

## **CASE STUDY PIMAMPIRO, ECUADOR**

Located in the Andes of northern Ecuador, the municipality of Pimampiro draws most of the water for its 13,000 inhabitants from the 630-hectare Palahurco River watershed. Water from the Palahurco is also used for irrigation. Annual precipitation in the area is estimated to be 850 mm per year. The municipality has been experiencing water shortages and is looking for ways to augment its existing water resources. Domestic water users receive water two days a week, for a period of two hours per day. A quarter of the population had limited access to drinking water services. Water quality (sediment) is also a problem and problems are believed to be caused by upstream agriculture. The 5,000 inhabitants of Pimampiro are connected to the municipal water system and 1,350 households and businesses in Pimampiro pay for metered water. The residential and commercial water use rates are \$0.05 and \$0.11/m<sup>3</sup>. It costs the municipality \$0.21/m<sup>3</sup> to produce the water, only 60% of the water billed is collected, and the water system is consequently heavily subsidized by the municipality. Water tariffs generate \$800/month. Eighty percent of water users indicate that they are satisfied with the water service and 97% indicate that it is important to protect the watershed.

The upland portions of the Palahurco watershed are owned and utilized by members of the Nueva América community who are all members of the Nueva América Association. They are mestizos of Indian descent. The 24 families who constitute the Nueva América Cooperative have had title to their land since 1985. In recent decades, members of the Nueva América community have substantially increased livestock pastures and potato fields through deforestation and conversion of existing highland pastures to potatoes. They also harvest and sell timber from the upland forests. The size of land holdings varies from 12 to 119 hectares/family, with an average of 26 hectares per family. Four of these families live in the upland forests and the rest live in lowland communities. Most of the men in the Association completed the third grade of school and 30% of adult women are illiterate. Average family income is \$61/month.

Although no hydrologic studies have been conducted, the common perception is that the upland forests and herbaceous páramo protect water quality and provide water during the dry season. The upland forests and herbaceous páramo are located in the buffer zone of the Cayambe Coca Ecological Reserve.

CEDERENA (Corporation for the Development of Renewable Natural Resources), an Ecuadorian NGO has experience in raising funds from international sources, managing conservation programs, and is interested in improving natural resource management in the area.

### Case Study Questions:

1. Is the described NRM case suitable for PES? Why or why not?
2. If not suitable for PES, what type of program might you develop to address the NRM problem?
3. Who are potential PES sellers and buyers?
4. What are the potential environmental services that might be involved?
5. How would you determine if the service is being delivered (conditionality)?
6. How long do you think it would take for environmental services to be delivered in an economically significant way?
7. How could this program be made pro-poor?
8. If there are PES program possibilities, would the program be true PES or PES-like? Explain your answer?



## PIMAMPIRO, ECUADOR - CASE STUDY X

Located in the Andes of northern Ecuador, the municipality of Pimampiro draws most of the water for its 13,000 inhabitants from the 630-hectare Palahurco watershed. Responding to water shortages and inspired by Costa Rica's PSA program (see Box), the town has used PES to finance the protection and regeneration of natural forests and *páramos* (alpine grasslands) since 2000. Adoption of this approach was made possible by an external grant of US\$37,000 to CEDERENA, a local NGO. This grant was used to cover start-up expenses, including those related to background studies, negotiations, and development of a contracting and monitoring system (CEDERENA, 2002).

Recipients of payments all belong to the Nueva América Cooperative. In places more than 3,000 meters above sea level within the watershed, these members had increased livestock pastures and potato fields gradually over time, in addition to occasionally extracting timber. Although no hydrologic studies were carried out before the payments scheme was adopted, the municipal government of Pimampiro reckoned that these activities threatened the quality and seasonal stability of water supplies. Accordingly, PES enrollment for five years was offered to all owners of high-altitude lands, with contracts renewed in early 2006.

Since the program's inception, monthly payments have ranged from US\$0.50 per hectare for previously cultivated land that has been allowed to revert to natural vegetation to US\$1.00 per hectare for pristine forests and *páramo* (Echavarría *et al.*, 2002). Added to this compensation for landowners have been recurring transaction costs for the water company – related to monitoring, administration, and related tasks. These costs amount to US\$1.57 per hectare per annum (Wunder and Albán, forthcoming).

Compensation paid to landowners is covered fully by the 1,350 households and businesses in Pimampiro with water meters, which pay a 20-percent surcharge on their monthly bills. Non-paying water users, including irrigators, can be considered free riders. A municipal account with a balance of about US\$15,000 comprises a financial guarantee for payments to members of the Nueva América Cooperative who fulfill their contractual obligations (Wunder and Albán, forthcoming).

Pimampiro's program contains the critical feature of PES, which is that payments are conditional. Initially, CEDERENA was responsible for monitoring selected plots of land every three months. This task subsequently passed to the municipal government, which occasionally has lacked the necessary workforce. However, conditionality has been maintained by sanctioning payment-recipients who do not honor land-use agreements. From 2002 through 2004, payments were cut off to several households that were found to be in violation, although some were allowed to reenroll later. Currently, 19 contracts are in effect, representing four-fifths of the Nueva América membership and covering 550 hectares.

Although a few members of the cooperative do not participate in the program, conservation payments that are voluntary and conditional appear to have succeeded in stemming deforestation in the Palahurco watershed. In 2000, prior to the initiation of PES, 198 hectares, equivalent to 31 percent of the watershed, had been cleared for cropland and pasture. Since then, agricultural land use has fallen to 88 hectares, or 14 percent, with a corresponding increase in the area reverting to natural vegetation (A. Guerrero, personal communication, 2005). In addition, timber extraction has all but ceased. These changes contrast markedly with the continuing deforestation that has occurred during the same period in neighboring areas with similar road

access and patterns of settlement. Yet to be studied, hydrologic impacts probably have been less pronounced than changes in land use, given that it takes time for watershed functions to recover after soils have been disturbed. But at the very least, the threat of continued degradation has been largely contained (Wunder and Albán, forthcoming).

The Nueva América Cooperative's acceptance of conservation payments, not to mention the impacts of these payments on resource use, might seem anomalous, in particular since monthly compensation of US\$0.50 to US\$1.00 per hectare is well below the opportunity cost of land (Wunder and Albán, forthcoming). However, individuals are paid for all of their holdings covered by natural vegetation, even though they are capable of clearing only a small share of these holdings in any given year. The opportunity cost of conservation clearly does not amount to US\$0.50 or US\$1.00 per hectare, but instead is much higher. In a financial analysis, Quintero *et al.* (2006) found that a household with modest land-clearing capacity and a high discount rate gains by accepting the conservation payment. Interviews with members of the Nueva América Cooperative confirm that household spending has increased thanks to PES (Echavarría *et al.*, 2002).

Two caveats must be kept in mind when evaluating watershed services in Palahurco. The first is that, since 2000, Ecuador's liberalization of meat imports has reduced the profitability of ranching, and therefore diminished the rewards of carving new pastures out of forests. In other words, counter-factual (i.e., without-PES) deforestation pressures were reduced. The second caveat, which further complicates definition of the counter-factual scenario, has to do with the effective legal status of forests. To be specific, municipal enforcement of legal prohibitions on logging and land-clearing in the Palahurco watershed, which were promulgated during the 1990s, tightened considerably about the time PES was adopted.

While the value of watershed services might be exaggerated if these two caveats are ignored, there are other environmental benefits that have yet to be analyzed. Among these benefits are biodiversity values, which are appreciable since the Palahurco watershed is part of the buffer zone for the Cayambe-Coca Ecological Reserve – one of the most species-rich protected areas in the world.

The Pimampiro initiative is worthy of the attention it has received because it is one of the few, unambiguous examples of PES, with all five features of this approach in place. There are genuine buyers and sellers of a well-defined (and valid) proxy for an environmental service. Participation is voluntary for both groups. Furthermore, conservation payments are truly conditional. Pimampiro has been a widely disseminated model for small-scale, self-organized watershed PES. For instance, CEDERENA is currently replicating the scheme in Loja province, in the southern Ecuador. A similar initiative in Los Negros (Santa Cruz Department, Bolivia) modeled voluntary agreements to halt upstream deforestation on the contract developed for Pimampiro (Asquith *et al.*, forthcoming). What has been put in place in this small, Ecuadorian town thus demonstrates that it is possible to implement PES in the way economic theorists have devised, at manageable transaction costs and achieving successful and sustainable outcomes. The Pimampiro model is likely to be particularly attractive to other communities searching for novel solutions to difficult watershed problems.