

# Payment for Hydrological Environmental Services in Costa Rica: The Procuencas Case Study

by Alvaro Redondo-Brenes, MFS 2005 and Kristen Welsh, MEd 2006

## Introduction

Implementation of Payment for Environmental Services (PES) programs, especially for watershed services, is a recent activity. PES is a mechanism whereby landowners receive compensation for the environmental services their land provides to the general public (Pagliola 2002). This program is often used to improve water quality through watershed protection. Watersheds accomplish this by improving flow regulation, filtering water, controlling erosion and sedimentation, and maintaining the hydrological functions provided by forests (Johnson et al. 2002; Echavarría et al. 2004). The watershed-based PES programs have been deemed a success for both conservation and development (Echavarría 2002; Redondo-Brenes 2005), which has led to the establishment of programs in Latin America, such as in Costa Rica (Cruz and Navarrete 2000; Mejías and Segura 2001; Rojas and Aylward 2002; Miranda et al. 2003), Ecuador (Echavarría

2002; Echavarría et al. 2004; Redondo-Brenes 2005), Colombia, and Brazil, and in the US, such as in New York City (Tam 2002).

The assessment of these programs is important because prototypes have been established in different countries and it can be useful in creating a framework for further implementation in other regions. This paper assesses a PES program participating in watershed conservation, the Public Services Enterprise of Heredia (ESPH) Procuencas program in Costa Rica, for strengths, weaknesses, and feasibility of implementation in other countries. ESPH was selected since it is seen as one of the most successful projects for watershed protection within the country. This effort is one component of a larger research project addressing water management in Costa Rica (see "Assessing Access to Potable Water in Rural Communities in Costa Rica" by Welsh, this volume). We interviewed technicians in charge of Procuencas, as well as other governmental institutions related to water issues and PES in Costa Rica. Additionally, we reviewed available literature related to Procuencas, ESPH, and PES programs for watershed conservation.

## Background of Payment for Environmental Services in Costa Rica

In Costa Rica, a PES program was implemented throughout the country with the creation of the Forestry Law in 1996. The Forestry Law identifies a range of environmental services derived from natural forests, tree plantations, and agroforestry systems, such as carbon fixation, hydrological services (i.e. reduction of silt

*Alvaro Redondo-Brenes is from Costa Rica and he has a BSc in Forestry Engineering from the Technological Institute of Costa Rica and a MFS from the Yale School of Forestry & Environmental Studies. He worked from 1998 to 2002 at La Selva Biological Station (Organization for Tropical Studies) in Costa Rica and now he is a doctoral student in Tropical Forestry and Conservation at F&ES.*

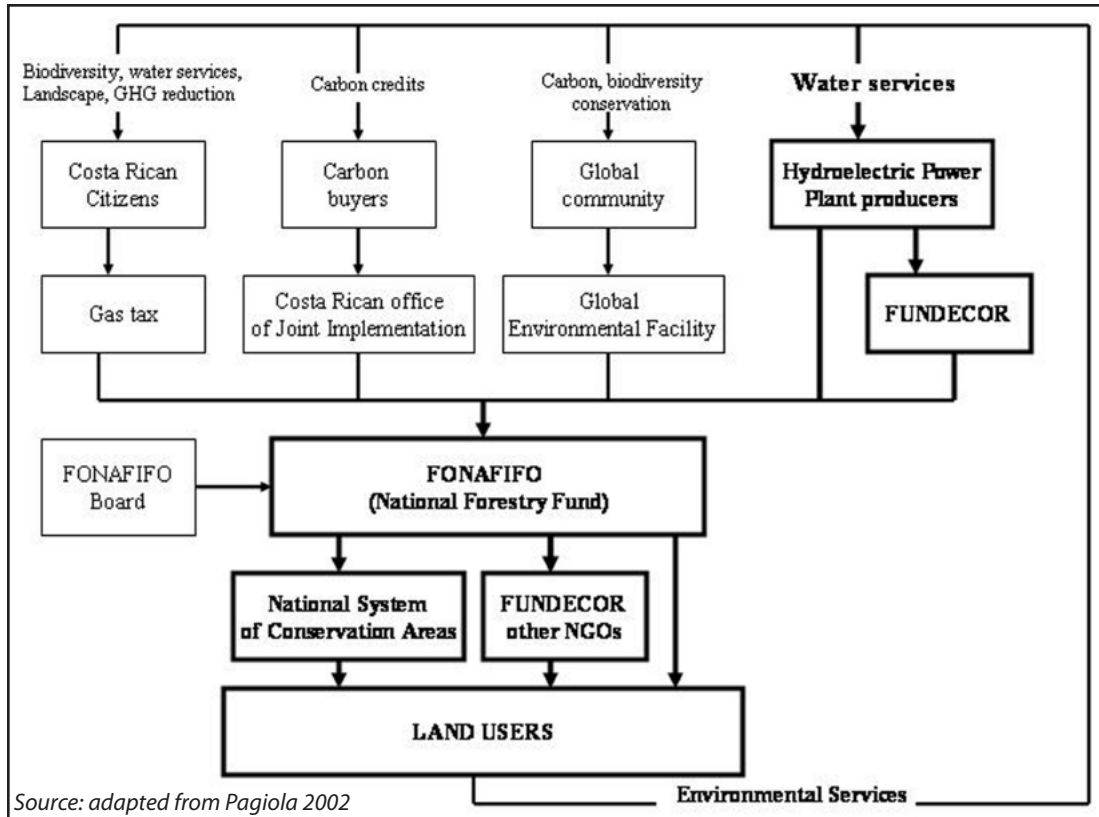
*Kristen Welsh, a native of Massachusetts, attended Tufts University, where she obtained her bachelors degree in Spanish and Environmental Studies. Before coming to the Yale School of Forestry and Environmental Studies, she worked with an environmental consulting firm.*

in the water supplied to hydropower and aquifers), biodiversity protection, and provision of scenic beauty (Subak 2000). On average, landowners receive \$540 per hectare for establishing new tree plantations, \$210 per hectare for established plantations, \$210 per hectare for forest conservation and regeneration, and \$0.8 per tree for supporting the establishment of agroforestry systems over a period of five years (FONAFIFO 2004). The PES program receives revenues from a five percent tax on gasoline consumption, private-sector contributions, and the sale of certifiable tradable offsets (CTOs) to foreign investors. For example, in 1997, Norway purchased \$2.0 million in CTOs in exchange for carbon offsets (Subak 2000), and the government of Germany, through the Kreditanstalt für Wiederaufbau Bank, is investing \$10 million (FONAFIFO 2004). The PES program is administrated through the National Forestry

Fund (FONAFIFO) and implemented by the Ministry of Environment and Energy (MINAE), private consultants, and NGOs, such as FUNDECOR (Foundation for the Development of the Central Volcanic Range), working at the community level with landowners (Figure 1).

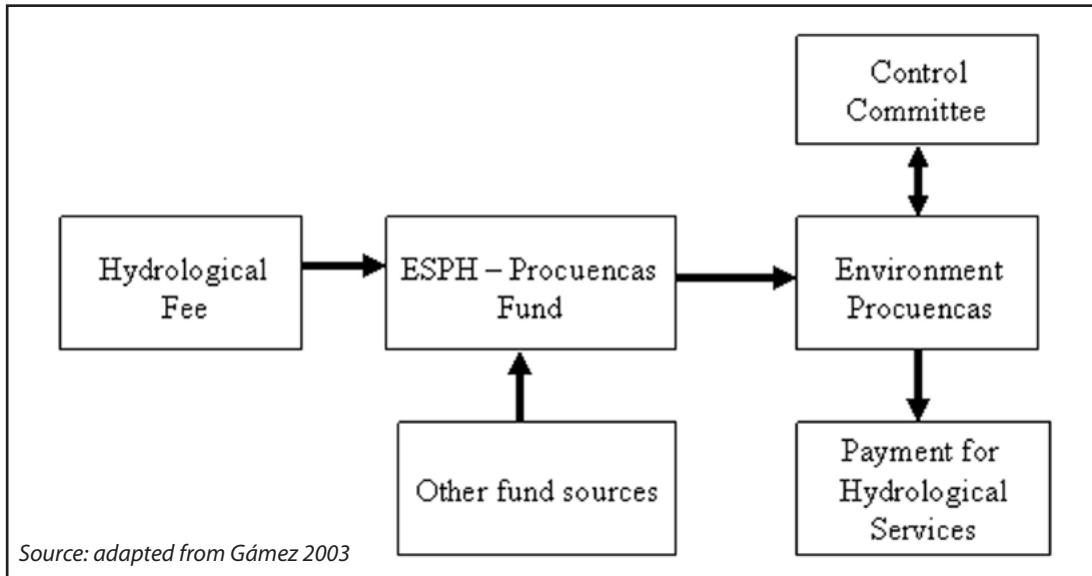
As a component of the PES program, private companies support the program through signed agreements with FONAFIFO that promote watershed conservation in Costa Rica. The hydroelectric power company Energía Global is paying \$10/ha/yr for the protection of 1,818 ha near the San Fernando River watershed and 2,493 ha around the Volcán River. Platanar, another hydroelectric power company, is paying between \$15/ha/year and \$30/ha/year to protect 3,654 ha in the Platanar watershed. The State Power Producer (CNFL) is paying \$40/ha/year to protect 10,900 ha around the Balsa Superior River, the Aranjuez

**Figure 1.** The Costa Rican payment program for environmental services. The water services program is in bold



Source: adapted from Pagiola 2002

**Figure 2.** Administration of the ESPH-Procuenas project funds acquired from the hydrological fee and payment for hydrological services



River, and the Cote Lake. The final example is of the Florida Ice and Farm Co. (Costa Rica Brewery), which signed an agreement in 2000 to pay \$45/ha/year to protect 1,000 ha in the Segundo River watershed, where they obtain water for their activities (FONAFIFO 2004).

### The Procuenas Project

ESPH (Public Services Enterprise of Heredia) was created in 1976 as a public institution and was transformed into a private institution in 1998. As the main water authority in the region, the company also provides electricity, sewage services, and public illumination to a total of 188,000 residents located in three municipalities—Heredia, San Rafael, and San Isidro—within the province of Heredia (Gámez, pers. comm., May 30, 2005). ESPH obtains its water from five micro-watersheds: Ciruelas, Segundo, Bermúdez, Tibás, and Pará, located in northern areas of the Heredia province (Solano, pers. comm., May 30, 2005). According to Gámez (pers. comm., May 30, 2005), the main problems affecting watershed conservation in the region are deforestation,

urban growth, and livestock. However, these problems have been decreasing in recent years.

The Procuenas project started in 2000 as an initiative of ESPH (Gámez 2003). Procuenas is a private PES program for watershed conservation independent of FONAFIFO, and it provides more payment to the beneficiaries in its region than FONAFIFO does in the rest of the country (Gámez, pers. comm., May 30, 2005). ESPH pays landowners approximately \$100/ha/yr for conservation distributed over 10 years and \$946/ha for reforestation distributed over 5 years (Gámez, pers. comm., May 30, 2005).

The main objectives of Procuenas are (1) to conserve and restore the watersheds of the water that ESPH administers and (2) to improve river water quality by providing economic compensation to landowners who voluntarily protect their forested lands or to those who want to reforest their land (Solano, pers. comm., May 30, 2005). Procuenas receives revenues from a Hydrological Fee included on each user's water bill, private contributions, and through partnerships between ESPH and other private companies (Figure 2).

To date, the ESPH fee is the first in the country that internalizes environmental benefits (e.g. forest services such as capture and infiltration of water and restoration of degraded lands) and opportunity costs for traditional uses of protected land (e.g. cattle ranching for dairy, which is the most common land use in this region) in a public service tariff (Gómez 2003). The Hydrological Fee was approved by the government's Public Services Authority (ARESEP) in 2000 (Solano, pers. comm., May 30, 2005). This fee is located in a separate column on the water bill, which draws users' attention to the additional amount they are charged. In 2004, the fee amounted to \$0.01/m<sup>3</sup> of water (Gómez, pers. comm., May 30, 2005). This fee is used to finance the ESPH-Procuenas fund administered by the Procuenas environmental division within ESPH (Figure 2). The final decision of how to prioritize the use of the fund is delegated to a control committee, consisting of one member from each of the three municipalities represented in ESPH, two representatives of ESPH, the director the Central Volcanic Range Conservation Area of MINAE as the fiscal advisor, and the director of FONAFIFO as an observer. The fund has been invested in payments for forest conservation, reforestation programs with native tree species, environmental education programs, and land purchase in priority areas delineated by ESPH (Solano and Gómez, pers. comm., May 30, 2005).

According to Gómez (pers. comm., May 30, 2005), the program's success can be attributed to (1) separating Procuenas from FONAFIFO, which has enabled better investment in ESPH priority areas instead of FONAFIFO areas, as well as the avoidance of bureaucratic requirements; (2) establishing their own institutional framework (Figure 2) that simplifies and focuses efforts and allows them to have control at the community level instead of the national level; (3) focusing on local and direct benefits as a means to activate the interest and responsibil-

ity of the local people; and (4) providing communities with large benefits from the project at a low cost because the administration of the fund represents only 0.5% of the ESPH budget.

### **Critique of Procuenas**

The Procuenas project is considered a successful case study in Costa Rica and has been used as a model in other regions of the world, such as in Ecuador (Echevarria 2002; Redondo-Brenes 2005). There are four main achievements of the program that can be highlighted. First, the Hydrological Fee was created as a means to compensate landowners for the hydrological services their lands provide. Second, while 97.5% of Costa Rican residents have access to water in their households, 40% of them drink public water that is not potable (Segura Bonilla et al. 2004). However, 100% of the local residents receive potable water from ESPH. Third, over 1,000 ha of land are protected within the program to date. Finally, other local water companies and municipalities are approaching ESPH to acquire knowledge about the program and implement similar approaches in their territories (Gómez, pers. comm., May 30, 2005).

There are, however, some weaknesses within the project that should be addressed to avoid failures in the future. First, ESPH personnel have not succeeded in communicating the objectives and benefits of the program to the users. Though local people see the fee on their water bills, according to Gómez and Solano (pers. comm., May 30, 2005), people are not educated about this new fee or the importance of preserving upstream watersheds. For instance, even though ESPH has invested in environmental education, most of the rivers within their territories are still highly polluted. More time and money must be spent to educate people about the importance of watershed protection. Second, the program would benefit from a revised delineation of areas designated for well protection. Based on current delin-

ations, areas are not large enough to protect wells from the complexities of hydrological flow, such as shifts in groundwater movement. If ESPH expands the area currently under protection, more land could be forested. Finally, according to Gámez (pers. comm., May 30, 2005), urban development in the region is significantly affecting the conservation of watersheds. Heredia is one of the provinces with the highest rate of urban growth. Although it is illegal, municipalities are allowing the construction of new development projects close to water sources, which may lead to future problems. Thus, there needs to be more coordination and control across different Costa Rican institutions.

### **Final Remarks: Feasibility of Project Implementation in other Regions**

The implementation of a watershed conservation model that targets household water consumption is attractive because it is cheaper to pay for environmental services than restoration activities. For instance, by investing approximately \$1 billion in land protection and conservation practices, New York City hopes to avoid spending \$4 to 6 billion on filtration and treatment plants (Johnson et al. 2002). In addition, in Portland, Oregon; Portland, Maine; and Seattle, Washington; authorities have found that every \$1 invested in watershed protection can save anywhere from \$7.50 to nearly \$200 in costs for new filtration and water treatment facilities (Johnson et al. 2002). People worldwide have expressed their willingness to pay for better water quality (Rodriguez and Southgate 2003; Echavarría et al. 2004; Gámez, pers. comm., May 30, 2005; Coronel-Castro and Jaramillo-Ordóñez 2005). In Costa Rica, for instance, a bottle of water costs approximately \$1.50, and one cubic meter of water supplied to households is only \$0.20. Thus, it is more economical for local users to pay for watershed protection and to have access to potable water than to spend a large amount of money buying bottled water.

Before implementing a payment mechanism for hydrological services, we have to consider the following questions: (a) Who are the beneficiaries? (b) Who are the suppliers? (c) How much should we charge the beneficiaries? (d) How will the project compensate service providers? (Johnson et al. 2002). ESPH-Procuenas addressed these questions before implementing the project, and the outcomes are highlighted above. Moreover, Procuenas created an adequate endowment from the Hydrological Fee, which allows them to implement and invest in conservation and environmental education in the region. On the contrary, in Ecuador, the water authority of Quito encountered several problems when trying to implement their watershed conservation program due to the lack of an endowment (Pugh 2002). Thus, building a strong endowment is a key step in starting a watershed conservation program.

Procuenas, as mentioned above, is independent from FONAFIFO and has a more simple structure in comparison to the latter (Figures 1 and 2). While in FONAFIFO intermediaries such as MINAE, local consultants, and NGOs are needed to invest money into conservation issues, Procuenas works directly with the local suppliers and beneficiaries of their watershed conservation approach. This is another key point that should be considered before implementing a watershed conservation program in a particular region of the world. As mentioned by Gámez (pers. comm., May 30, 2005), if ESPH could implement Procuenas with just 0.05% of their total budget and with only one technician working full time on the project, other water authorities in Costa Rica or worldwide should be able to implement a similar project. If only 40% of Costa Ricans have access to potable water and Procuenas has dramatically improved this situation, water authorities in the country should think about establishing similar approaches to ensure better water quality for their residents.

Utilizing water as a means for watershed conservation not only ensures better quality water for users but also is a good strategy for preserving forests, restoring or rehabilitating degraded lands through reforestation, protecting biodiversity, and achieving other forest services, such as carbon sequestration and scenic beauty. Despite considerations of certain weaknesses in the Procuencas program, ESPH provides a useful model for implementation in other regions of the world. This implementation may be feasible in regions where water authorities work with local residents to improve water quality and watershed conservation and where every participant can potentially benefit from the program.

### Acknowledgements

The authors want to thank Luis Gámez and Viviana Solano for the information provided regarding the ESPH Procuencas project. We also want to thank personnel from MINAE, FONAFIFO, AyA, and other institutions that helped us to gather information regarding PES and water management in Costa Rica. Laura Kiernan provided important feedback in previous drafts of this paper. This project was supported by the Tropical Resources Institute (TRI) at the Yale School of Forestry and Environmental Studies.

### References

- Coronel-Castro, R.M. and A.B. Jaramillo-Ordóñez. 2005. *Valoración Económica del Servicio Ambiental Hídrico de la Microcuenca Hidrográfica El Limón. Tesis Ing. en Manejo y Conservación del Medio Ambiente*. Ecuador: Universidad Nacional de Loja.
- Cruz, G. and G. Navarrete. 2000. *Los Bosques y el Servicio Ambiental de Protección del Recurso Hídrico en Costa Rica*. Costa Rica: FONAFIFO.
- Echavarría, M., J. Vogel., M. Alban, and F. Meneses. 2004. *The Impacts of Payments for Watershed Services in Ecuador: Emerging Lessons from Pimampiro and Cuenca*. London: International Institute for Environment and Development.
- Echavarría, M. 2002. Financing Watershed Conservation: the FONAG Water Fund in Quito, Ecuador. Pp. 91-101 in *Selling Forest Environmental Services: Market-Based Mechanism for Conservation*, edited by S. Pagliola, J. Bishop, and N. Landell-Mills. London, UK: Earthscan.
- FONAFIFO (Fondo Nacional de Financiamiento Forestal, Costa Rica). 2004. Pago de Servicios Ambientales. Data available at <http://www.fonafifo.com> (accessed on December 7, 2004).
- Gámez, L. 2003. Remunerar la Protección de las Fuentes de Agua. *Ambientales* 25: 58-66.
- Johnson, N., A. White, and D. Perrot-Maitre. 2002. *Developing Markets for Water Services from Forests: Issues and Lessons for Innovators*. Washington, D.C.: Forest Trends, WRI, and the Katoomba Group.
- Mejías, R. and O. Segura. 2001. *Situación Actual del Pago de Servicios Ambientales en Centroamérica: Documento Borrador*. Heredia, Costa Rica: World Resource Institute and Centro Internacional de Política Económica para el Desarrollo Sostenible (CINPE).
- Miranda, M., I.T. Porras, and M.L. Moreno. 2003. *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.
- Pagliola, S. 2002. Paying for Water Services in Central America: Learning from Costa Rica. Pp. 37-61 in *Selling Forest Environmental Services: Market-Based Mechanism for Conservation*, edited by S. Pagliola, J. Bishop, and N. Landell-Mills. London, UK: Earthscan.
- Pugh, J. 2002. *The Public Perception of "FONAG": A Case Study of an Ecuadorian Watershed Sustainability Program*. Paper presented at The National Conference on Undergraduate Research (NCUR). Whitewater, Wisconsin: University of Wisconsin.

- Redondo-Brenes, A. 2005. An Assessment of a Fund for Watershed Conservation in the Southern Ecuadorian Andes. *Journal of Sustainable Forestry*. Submitted November 2005.
- Rodriguez, F. and D. Southgate. 2003. Water Resources Management and Willingness to Pay: the Case of Cotacachi, Ecuador. Sanrem CRSP Research Brief #15. Sustainable Agriculture & Natural Resource Management. Collaborative Research Support Program, University of Georgia.
- Rojas, M. and B. Aylward. 2002. The Case Study of La Esperanza: a Small, Private, Hydropower Producer and a Conservation NGO in Costa Rica. *FAO's Land Water Linkages in Rural Watersheds Case Study Series*. Available online at [www.fao.org-landandwater-watershed](http://www.fao.org-landandwater-watershed).
- Segura Bonilla, O., M. Miranda Quirós, Y. Astorga Espeleta, J.E. Solano Mora, F. Salas Pinel, M. Gutiérrez Miranda, M. Dierckxsens, and M.M. Cespedes Mora. 2004. *Agenda Ambiental del Agua en Costa Rica*. Costa Rica: Fundación CR-USA.
- Subak, S. 2000. Forest Protection and Reforestation in Costa Rica: Evaluation of a Clean Development Mechanism Prototype. *Environmental Management* 26 (3):283-297.
- Tam, L. 2002. *Economic Incentives to Protect Watersheds: A Review of Literature and Case Studies of Payments for Environmental Services*. Washington, D.C.: Conservation International.
- Ziegelmayr, K., T.W. Clark, and C. Nyce. 2004. Biodiversity and Watershed Management in the Condor Bioserve, Ecuador: An Analysis and Recommendations. *Journal of Sustainable Forestry* 18 (2/3):139-169.



Source: Rhind, William. 2004. *The Vegetable Kingdom*. *Fine Rare Prints*. Available at: [www.finerareprints.com](http://www.finerareprints.com)