001, added poverty reduction as an explicit priority of the program.[6]

The framework and institutional set-up of the PES program has been referred to as "the most elaborate such system in place in the developing world."[7] Many project-monitoring activities, including inspection and compliance assurance of participants, are performed by the Sistema Nacional de Areas de Conservacion and its directorate, the Ministerio del Ambiente y Energia.

The PES program is funded through a variety of national and international sources. As of 2009, the total budget for the PES program was approximately 115 million dollars, and the ordinary budget (not including funds obtained through special agreements or sales of Environmental Service Certificates, ESC) was 71 million dollars.[8] The program receives its domestic funding through several mechanisms. The primary source of funding is derived from a national fuel tax which allocates 3.5 percent of the revenue from sales of fuel to FONAFIFO (amounting to approximately 10 million dollars per year).[9] FONAFIFO also receives income via the sale of ESC to service users. Private organizations purchase these certificates on a voluntary basis, presumably to pay for the environmental services from which they will benefit. They can specify the forest area to which the funds should be applied, if they desire.

FONAFIFO has also obtained significant funding from non-domestic sou-

4 Between 1979 and 1985, the government adopted a policy that allocated funds from income taxes to prevent deforestation. The government subsequently pursued a different approach by providing a tax incentive known as the Forest Credit Certificate (CAF), which was given to farmers who reforested their lands. The CAF, along with other subsidies, ended with the third Structural Adjustment Loan from the World Bank in 1995, paving the way for the PES program.

5 Forestry Law 7575 also bans the clearing of forests and stipulates that forests may only be harvested under an approved management plan that complies with sustainable forestry criteria. For a succinct overview, see G. Arturo Sanchez-Azofeifa et al., "Costa Rica's Payment for Environmental Services Program: Intention, Implementation, and Impact," *Conservation Biology* 21, no. 5 (2007): 1165-1173; Ronnie de Camino et al., "Costa Rica: Forest Strategy and the Evolution of Land Use," *Operations Evaluation Department Evaluation Country Case Study Series*, (Washington, D.C.: World Bank, 2000), 4-20.

6 World Bank revisions to the program also included the targeting of new priority areas for conservation, increasing the participation of women landowners and indigenous communities, and the recruitment of local NGOs to aid small landholders with program application and compliance.

7 Stefano Pagiola, J. Bishop, and N. Landell-Mills, *Selling Forest Environmental Services: Market-based Mechanisms for Conservation and Development* (London, UK: Earthscan Publications, 2002), 7.

8 Fondo Nacional de Financiamiento Forestal Website. "Asignación Presupuestaria Para CAF y PSA Por Fuente De Financiamiento," *Fondo Nacional de Financiamiento Forestal* (2007). http://www.fonafifo.com/text_files/servicios_ambientales/Montos_Pag_Mod2006.pdf (accessed October 17, 2009).

9 Stefano Pagiola, "Payments for Environmental Services in Costa Rica," *Ecological Economics* 65, no. 4 (2008): 713.

rces. In 2001, the World Bank issued the agency a loan of 32.6 million dollars and a grant of 8 million dollars as part of the Ecomarkets Project. World Bank support continued in 2007 through the Mainstreaming Market Based Instruments for Environmental Management program, which provided a 30 million dollar loan and a 10 million dollar grant.[10] Various bilateral donors, including the German Development Bank (KfW) and the governments of Norway and Japan, have also provided financial support.[11]

Measuring Success against Dueling Objectives

In assessing the success of the program in terms of its objectives, costs and benefits, it is important to note the inherent tension between the primary goal of delivering environmental benefits and the secondary objective of reducing poverty in low-income rural areas. At the heart of this conflict is the selection of participant lands and the appropriate payment size. If policymakers were to seek to maximize environmental protection, it would be crucial to enroll as much forest land as the budget permits. This would entail setting the payment size at an amount just high enough to ensure wide participation, with priority going to lands with higher biodiversity or ecological value. Conversely, to have effective poverty reduction, priority would be placed on enrolling low-income landholders, and payments would be set at an amount large enough to positively impact their livelihoods.

Participant Selection

Initially, the program was designed so that landholders could opt to participate on a voluntary, continuous, first-come-first-served basis.[12] However, excess demand for participation has resulted in a complex system of prioritization in which program administrators decide priorities on a yearly basis according to land use activity (or modality), location and environmental factors such as carbon sequestration potential, species habitat and hydrological processes. After these priorities have been set, the remaining applications are dealt with on a first-come-first-served basis.[13]

Under the current rules, those who wish to participate in the PES program may enter into a payment contract for three possible modalities, each of which is

10 Ibid.

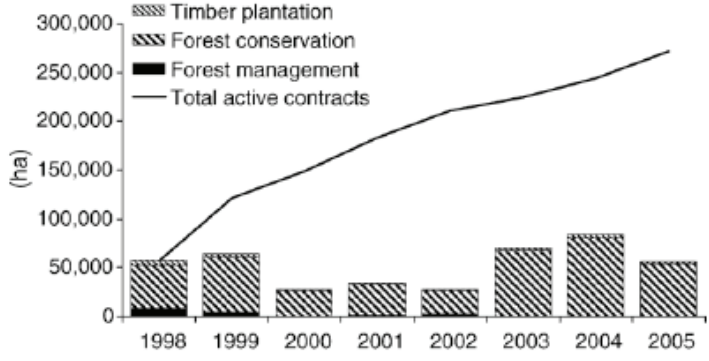
11 Many of these donor funds have been allocated to specific regions. For example, KfW funds 70 percent of the payments made by FONAFIFO toward the Forest Management Reforestation Protection in the Huetar Norte Region, and the Government of Norway provided funding specifically for reforestation projects in the Virilla River Watershed.

12 Sanchez-Azofeifa et al., "Costa Rica's Payment for Environmental Services Program."

13 Karen Bennet and Norbert Henninger, "Payments for Ecosystem Services in Costa Rica and Forest Law No. 7575: Key lessons for Legislators" (paper for the World Resource Institute, Washington, DC, 2009). http://www.e-parl.net/eparlimages/general/pdf/090422%20e-Parliament%20Forests%20Initiative.pdf (accessed December 8, 2009).

presumed to deliver environmental services. These are as follows: 1) forest conservation; 2) reforestation; and 3) agroforestry.[14] Participation in the program has not been evenly dispersed among modalities. As Figure 1 illustrates, the vast majority of land enrolled in PES is contracted under the conservation modality. As of 2005, the conservation modality accounted for 95 percent of enrolled areas. Applications to participate in this popular modality have continuously outweighed the funds available.[15]

Figure 1: Total Area Contracted in the PES Program by Modality[16]



Payment and Plot Size

Each contract type has a fixed payment rate for all participants across various regions. Payment disbursal is contingent upon compliance with contract requirements. The details of each modality are as follows:

1) The *forest conservation* contract requires landholders to transfer usage rights to the government for a contract period of five years, which may be renewed. The forest owner is not allowed to log timber or otherwise use the forest during this period. Participants receive equal annual payments of 65 dollars per hectare each year.[17]

2) The *reforestation* contract requires landholders to set aside a specific por-

14 The program started with two other contract types—sustainable management and plantations—but these have since been discontinued.

15 For example, in 2006, FONAFIFO's regional office in Nicoya received applications for about 12,000 hectares but only had funds available for 2,000 hectares. (J.A. Jiménez Fajardo, personal communication, 2007).

16 Data from World Bank in Pagiola, "Payments for Environmental Services in Costa Rica."

17 Tobias Wunscher, Stefanie Engel and Sven Wunder, "Payments for Environmental Services in Costa Rica: Increasing Efficiency through Spatial Differentiation," *Quarterly Journal of International Agriculture* 45, no. 4 (2006).

tion of their land for tree planting. Landholders must maintain a threshold survival rate of over 85 percent for the full ten year period. Front-loaded payments totaling 816 dollars per hectare are made to the landholder over the course of the contract.[18] Environmentally sensitive or "critical" areas, such as steep slopes and land bordering rivers, are not considered commercially viable for reforestation and thus are not eligible for payments.[19]

3) The *agroforestry* contract, introduced in 2004, compensates landholders for adding to and maintaining a specified minimum number of trees to existing pastures or cropland. Landholders are paid one dollar per tree planted, distributed over three years.[20]

The size of the eligible plot varies according to modality. The reforestation modality requires a minimum of one hectare and the conservation modality a minimum of two hectares. No more than 300 hectares of land can be enrolled under any modality of the program.[21]

Analysis of Program Impact

The launch of the PES program elicited an immediate response from landholders across Costa Rica. In the first four-year phase of the program, FONAFIFO enrolled approximately 284,500 hectares and directed payments to 4,461 participants.[22] Since this first phase, participation in the program has remained strong and has incrementally increased, even after the initial round of five year contracts expired (see Figure 1). As a result, between 1997-2005, the PES program has been applied to approximately 500,000 hectares of privately owned forested land in Costa Rica,[23] acreage equal to 9.7 percent of Costa Rica's entire national territory and a fifth of the total forested area.[24]

The forest conservation modality was by far the most popular modality (see Figure 1). This is surprising, given that the payments of 65 dollars per hectare per year are lower than the reforestation payment of 816 dollars per hectare up front or 81.60 dollars per hectare annually. In addition, the agroforestry option requires

18 50 percent of the payment is paid in the first year, 20 percent in the second year, 15 percent in the third, 10 percent in the fourth, and 5 percent in the fifth. Stefano Pagiola, "Payments for Environmental Services in Costa Rica."

19 M. Miranda, I.T. Porras and M. L. Moreno, *The Social Impacts of Payments for Environmental Services in Costa Rica. A Quantitative Field Survey and Analysis of the Virilla Watershed* (London: International Institute for Environment and Development, 2003).

20 World Bank, *Costa Rica Mainstreaming Market-Based Instruments for Environmental Management Project: Project Appraisal Document* (Washington, 2006) Report No. 36084-CR, 71.

21 Bennett and Henninger, "Payments for Ecosystem Services in Costa Rica."

22 S. Zbinden and D. Lee, "Paying for Environmental Services: An Analysis of Participation in Costa Rica's PSA Program," *World Development* 33, no. 2 (2005).

23 World Bank, *Costa Rica Mainstreaming Market-Based Instruments,* 116.

24 Bennett and Henninger, "Payments for Ecosystem Services in Costa Rica."

the shortest time commitment of only three years, compared to the conservation modality's five year commitment and ten years for reforestation. However, the advantage of conservation is that little input of time or money is required, and landholders are essentially compensated for doing nothing to their land.

Environmental Impact

Since the start of the PES program, deforestation rates in Costa Rica have markedly declined and forest cover has increased. While it is clear that significant progress has been achieved in preventing deforestation in Costa Rica during the life of the PES program, assessing the precise environmental impacts of the program itself has proven difficult. Other factors favoring conservation may have motivated conservation during this time period. As the environmental movement has grown in power and influence so have other motivations for conservation beyond the PES program. It thus remains a difficult task to attribute deforestation outcomes directly or entirely to the PES program.

Statistics available for the first phase of the PES program indicate that a significant drop in deforestation rates did in fact occur during this time period, from 16,400 hectares per year in 1986-1987 to 3,300 hectares per year in 1997-2000.[25] Nevertheless, scientific and econometric studies have reached varying conclusions about the environmental impacts attributable to the program. Several studies conclude that the PES program has had a direct positive impact on decreasing deforestation. For example, in 2006, Tattenbach et al. found that primary forest cover nationwide was ten percent greater than it would have been in the absence of the PES program.[26] Similarly, in 2009, Morse et al. concluded that PES helped to at least partially achieve forest conservation, and that incentives for reforestation have been "relatively effective" at increasing forest cover in an area surveyed within the San Juan-La Selva portion of the Mesoamerican Biological Corridor.[27]

Yet, several other studies on deforestation rates in Costa Rica have raised doubts as to whether the correlation between PES program implementation and decreasing deforestation implies actual causation. One author found that the deforestation rate in Costa Rica from 1997-2000 was "not significantly lower" in areas that received payments, and concluded that the PES program "did not reduce deforestation rates or total deforestation in Costa Rica."[28] Similar results were found

25 Julio César Calvo-Alvarado, Gerardo Arturo Sánchez-Azofeifa and J. Pablo Arroyo-Mora, *Dynamics of Forest Cover Change and Its Implications to Conservation in Costa Rica* (Panamá City: The Association for Tropical Biology, 2002), 1.

26 Tattenbach et al., (2006) in Pagiola, "Payments for Environmental Services in Costa Rica."

27 W.C. Morse, et al., "Consequences of Environmental Service Payments for Forest Retention and Recruitment in a Costa Rican Biological Corridor," *Ecology and Society* 14, no. 1 (2009): 23.

28 Sanchez-Azofeifa et al., "Costa Rica's Payment for Environmental Services Program," 6.

for the 2000-2005 time period.[29] Another study, focusing more narrowly on the Osa Peninsula region, found that PES had "limited immediate effects" on forest conservation in the region.[30]

One challenge in determining the effectiveness of the PES program in reducing deforestation is that additionality is difficult to prove. For many of the participants, receipt of PES payments did not change their decision about how to use their land. Some PES participants would have likely conserved the land as forest regardless of the PES incentives. For example, in a survey of participants in La Selva Biological Corridor, 50 percent of respondents reported that they would have preserved their land even without PES payments.[31]

Conservation policies in place prior to the PES program may be largely responsible for the actual reduction in deforestation rates that have occurred.[32] In the Guanacaste region, socio-economic factors such as the crash of the beef market, urbanization and the rise of the tourism industry may have also been more important in reducing deforestation rates than conservation policies.[33]

The most noticeable benefit for users of environmental services, both participants and nonparticipants, has been the protection of critical watershed areas and subsequent reductions in fluctuations in the availability and contamination of drinking water. The reforestation and conservation modalities of the PES program ensure that upstream forests have appropriate vegetation cover and soil management. This results in proper water filtration and avoids harmful sedimentation and chemical pollution. Downstream areas, often comprised of large populations of urban poor, benefit from increased quantity, access and seasonal security of water flow. This has been the case in the Virilla watershed, where approximately 54 percent of the 200,000 inhabitants in the urban lower part of the watershed have benefitted from improved upstream forest protection.[34] Proper management of watersheds has also ensured effective functioning of hydropower facilities and new hydropower opportunities.

On the other hand, the PES payments have not tended to target areas that are ecologically most important. There is much potential for improvement in protecting water resources if the administrators of the program take a more targeted

29 Between 2000 and 2005, findings revealed that about 0.4 percent of the parcels enrolled in the program would have been deforested annually without payments. This was due to the net impact of land returns in agriculture versus ecotourism, as well as the effects of other conservation policies.

30 Rodrigo Sierra and Eric Russman, "On the Efficiency of Environmental Service Payments: A Forest Conservation Assessment in the Osa Peninsula, Costa Rica," *Ecological Economics* 59, no. 1 (2006).

31 It is possible that these results were skewed by individuals' desire to impress the survey taker. However, they do point out a potential inefficiency resulting from the lack of targeting in the PES program.

32 Sanchez-Azofeifa et al., "Costa Rica's Payment for Environmental Services Program." These policies include the prohibition of clear-cutting, limiting the number of deforestation permits and ending the custom that allows a person to claim property rights of forested areas by changing the use of the land (e.g. clearing trees in order to farm).

33 J. Alvarado, B. McLennan, A. Sanchez-Azofeifa and T. Garvin, "Deforestation and Forest Restoration in Guanacaste, Costa Rica: Putting Conservation Policies in Context," *Forest Ecology and Management* 258, no. 6 (2009): 931-940.

34 Miranda et al., *The Social Impacts of Payments for Environmental Services*.

approach to participant selection. Nationwide, only 35 percent of the area under forest conservation contracts is actually in a watershed with downstream users.

Beyond the immediate impacts of the environmental services provided, the PES program appears to have created several long-term environmental benefits, as well as strengthened relevant social and institutional capabilities that may produce benefits well into the future. The PES program has attracted international attention and significantly contributed to the government of Costa Rica's reputation and capacity for sustainable development. The program has already proven its ability to serve as a mechanism for Costa Rica's entrance into the global carbon market and carbon sequestration schemes. Through a partnership with the government of Norway, FONAFIFO has secured two million dollars in financing for a ten year project which will facilitate the transfer of 200,000 certified tradable offsets (CTO) generated through carbon mitigation under the PES program. This partnership, alongside prospective future CTO sales under the PES program, has generated capacity building within the Costa Rican government for further sustainable development initiatives. Such capacity has increased through the creation of institutions like the Costa Rican Joint Implementation Office (OCIC). Furthermore, the PES program has resulted in an increase in demand for skilled labor highly relevant to sustainable development. New jobs have been generated for forest engineers, geographers, biologists, economists, social scientists, ecologists, topographers and geographic information services specialists in central government organizations, local NGOs and the private sector.[35]

Economic Impact

At the time of the program's initial formulation, policymakers presumed that compensation for environmental services would have a positive impact on poverty alleviation in rural areas of Costa Rica.[36] However, throughout the life of the program, PES participants have generally been large landholders. These landholders have higher average incomes than non-participant landholders and tend to be well-educated professionals employed in urban areas, primarily dependent on non-farm sources of income. When it was realized that poverty reduction was not automatic, a poverty alleviation component was formally added to the program goals in 2001 with the initiation of the World Bank Ecomarkets Project. The Ecomarkets Project included not just financing of the program, but an effort to "refocus" the PES in terms of national social goals.[37] In a similar vein, the renewal of World Bank grants and loans in 2006 included a component to improve "efforts to increase its contribution to poverty reduction and sustainable rural development."[38]

35 Ibid.

36 It is noteworthy that Costa Rica has one of the most unequal land distribution profiles in Latin America, with a Gini coefficient of 0.80.

37 World Bank, *Costa Rica Mainstreaming Market-Based Instruments*, 116.

38 Ibid.

Similarly, the PES program has been flexible in amending or abolishing potentially exclusionary policies and requirements. Early in the program, the land title precondition was one factor discouraging the participation of low-income landholders, as the law prohibited the use of public funds to pay owners without land titles.[39] However, the law has been changed, dropping requirements for land titles and enabling landholders who lack formal titles to participate.[40] The application process requires evidence of secure land tenure over the property proposed for contracting, and the landholder must work with a *regent* (forest steward) to prepare and submit a land assessment report and forest management plan. The initial payment can be requested at the contract signing, but subsequent annual payments are made only after *regentes* have verified continued compliance.

To the program's credit, participation dynamics have shifted since 2001 to include more low-income landholders. In order to ameliorate the problem of high transaction costs that the many widely dispersed small landholders face, FONAFIFO developed and expanded the system of collective contracting. FONAFIFO has also sought to further "maximize their poverty impact by adding particularly disadvantaged districts to the priority areas for the program."[41] Biological corridors targeted under the World Bank's Ecomarkets program are located in some of the poorest regions in Costa Rica, and the program did reach a greater number of small landholders than during the previous phase, positively impacting a greater proportion of rural landholders.[42] In 2006, FONAFIFO introduced the agroforestry modality intended to alleviate the land-use constraints faced by small landholders who often find it challenging to set aside enough land for simple conservation. This modality, which is still being rolled out, allows for the use of forests in an environmentally sustainable way, such as producing shade-grown coffee or the provision of shelter for cattle.

By 2006, a more equal representation of landholders had been achieved; the participant population was composed of 38 percent small landholders (1-30 hectares), 20 percent medium landholders (30-70 hectares), and 42 percent large landholders (over 70 hectares). However, small landholders still received only six percent of total program payments.[43] This is due to the per hectare payment structure under which landowners with more land receive more compensation. In addition, monitoring reports for 2001-2005 showed that the smallest landholders (owning less than ten hectares) remain the largest group not receiving payments. A survey of participants in the Osa Peninsula revealed that while all of the large landholders (owning more than 80 hectares) in the region had enrolled in the PES program, only one third of small landholders (owning less than ten hectares) were

39 Bennett and Henninger, "Payments for Ecosystem Services in Costa Rica."
40 Pagiola, "Payments for Environmental Services in Costa Rica," 722.
41 Ibid., 721.
42 World Bank, *Costa Rica Mainstreaming Market-Based Instruments*, 116.
43 Ibid., 79.

participating.[44]

Over the past few decades, there is very clear evidence of reduced poverty in Costa Rica's rural areas. Between 1996 and 2008, the poverty headcount in rural areas declined from 25.1 percent to 18.7 percent, and extreme poverty declined from 9.0 percent to 4.6 percent.[45] It is very difficult, however, to separate the effects on rural poverty of the PES program from other factors such as economic growth and the tourism boom, especially considering that the decline in poverty had begun long before the implementation of the program.

Impacts on Small Landholder Participants

The PES program was not originally meant to be an instrument of poverty reduction policy, and payments from the program are the primary source of income for only two percent of the participant population. However, economic factors were still cited by landholders as one of the most important reasons influencing their decision to enroll in PES.[46] Nationwide figures are not available, but a survey in the Central Volcanic Mountain Range Conservation Area found that PES payments resulted in an average increase of approximately fifteen percent in the household disposable income of participants.[47]

While income impacts do not appear to be significant for the overall participant population, studies show that this is a larger consideration for small landholders, for whom payments comprise an important factor in program participation. In the Osa Peninsula, one study found that PES payments have a significant impact on the livelihoods of small landholders. For one quarter of the participants, PES payments constituted more than ten percent of household income, and payments became the "primary household cash income source in 44 percent of cases."[48] The study of the Central Volcanic Mountain Range Conservation Area identifies the PES program as having lifted half of the PES participants who were below the poverty line out of poverty.[49] This study also found that for small landholders (less than 30 hectares), payments were mainly used for investments within the farm with most of the remainder being used for general expenses.[50]

The payments received for environmental services produce dual benefits in terms of income for the poor. First, the payments serve as a new and significant source of income for small landholders in geographic areas with low diversification

44 Miranda et al., *The Social Impacts of Payments for Environmental Services*, 21-22.

45 Instituto Nacional de Estadísticas y Censos, "Relativa De Los Hogares Con Ingreso Conocido, Por Zona y Nivel De Pobreza 1987-2008." http://www.inec.go.cr/02EstadSociales/02HogaresYPobreza/series/C.01%20Distribución%20relativa%20de%20los%20hogares%20con%20ingreso%20conocido,%20por%20zona%20y%20nivel%20de%20pobreza,%20según%20año,%201987%20-%202009/C.01-h.xls (accessed November 16, 2009).

46 Miranda et al., *The Social Impacts of Payments for Environmental Services*.

47 Ibid., ii.

48 Bennet and Henninger, "Payments for Ecosystem Services in Costa Rica."

49 Miranda et al., *The Social Impacts of Payments for Environmental Services*.

50 Ibid., 26.

of income generating activities. Other than the income impacts discussed above, samples of small landholder participants have referred to the "creation of new economic activities" as an important outcome of the program.[51] Investments made in the farm with the use of PES payments also have long-term benefits. Second, income generated from PES provides a stable and fixed income flow for a set period of time. This is critical given that small landholders, while not under the poverty line, are considered to be vulnerable households.[52]

Participation in the program potentially imposes a wide range of costs on the sellers of environmental services. The most obvious of these are transaction costs, which may discourage participation of landholders and dilute the positive benefit accruing to the poor. Survey data showed that the more informational meetings landholders attended, the more likely they were to enroll in the PES program.[53] The traveling associated with this process of information gathering can be very costly to some landholders, depending on the distance they have to cover in order to attend meetings. For poorer households, this represents a larger proportion of their budgets and eats away at the potential benefits resulting from program participation. Once choosing to enroll, sellers also have to bear the cost of payments to the *regentes* for the initial plan management and monitoring. These payments typically represent fifteen percent of the face value of the payment the landholder receives under the PES scheme.

Transaction costs to the government or program administrators can also affect the inclusion of the poor in the program, as it is more expensive to target small landholders whose plots are widely dispersed throughout the country and whose service provision is relatively lower than the owners of larger plots.[54] The program administrators, in an attempt to address this problem, instituted the system of collective contracting, thus reducing the cost to FONAFIFO associated with arranging and signing individual contracts. However, this initiative was revised as non-compliance of one seller in the group would disrupt the payments flowing to the other sellers. Under the current system, applications are still bundled together for processing, but individual contracts are issued.[55]

The cost of acquiring a formal land title may also be regarded as a transaction cost. It is probable that this original eligibility requirement discouraged many people, particularly the poor, from participating. Having since abandoned this policy, Costa Rica permits enrollment by landholders who lack formal titles, but only if they can prove their tenure and ability to secure their land from trespassers.[56]

Enrolling in a PES scheme may require landholders to undertake certain investments to ensure their compliance. If enrolled in the forest conservation mo-

51 World Bank, Costa Rica Mainstreaming Market-Based Instruments, 80.
52 Miranda et al., *The Social Impacts of Payments for Environmental Services*.
53 Zbinden and Lee, "Paying for Environmental Services."
54 Pagiola, "Payments for Environmental Services in Costa Rica."
55 Ibid.
56 Sven Wunder, "Payments for Environmental Services and the Poor," *Environment and Development Economics* 13 (2008): 279-297.

dality, the landholder may find it necessary to construct a fence or barrier to keep out intruders and livestock. If the landholder is contracted for reforestation, he/she will have to bear the upfront costs of planting trees before being compensated. These costs may also pose an impediment to participation of the poor, as the poor may face greater liquidity constraints and may be without access to capital or credit, rendering them unable to make these large, one-time investments.

Opportunity costs, or the foregone income and other benefits that would have accrued under alternative uses of the land, are a major factor for landholders when deciding whether to participate in the PES program. If participants have been engaged in the raising of livestock, production of agricultural crops or timber harvesting before enrolling, they may also be faced with the added cost of interrupted streams of income due to joining the PES program and giving up these other income-generating activities. Theoretically, the higher the opportunity cost to a household, the higher the payment must be to make participation in the program attractive. Contrary to the current system of undifferentiated payments, the PES scheme could more effectively take into account varying opportunity costs across regions and households.

While there is very little data that can quantify the opportunity costs to the participants, land use changes over time provide insight to individuals' choices. According to the World Bank forest strategy for Costa Rica, there is evidence of conversion of land from forest cover to use for various kinds of economic activity (see Table 1). From 1979-1992, natural forestland cover decreased while land used for permanent and seasonal crops and for pastures increased in most regions. Notably, 6.3 percent of the land denoted as natural forest and 7.9 percent of land denoted as secondary forest were converted to pasture during the study period.[57] Thus, one can infer that for many potential program participants, the opportunity cost of conserving land would be foregone income from grazing cattle and agriculture.

Table 1: Land Use Change by Region, 1979-92[58]

Land use	Liberia	San Carlos	Barra	Nicoya	San Jose	Limon	Quepos	Tala-manca	Golfito
Natural forests	-31,852	290,518	-11,781	-48,763	-44,709	-128,300	-52,911	-114,736	-67,741
Pastures	124,207	167,674	1,830	42,849	56,831	58,368	74,476	169,352	19,668
Fallow areas	7,858	-18,315	-138	12,305	-26,007	-6,802	-14,996	7,524	-20,868
Burnt areas	2,092	---	---	7,734	---	---	---	---	---
Swamps and humid areas	-1,502	-9,343	1,524	-1,592	---	-2,143	---	-868	-2,021
Infrastruc-ture	497	---	---	559	6,016	65	1	128	266

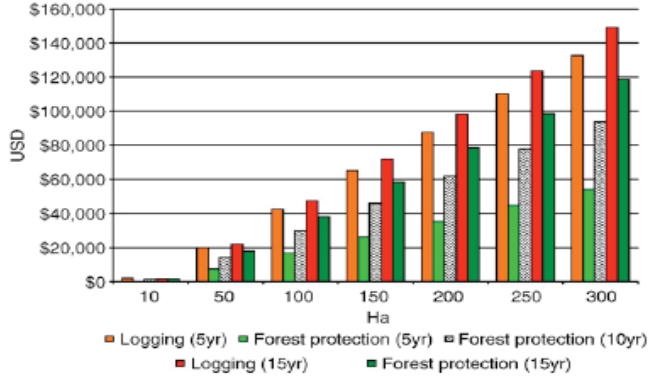
57 De Camino et al., *Costa Rica: Forest Strategy and the Evolution of Land Use*.

58 World Bank, *Costa Rica: Forest strategy and the evolution of land use* (2000).

Waters	-6,600	-1,061	---	---	-442	26,469	---	---	-144
Harvested natural forests	-13,065	100,476	2,722	-17,384	-58,478	17,533	15,425	25,093	43,995
Secondary forests	-92,533	30,528	5,364	-48,212	24,453	-17,435	-23,398	-78,693	28,073
Mangroves	---	---	---	-232	-1,620	---	-7,222	-1,604	-2,412
Mixed uses	4,979	4,032	---	-598	34,301	585	-1,272	-14,196	-1,144
Seasonal crops	1,137	444	76	11,330	4,001	17,862	4,291	473	-1,742
Permanent crops	2,993	13,896	760	41,471	5,800	33,422	4,923	8,825	2,909

Moreover, among those landholders with plots already utilized in a type of economic activity, opportunity costs are positively related to land productivity. Again, due to the current system of undifferentiated payments, this would make owners of highly productive lands less likely to enroll in a PES scheme while making the PES payments seem more attractive to owners of less productive land, who may or may not be poor.[59]

Figure 2: Net Present V of Logging and Forest Protection under the PES and Timber Prices of 2005[60]



Ironically, some of the lands that are richest in biodiversity are also the most attractive for logging due to untouched tracts of land and the presence of rare and valu-

59 Stefano Pagiola, A. Arcenas and G. Platais, "Can Payments for Environmental Services Help Reduce Poverty? An Exploration of the Issues and the Evidence to Date from Latin America," *World Development* 33, no. 2 (2005).

60 Ibarra Gené, "The profitability of forest protection versus logging and the role of payments for environmental services (PES) in the Reserva Forestal Golfo Dulce, Costa Rica," *Forest Policy and Economics* 10, no. 1-2 (2007).

able species of wood.[61] In the Osa Peninsula, one of the most important areas for biodiversity, the value of logging is shown to be higher than the PES price in both 1999 or 2005.[62] In Figure 2, Gené calculates the net present value to a landowner in the Osa Peninsula of either protecting or logging the land. It shows that on every scale logging is a more profitable endeavor.

Additionally, households that are more reliant on the land as their primary source of income have higher opportunity costs. Often these are poorer households because larger landholders have alternative sources of income such as professional jobs in urban centers. In a small survey taken in the Reserva Forestal Golfo Dulce in the Osa Peninsula, it was found that smaller landholders had higher rates of deforestation (see Table 2).[63] This is troubling because small landholders may require higher payment rates in order to participate in the PES program. Unfortunately, the federal government sets the price at one level for all.

Table 2: Distribution of the Farms of the Interviewed Landowners, Forest Area and Logged Area[64]

Farm size	Number of farms	Total area	Area with natural forest	Logged area
<50	13	391	258	142
50-100	17	1,080	735	291
100-150	2	244	129	60
150-200	6	1,102	857	351
200-250	3	654	528	102
250-300	2	562	502	61
300<	1	980	420	100
Total	44	5,012	3,428	1,107

Non-Income Benefits for Small-Landholders

Land Tenure and Land Value

There are several non-income benefits available to small landholders. Firstly, the PES program has contributed to overall land tenure consolidation efforts in the country, as well as the reinforcement of local recognition of tenure for small landholders. This benefit has particular significance since many small landholders in Costa Rica fear land invasion. Despite now being abolished, an old land law which guaranteed land tenure only if "improvements" were made to the land, continues

61 Ibid., 7-13.
62 Ibid.
63 Ibid.
64 All values are in hectares. Ibid.

to bring ownership of degraded land into question.[65] By participating in PES and putting land to economic use, small landholders are able to demonstrate legitimate ownership of the land and enhance local acceptance of land tenure. In the Central Volcanic Mountain Range Conservation Area, landholders identified "security against squatters" as one of the primary benefits of the PES.[66] Furthermore, the program participation requirements of mapping, demarcating and securing land claims and providing this information to a national FONAFIFO database, all contribute to overall tenure-consolidation efforts in the country. This is an important benefit given that scholars have pointed to insecure tenure and the lack of an efficient land registry system as a constraint on rural development in the region.[67]

Another potential outcome of environmental payment programs in general is that the value of land enrolled in the program will increase. In their 2009 "toolkit" for legislators, Bennett and Henninger of the World Resource Institute suggest a danger in increasing land values, which could lead to more powerful groups displacing more vulnerable groups with insecure land tenure.[68] There is no evidence of this occurring in Costa Rica. Rather, an argument could be made that increasing land values would benefit those poorer participants who do have secure land tenure.

Impact on the Rural Labor Market

Landholder participation in the PES program, which restricts uses of land, would be expected to decrease the demand for rural labor. Farm hands, lumber workers, firewood cutters, charcoal makers, cattle ranchers, et cetera are not needed when forested land remains forested. It should further be expected that jobs would be lost if land use changes from lumber or agriculture to conservation, as farming and lumber harvesting require higher numbers of employees than reforestation and certainly conservation. The poor are often involved in the most environmentally degrading activities and are more likely to be those who lose their jobs. However, there is a lack of evidence pointing to jobs lost due to landowners' decisions to switch land-use.

While the alternative land use is most likely the highest source of jobs, amongst the PES modalities reforestation was seen as a better source of job creation than conservation. Reforestation contracts require labor to meet the goals of the modality. Indeed, Morse found that participants in reforestation contracts spent a higher percentage of the payment received on investments for the farm or on labor, while participants in conservation contracts were less in need of local labor and more likely to spend the payments in urban areas.[69] Enrolling in the conservation

65 Miranda et al., *The Social Impacts of Payments for Environmental Services*.

66 Ibid.

67 R.A. Hope, I.Porras and M. Miranda, *Can Payments for Environmental Services Contribute to Poverty Reduction? A Livelihoods Analysis from Arena, Costa Rica*, report for United Kingdom Department for International Development (2005), 8.

68 Bennett and Henninger, "Payments for Ecosystem Services in Costa Rica."

69 Morse, "Consequences of Environmental Service Payments."

modality only creates the need for a few short-term, poorly-paid jobs.[70] Unfortunately, the vast majority of PES contracts are in conservation, not reforestation.

Future Considerations

Changing Opportunity Costs and the Uncertainty of Forest Conservation

Economic factors influence program participation, leading to fluctuations in participation rates. PES contracts last only five years without guarantee of renewal. Over the long term, changes in several factors could provide enough economic incentive to landholders to convert forests to more economically attractive uses. These factors include an increase in timber prices, the introduction of new agro-industries that make marginal land more profitable, a demand for land for use in real estate development, or a global economic crisis depressing tourism.

Historically, cattle-grazing was a large driver of deforestation in Costa Rica, referred to by Myer as the "Hamburger Connection."[71] In the Guanacaste region, for example, a drop in deforestation rates over the past two decades is attributed largely to the collapse of the cattle industry and the rise of tourism in the region. In the past few years, however, Costa Rica has seen a revival of the cattle industry, with exports growing from 10,440 tons in 2000 to 17,400 tons in 2005.[72] From 2005-2007, the international beef price climbed back to 1970 levels. Additionally, a national cattle farming reactivation program was launched in 2007 by the government, which provides low interest loans and increased technical assistance for cattle farmers.[73] These changes could decrease participation in PES and could pose a threat to the future conservation of forests.

70 Miranda et al., *The Social Impacts of Payments for Environmental Services*.
71 As quoted in Alvarado et al., "Deforestation and Forest Restoration in Guanacaste."
72 Ibid.
73 Ibid.

Figure 3: Cattle Population Trend in Costa Rica in Relation to International Beef Price[74]

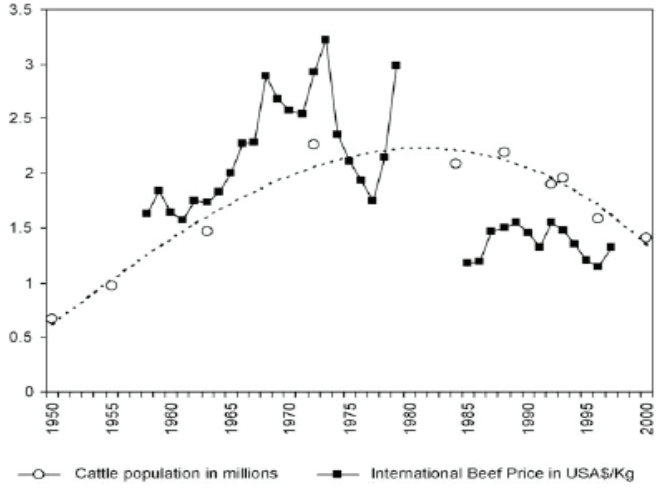


Fig. 2. Cattle population trend in Costa Rica in relation to international beef price (Sources: Montenegro and Abarca, 1998; Ibraham et al., 2000).

Other economic considerations that may affect participation include advances in agriculture and decreases in tourism. Landholders, particularly large land owners, could be persuaded to switch land use to agriculture if new crops that are more suitable to the terrain and climate of Costa Rica are introduced by biotechnology companies. For example, the castor bean and physic nut are biofuel crops that have been adapted to suit hilly conditions.[75] Also, an increase in world demand and improvements in irrigation methods could lead farmers to grow other biofuel crops, such as sugar cane or palm oil. Finally, tourism has historically been a large driver of decreased deforestation in Costa Rica. Because it is tied to the global economic situation, a decrease in international tourism rates could lead landowners to reconsider commitments to conservation.

Suggestions for Reform

Leakage

The program does not include any controls to protect against larger landholders enrolling one area of land in the program and receiving payments, while deforesting another area.[76] Addressing leakage is important in order to qualify for international carbon credits. While there is little evidence to suggest that this is occurring in Costa Rica, program administrators may wish to consider this potential for leakage

74 Ibid.

75 Hecht and Saatchi (2007) as described in Alvarado et al., "Deforestation and Forest Restoration in Guanacaste."

76 Bennett and Henninger, "Payments for Ecosystem Services in Costa Rica."

and include it in monitoring efforts.

Land Titling Reform

It has been observed that the PES program has contributed to the consolidation of the land registry system in Costa Rica. However, independent efforts towards land titling reform and improving overall land tenure, especially for indigenous groups and women, would enable more disadvantaged persons to enroll their land in PES. This would improve the program's impact on poverty and possibly increase the enrollment of environmentally critical lands that may otherwise not be eligible because of insecure land tenure.

Program Participation

Adequately disseminating information on the PES program's opportunities remains one of the main challenges in FONAFIFO's attempts to reach small landholders. Econometric analysis of factors influencing participation revealed that landholders who receive a visit from a forest engineer or organization are ten times more likely to participate in the PES program than landholders who do not receive visits.[77] News of the program has spread both informally through word of mouth and formally through television and radio announcements, community meetings organized by forest organizations and site visits from forest engineers.[78] However, distribution of information on the PES program has not yet reached many landholders, particularly in rural areas. Surveys have shown that landholders not participating in PES have little to no knowledge of the existence of the program.[79] Additionally, many participants often lack information on key aspects of the program, such as the length of contracts, initiation costs or payments to *regentes*.[80]

Conclusion

While it is clear from the data that the Payments for Environmental Services program in Costa Rica has had some success in stemming deforestation and lifting some persons out of poverty, it remains a challenge for the administrators of the program to advance further with either objective without sacrificing performance in the other. Rates of deforestation have declined, but environmentally sensitive lands remain underrepresented in forest conservation contracts, partly due to undifferentiated payments and lack of targeting. Poverty rates continue to decline with the help of other socio-economic factors, but the poorest people, including

77 Zbinden and Lee, "Paying for Environmental Services," 266.
78 Pagiola, "Payments for Environmental Services in Costa Rica."
79 Hope et al., *Can Payments for Environmental Services Contribute to Poverty Reduction?*
80 Miranda et al., *The Social Impacts of Payments for Environmental Services*, iv.

the landless, are not able to participate because of program requirements and their associated costs. **PEAR**