An Assessment of Mexico's Payment for Environmental Services Program

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Photo: Jaime Sáinz, 2005

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CURRENCY AND EQUIVALENTS

All amounts are expressed in US dollars

(Base year 2004)

ACRONYMS AND ABREVIATIONS

CCT	Conditional Cash Transfer
CIDE	Centre for Research and Education in Economics
CNA	National Commission on Water
CO_2	Carbon dioxide
COLPOS	Postgraduate College
CONAFOR	National Forestry Commission
CONANP	National Commission of Protected Areas
CONAPO	National Population Council
ENNAF	National Survey of Forest Communities
FFM	Mexican Forest Fund
FIA	International Automotive Federation
GIS	Geographical Information System
IMTA	Mexican Institute of Water Technology
INE	National Ecology Institute
INEGI	National Institute of Geography, Statistics and Information Systems
NAFTA	North American Free Trade Agreement
NGO	Non Government Organization
PAN	National Action Party (political party)
PEA	Department of Policy and Environmental Economics (INE)
PES	Payments for Environmental Services
PET	Program for Temporal Employment
PMSEM	Program for the Sustainable Management of Mountain Ecosystems
PROCAMPO	Program for the support of the Countryside
PROCEDE	Program for the Certification of Ejido Land Property Rights
PROCYMAF	Program for Sustainable Forest Conservation and Management
PRODEFOR	Program for Forest Development
PRODEPLAN	Program for the Development of Commercial Forest Plantations
PRONARE	National Program of Reforestation
SEDESOL	Secretariat of Social Development
SEMARNAP	Secretariat for the Environment, Natural Resources, and Fisheries (1995-2000)
SEMARNAT	Secretariat for the Environment, Natural Resources
SHCP	Secretariat of Hacienda and Public Credit
UC	University of California
UCF	Cooperation and Financing Unit
UIA	Iberoamerican University
WDR	World Development Report

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I. Introduction

Programs of payments for environmental services (PES) are becoming, throughout the world, an increasingly popular way of creating, conserving, and restoring natural resources that provide public benefits. These programs encompass a variety of strategies, including payments for the continued existence of a forest, for the planting of native species on fallowed land, or for working-lands projects that include agroforestry components. Though the term "payments for environmental services" is relatively new, such programs have been in existence for quite some time. The Nature Conservancy pioneered one types of PES strategy, having purchased 116 million acres around the world since 1951 (Nature Conservancy, 2003). In the United States, the water supply of New York City is partially guaranteed by the subsidized conservation efforts of working farmers in the watershed which feeds the metropolis, an effort which began in the 1980s.

In recent years, such programs have increasingly been introduced by developing countries, with one of the earliest efforts occurring in Costa Rica in 1997, and pilot programs mushrooming throughout Latin America and Asia (World Bank, 2005). In 2002, more than 300 such schemes were inventoried (Mayrand and Paquin, 2004). Despite the increasing number of such projects, there is a scarcity of rigorous studies analyzing their effectiveness in providing environmental services and their impacts on the people and communities receiving the payments. This report intends to partially address this gap by presenting an analysis of the first two years of the Mexican PES program for hydrological services, which began in 2003, where payments are made to individuals and communities as incentives to preserve existing forests. Although the program has not been in place long enough to truly assess results in terms of forest conserved, sufficient time has passed to extract various lessons from both the political process which led to the program as well as the impact of the payments on recipient communities, and, to some extent, on their forest management behavior.

The following pages will outline the evolution of the Mexican PES program from the original proposal through the first two years of the program's implementation. The first section will provide background information on deforestation and potential environmental services in Mexico. Section 2 presents a political economy analysis of the tortuous path the program traveled through Mexico's legislative and administrative structures. The third section focuses on

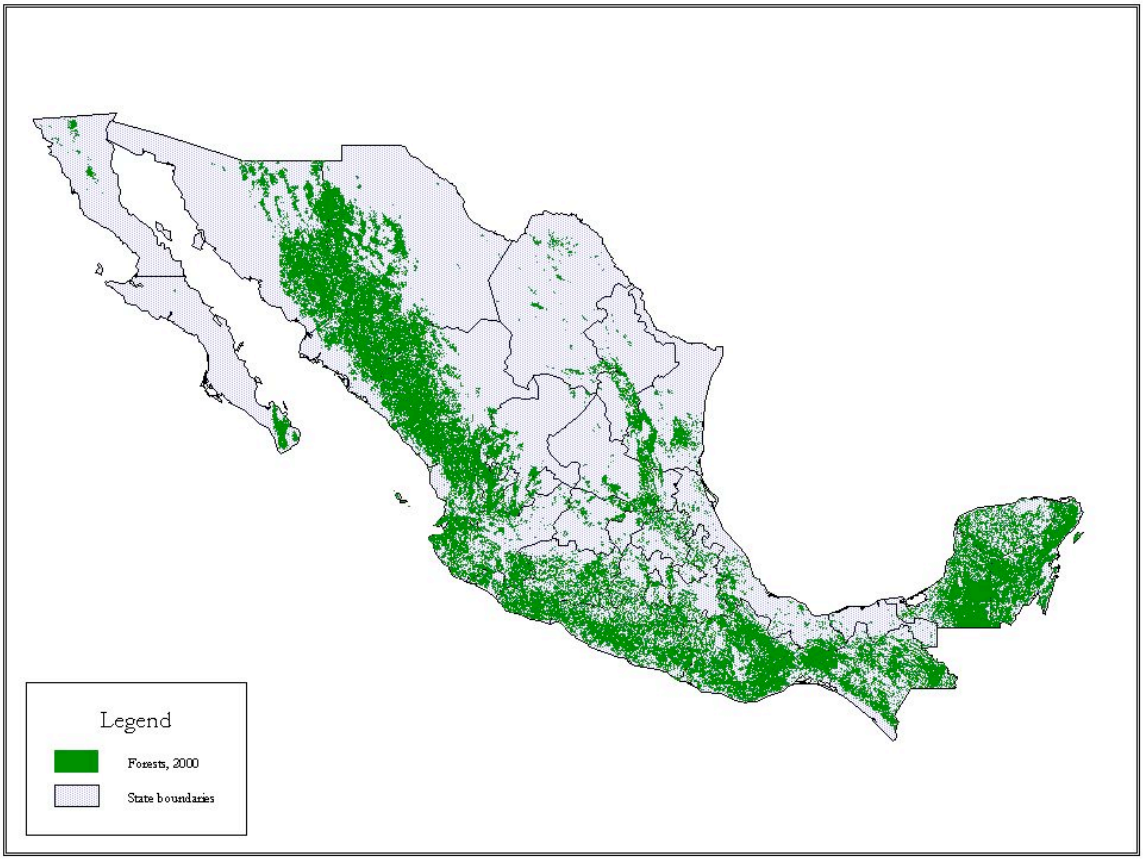
the recipients of the pilot program, including results from a survey of participants as well as in-depth community case studies. Section 4 which puts the Mexican PES experience in a conceptual framework focused on accountability mechanisms between different actors in the process of the provision of environmental services. Based upon this framework, we then extract in section 5 lessons from the Mexican experience, including possible alternative program designs to address some of the problems encountered in its implementation.

II. Deforestation in Mexico and the environmental services crisis

a. Forests and deforestation in Mexico

According to the National Forest Commission (CONAFOR), forests and areas with natural vegetation (including arid and semi-arid environments) cover 72% of the Mexican territory (CONAFOR, 2001). Mexico is among the most biologically diverse countries in the world, with first place in reptilian diversity, third in bird, and fourth in mammal diversity. Its plant diversity exceeds that of the United States and Canada combined. The area in temperate and tropical forests (covering over 50% of the country), as measured by the 2000 Forest Inventory, is shown in Figure 1. It demonstrates that forests are widely distributed across the Mexican territory, and thus an issue of concern for a large number of municipalities.

Figure 1. Mexican forest cover, 2000.



Source: National Forest Inventory, SEMARNAT

These biological riches and the hydrological services associated with forests are threatened by deforestation which has reduced the extension of forests by fifty percent over the past five decades. Velásquez *et al.* (2003) estimate the overall deforestation rate at 1.3 percent per year, a rate which, if it continues, would eliminate all forests in the country within a century. This deforestation is not uniformly distributed across forest types or geographic regions. Table 1 shows the distribution of deforestation across forest types between 1994 and 2000, with an overall average annual rate of 1.2%. The category of temperate forest includes pine, oak, and cloud forests, while tropical forests include a variety of rainforest and dry tropical forest types. Clearly, deforestation in tropical forests is progressing at a much faster rate, 2.4 % per year, than in temperate forests, 1.2 % per year, and in scrub forests, 0.6% per year (Table 1).

Table 1. Change in forest cover by forest type from 1993-2000

Forest type	Km^2 in 1994	Km^2 in 2000	Average annual rate of change
Temperate forests	352,969	328,471	-1.2
Tropical forests	356,228	308,001	-2.4
Scrub forests	578,841	558,077	-0.6
All forests	1,288,038	1,194,549	-1.2

Source: Velásquez *et al*, 2003.

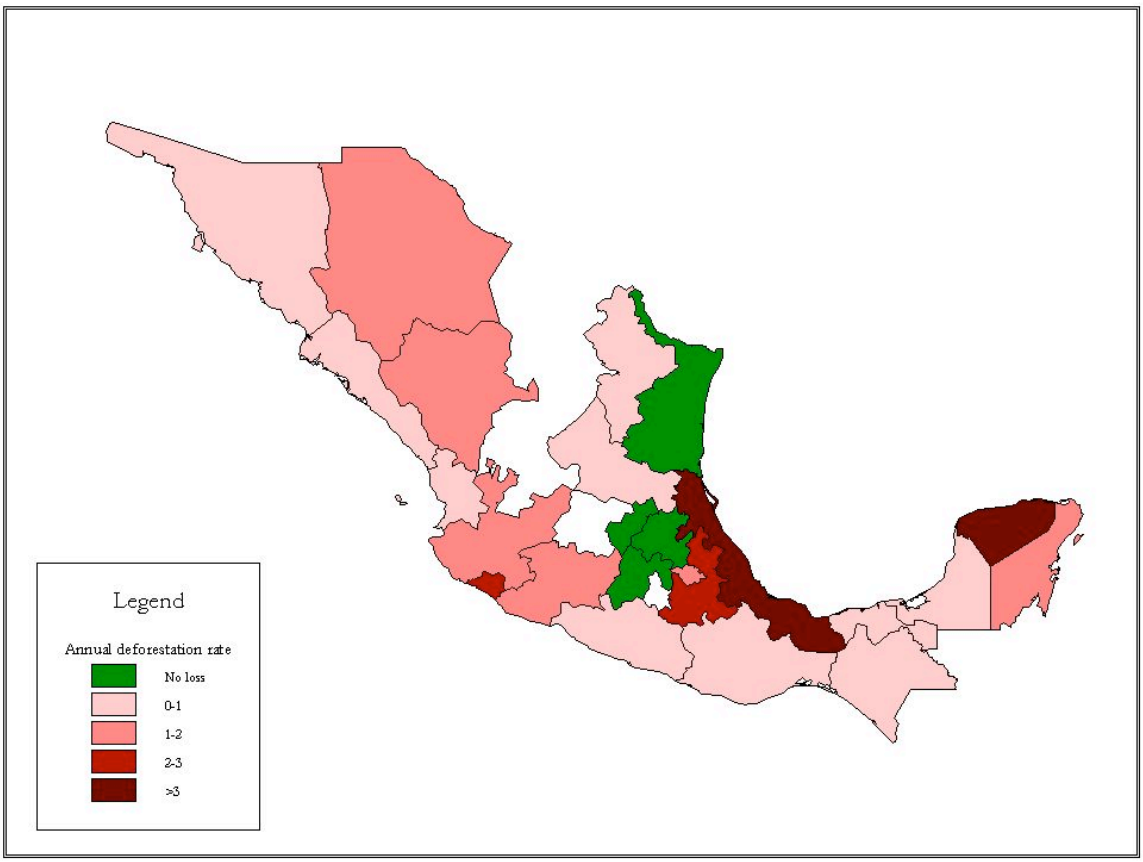
About 5 percent of Mexico's remaining forest is located in the National System of Protected Areas (SINAP). Durán Medina, Velásquez, and Mas (2004) show that some of these forests in fact exhibit higher deforestation rates than those managed for wood extraction. According to these authors, forest loss on this land is at least partially due to the fact that SINAP is underfunded.

Private owners control around 15 to 20 percent of the forest, depending on the estimate. Although some quantity of forest conversion clearly results from forest fires and pest damage, as in the large fires of 1998, the main cause of deforestation is the economic return from agricultural, pastoral, and extractive activities relative to that of conservation and sustainable harvesting of forest stocks. As forest cover decreased between 1994 and 2000, pasture lands increased at a rate of 4.6% per year, while agricultural lands increased by 2%. A study by Muñoz *et al.* (2004) showed that the main correlates for deforestation nationwide were proximity to cities and rural population centers, low slope, and soils appropriate for agriculture. This suggests that the driving force behind deforestation is the relative profitability of agricultural and pastoral activities versus forest.

The remainder of the forested land, and the vast majority (75-80%), is found in the *ejidos* and *comunidades*, rural communities resulting from a drawn-out land reform that extended from the end of the 1910 Revolution until the constitutional reform of 1994. During this time, an area equivalent to half the country was redistributed to peasants organized in communities. *Ejidos* are composed of two different kinds of property rights over land: individual parcels and common lands. Land in individual parcels is mostly used for agricultural activities. Within these same communities, there also live many people who are not members of the *ejido,* usually descendants of the original members (*ejidatarios*) who were prevented from becoming members by the legal restriction on inheritance to only one child (unigenitur rule). The non-members (called *avecindados* or *posesionarios*) do not have voting rights and are not formally given land for productive purposes, but in practice they often farm on *ejido* lands ceded or rented by others or illegally taken from the commons. The commons are mainly dedicated to pasture and forest. Indigenous communities (*comunidades*) are very similar to *ejidos*, although they are almost always composed entirely of common property. Their members are known as *comuneros,* inhabitants of a community or region whose land rights were recognized by the government, and are indigenous in origin. *Comunidades* use the same terminology to refer to the non-members living in their communities. In the interest of brevity, for the remainder of this report we will use the term *ejidos* or "communities" to refer to both *ejidos* and *comunidades* as the deforestation problem does not differ markedly in the two cases.

The overall deforestation rate in these communities, which is equal to 1.4% per year, is higher than the 1.2% national average. The distribution of this deforestation at the state level is shown in Figure 2. The calculations of this rate and of the map below were made using the random sample of forest-holding *ejidos* from Alix-García, de Janvry, and Sadoulet (2005). The highest rates of deforestation in the sample are found in the states of Veracruz and Yucatan, followed by Colima and Puebla, with moderately high rates throughout the Northern Sierra region and Quintana Roo. This corresponds with the observation from Table 1 that tropical forests are subject to higher rates of loss than temperate ones. Note that there were several states for which there was no data available.

Figure 2. Deforestation in *Ejidos* and *Comunidades*, 1994-2000.



Source: National Forestry Inventories and ENNAF 2002

Although the deforestation decision in *ejidos* is clearly affected by the correlates mentioned above, the common property element creates additional complications in their deforestation dynamics. In a recent study of forest loss based on a random sample of 450 ejidos, Alix-García, de Janvry and Sadoulet (2005) found that there are two different types of community behaviors that lead to deforestation within these communities. This is due to the fact that only a small subset of the *ejidos*, between 25 and 30% of those with forest, hold permits which allow them to extract wood for sale. Table 2 shows a surprising difference between these two types of ejidos – those with permits have much higher overall deforestation as well as much higher deforestation per member than those without permit where deforestation is unregulated. This statistic is important because it gives us insight into the causes of deforestation across communities. Although *ejidos* with extractive permits make up only 16 percent of the sample in the study, they account for 34 percent of the overall forest loss over the period. This suggests two conclusions.

First, special efforts need to be made to address excessive forest loss in communities whose forest is managed under the permit system; and second, policies for permit versus non-permit forest communities need to be differentiated as the causes of deforestation are quite different.

Table 2. Contrasting *ejidos* with and without extractive permits.

Deforestation	Without permits	With permits
Forest loss in 1993-2000 (ha)	253	920
Forest loss per *ejido* member in 1990 (ha)	3.8	6.6
Share of total deforestation (%)	66	34

Source: 2002 survey of forest ejidos, Alix-Garcia *et al.* (2005).

For *ejidos* that choose not to have forestry exploitation, deforestation is largely related to the ability of the community to induce as large a group of households as possible to cooperate in not encroaching on the forest. The members of that coalition are more likely to be younger households with sufficient private land, but not having exercised a leadership position. The coalition is also larger in small *ejidos* with experienced leaders. Alix-García (2005) shows suggestive evidence that use of the common property forest in these types of communities is also associated with household members having larger cattle herds. Conversations with farmers reveal that cattle are often used as an insurance policy, and statistically, larger cattle herds are associated with households with secondary education and those receiving remittances – both possible sources of outside income. This suggests that access to alternative savings and insurance mechanisms might reduce the incentives to convert forest to pasture land.

When *ejidos* with non-members present in the community choose to extract wood under the permit system, the main determinant of their deforestation rate is their choice of how to divide up profits between dividends and public goods. Holding all else constant, a larger investment in public goods helps reward non-members for not encroaching on the forest and decreases forest loss per member. Simulations show that the incorporation of some of these non-members as new members can help decrease deforestation.

In addition, the study shows that while communities that extract wood for profit would deforest more even if they did not engage in this activity, were the non-extractive communities

to begin such projects, they would have significantly higher deforestation per member. This implies that forestry projects, as they now exist in Mexico, are contributing to the deforestation problem because they are not sufficiently profitable relative to land use in agriculture and pasture. Durán Medina *et al.* (2004) emphasize this issue, pointing out that even in communities that are very interested in sustainable management of their forests, lack of access to good technical assistance and poor administration of existing resources can lead to excessive deforestation.

Work by Torres-Rojo *et al.* (2005) suggests a refinement of this analysis. The authors find that among *ejidos* possessing permits, the rate of deforestation varies according to the extent to which the forestry business is vertically integrated. *Ejidos* which are more integrated – that is to say, sell already cut wood or own sawmills – have considerably lower deforestation rates than those who sell standing trees and allow contractors to come into the community to harvest them. This result is logical, as one would expect that communities that have made larger investments in the business of extractive forestry would be more concerned with the sustainability of their most important input.

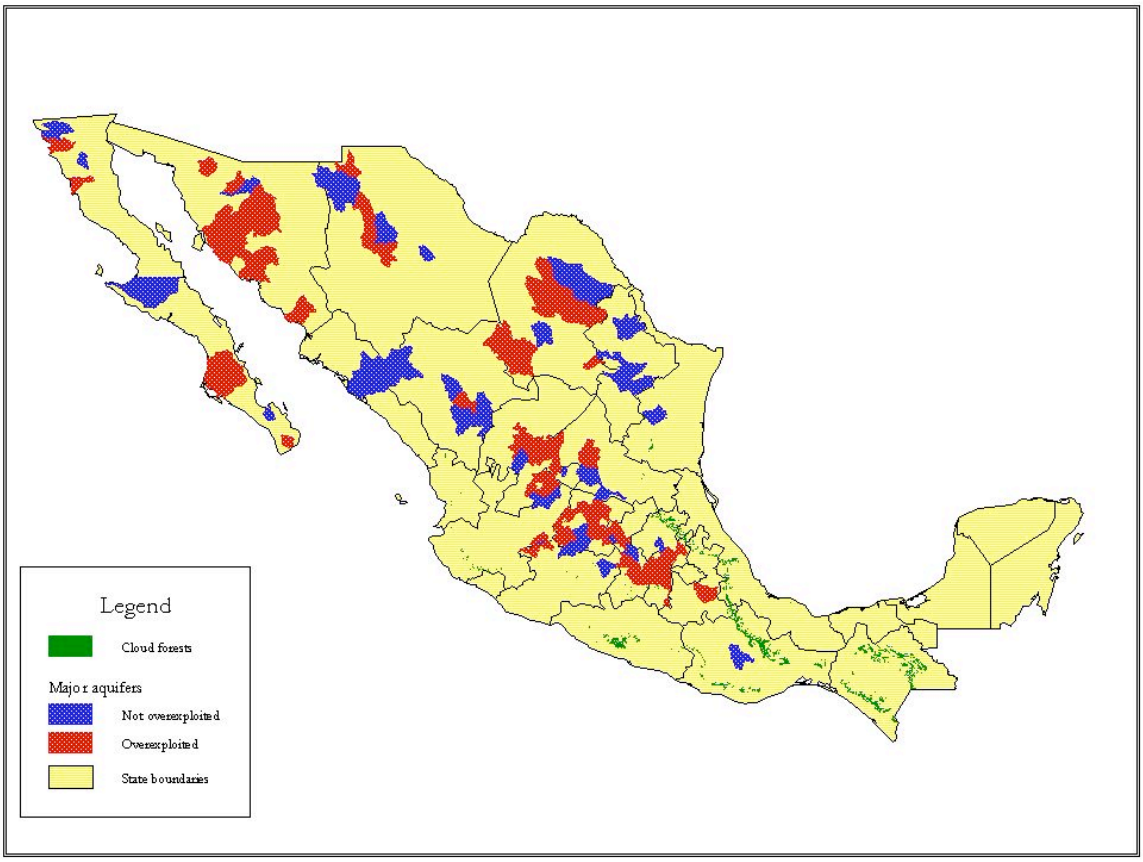
Finally, 20% of the *ejidos* and *comunidades* surveyed in 2002 complained of the clandestine removal of trees from their properties (Alix-Garcia, de Janvry and Sadoulet, 2004). This is clearly a problem that combines the facts that the existing law is not being enforced (allowing a market for such wood) with the lack of incentives and capacity of forest holding communities to effectively monitor their land.

b. Priority environmental services provided by forests

Where and what are the environmental services provided by Mexican forests? It is important to assess this potential, as this provides part of the benchmark by which we can measure the effectiveness of the program. Forests provide a wide variety of ecosystem services, including some which are attractive on the international market, like biodiversity maintenance and carbon sequestration capacity. In designing its hydrological PES program, the Mexican government has chosen to focus on a service which the forests provide strictly within its national boundaries, which is broadly consistent with the idea that recipients of the services should provide the source of funding for them. In particular, government officials are concerned with the growing scarcity of water. According to the National Water Commission, 66% of the most important aquifers in Mexico are overexploited, with an average extraction 190% above the replacement rate (Muñoz *et al*, 2005). Although the relationship between forest cover and water flows is highly debated, there is clearly a positive effect of forests on water quality, if not always on quantity. For this reason, the original proposal for the PES program focused on the watersheds defined as overexploited, as well as on cloud forests which are thought to have a particularly strong relationship with water quantity (García Coll, I., 2002).

It is estimated that 18.69% of the area of Mexico is covered by the aquifers that have been categorized as overexploited. However, of the population that lives in these areas, 28.7% is located in .09% of the aquifer area defined as very high or extremely high overexploitation. Around 17,000 hectares of cloud forest, or about 3 percent of the total forest, are found in Mexico, all of them in the central and southern zones of the country. As Figure 3 shows, the distribution of these areas is highly regionalized, with major concentrations of overexploited watersheds in the central and northern areas of the country and the bulk of cloud forests in the states of Oaxaca and Chiapas.

Figure 3. Major aquifers and cloud forests in Mexico.



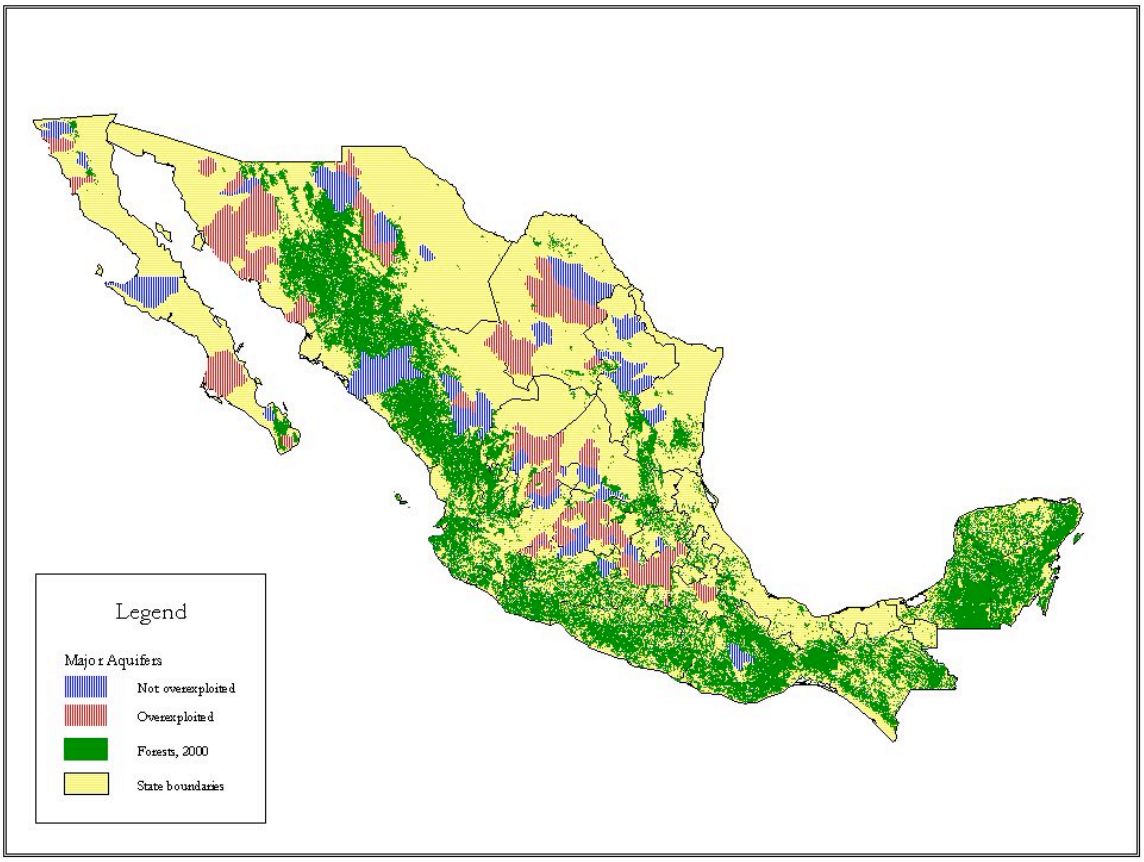
Source: National Institute of Geography and Statistics (INEGI), Mexico

Although Mexico's main concern is to address its current water scarcity problems, forests provide a variety of environmental services, some of which are marketable on an international level, like biodiversity and carbon sequestration capacity. With the intent of comparing the total forested area with the area prioritized by the national scheme, Figure 4 shows the distribution of all forests, both tropical and temperate, overlaid with the overexploited aquifers.

This figure highlights several important issues. First, it shows that there is little overlap of the forests with the overexploited aquifers. It is very important that the forests which are located in the recharge zone for these aquifers be identified in order to establish which forests provide potential water services. More importantly from a cost perspective, it is important to identify the overlap between these forests and the ones which are at risk of being cut down. The service providing forests which are at risk of being lost should be the priority forests for

environmental service payments. Recall that the highest common property deforestation rates in the country are locate in Yucatan, Veracruz, Colima, and Puebla, followed by those in the Northwestern Sierra. These latter forests are more likely to be important for the recharge of the aquifers in the center of the country. The cloud forest is located in areas where it is highly unlikely that they are recharging the aquifers of concern.

Figure 4. Forested areas and overexploited aquifers.



Source: National Institute of Geography, Statistics and Information Systems (INEGI), Mexico.

The forested area is very large, which implies that the potential to provide alternative services, like carbon sequestration and biodiversity, may also be. These types of services may be particularly important for the tropical forests of Southern Mexico, given their lack of overlap with critical watersheds. There are large areas of the country – Baja California, Nuevo Leon, San Luis Potosi, and Zacatecas – which possess very little forest (though they have overexploited aquifers) and who would not benefit from an environmental services program targeted at forest

conservation, a fact which may eventually be important if funding is to continue being allocated to forest service programs from the federal budget. It seems that the current water-focused priority of the environmental services program in Mexico can only justify payments to very specific, and perhaps not very large, tracts of forest. It is also possible that such payments may not in fact be the most efficient way to affect these threatened aquifers. However, the large tracts of remaining forest may still house benefits for which it is worth paying, including improving local water quality, reducing soil erosion, maintaining biodiversity, and improving air quality.

c. Putting PES in context

Whichever environmental services are being considered, there is a clear consensus on a national and international level that the rate of deforestation in Mexico is too high relative to the "social optimum" and that this deforestation results in the loss of important environmental services related to forest cover. The current policy of choice is a national level program of payment for environmental services financed through Federal fiscal revenues, and this program is the subject of this report. However, there is a sense in which this should be the last step in a series of policies to conserve environmental services. In the interest of providing a context for the current program, we briefly turn our attention to two less expensive interim policies that could be effective initial steps in addressing deforestation: liberating "win-win" solutions and local environmental services agreements.

i. Liberating "win-win" solutions

Liberating "win-wins" implies addressing existing inefficiencies within the agencies responsible for forest regulation and within other agencies whose policies may indirectly encourage forest misuse. They are "win-wins" because they encourage forest conservation and are aligned with private incentives. This requires analyzing current policies and assessing whether they help or hinder deforestation. For example, is the forest permit system so unwieldy that it creates an inordinately high transactions cost, pushing forest owners into illegality? For example, in the state of Oaxaca, only 27 percent of the communities with forestry potential

possess permits to extract and sell trees (Antinori *et al*, 2004). Why is it that so few of these communities have actually obtained permits?

Although it is difficult to clearly identify all of the sources of forest loss, particularly illegal ones, as was mentioned earlier, about 20% of the forest-holding *ejidos* sampled in 2002 stated that they had experienced theft of trees from their land. An effective policy to address this activity could do much to slow down deforestation in Mexico. It is also important to keep in mind that tree-stealing is a symptom of some larger incentive problem, usually associated with ill defined and inadequately enforced property rights, a problem that still affects many *ejidos* in spite of efforts at clarifying property rights through the PROCEDE[1] program.

Even within the realm of legal forest management, it would appear that there is room for improvement. In *ejidos* that extract wood for profit, around 36% do not actively reforest after logging in spite of the investment made in obtaining a permit. Among those that reforest, the average survival rate of hectares reforested is only around 58%. In many cases, natural regeneration is sufficient to replace the harvested trees. However, the correlation between lack of reforestation effort and deforestation at the *ejido* level is –0.05, suggesting that higher deforestation is associated with not reforesting post-harvest. On the other hand, the correlation between hectares successfully reforested and deforestation is also negative (-0.09), which implies that improvements in the quality of the reforestation effort are also necessary to reduce net deforestation. It is important to note that these correlations may also reflect the forest management skills or the ability of the community to cooperate rather than the actual impact of reforestation activities on forest loss. If this is the case, there may be a large return to offering forest management training services to these communities.

We currently have no way of telling if forestry *ejidos* are exceeding their permit levels, although there is anecdotal evidence that permits are, indeed, enforced. In fact, Antinori *et al.* (2004) find that 67% of the ejidos with permits for forest extraction do not extract even up to their permit level. We also do not know if permits issued correspond to the optimal policy for managing a forest. What we can tell is that the process of forest management within the permit system is far from systematic and that technicians in some regions are insufficiently engaged in that process. We can thus conclude that introducing more uniformity in technical assistance and

[1] The PROCEDE (Programa de Certificación de Derechos Ejidales) program was designed to clarify and record community's land property rights.

rules for forest management, monitoring harvest and post-harvest activities, and enforcing measures to avoid illegal wood sales could do much to reduce forest loss, expectedly at a lower cost than compensating through PES for ill-devised or ill-applied policies.

ii. Local markets for environmental services

The second option to reducing deforestation without a federally funded PES program is to look for self-sustaining markets for environmental services at the local level. There is at least one case of this type of exchange in Mexico related to forestry: in the coastal state of Veracruz, lowland communities are paying those higher up in the watershed to conserve the remaining forest cover (SEMARNAT, 2003). There are surely more opportunities for this sort of local trade, particularly through the existing regional water districts. Many environmental externalities, especially water-related ones, are highly localized within specific watersheds. Unless coordination problems across states are extremely difficult, it makes sense to have a watershed-specific transfer to pay for these services. Payments for well-defined local services are also easier to administer than a nationwide program and less exposed to discontinuities in the federal policy process.

Another small-scale environmental services market that is quite active in some places is international. Many environmentalists in industrialized countries perceive and are willing to pay for the international negative externalities of the loss of carbon sequestration capacity and biodiversity. The Nature Conservancy has long been a purchaser of lands for environmental services in other countries, and even Formula One race car events in the US are now buying amounts of forest corresponding to the quantity that would be needed to mitigate the CO_2 emissions of their activities (FIA, 2003).

Once all of the 'win-wins' are taken advantage of and the localized environmental services markets are active, there remain two options for conserving the environmental services still at risk: coercion and incentives. A nationwide PES program falls in the latter category. Mandating conservation by law (and enforcing that mandate) can be just as effective as a payment scheme for forest conservation. However, the legality of coercion depends on property rights, and it may be quite costly to enforce both monetarily and politically. When services are

provided freely by legal owners of the resource, putting into place a payments system based on fiscal revenues can be effective.

The remainder of this report focuses on this final option, first describing the origins and evolution of the policy through the Mexican political process, then using case studies and summary statistics to describe the experiences of recipient communities, and finally extracting lessons that might be applied to PES programs in similar contexts. We end this section with a brief summary before beginning the political story.

d. Summary

This section has given an overview of the distribution of potential environmental services provided by forests in Mexico as well as providing some background on the risk that these services might be compromised by deforestation. More than answering questions, this section has served to highlight many areas where further information is required. In particular, the forests providing key water services that are at risk of being lost need to be identified. If we follow through the logic of a federal program being the last step in a series of policy options, one could further reduce the need to give payments to these forests at risk by reforming the forest service to reduce illegal harvesting and increase the quality of technical assistance given to those communities already operating extractive forestry operations. In addition, one need not give payments for forests where downstream beneficiaries can clearly be identified and contracts easily made between the beneficiaries and forest holders.

When we consider the spatial distribution of forests, cloud forests, and priority watersheds, it appears that the cloud forests do not have much overlap with important aquifer recharge zones, and that there may be a considerable amount of forest that would not qualify as "essential" for the provision of hydrological services. This does not mean, however, that these forests provide no environmental services. Clearly, forests provide a range of environmental services. In Mexico, the forests at highest risk of being lost – those located in tropical ecosystems – provide important biodiversity preservation and carbon sequestration functions. Biodiversity conservation is a service which can be valuable at a local and national level through ecotourism, while carbon sequestration is valuable at the federal and global levels. Opening up the discussion to different environmental services points the way to various sources of funding

for forest conservation. However, for as long as the current PES program is aimed at preserving and improving the provision of hydrological services, the low overlay between cloud forests, other existing forests, and priority watersheds should be an issue of concern in assessing the efficiency of the program.

III. The evolution of Mexico's PES program for hydrological services[2]

This section details the evolution of the PES program from the beginning of Vicente Fox's presidency in 2000 to the present, after two years of payments. The idea of payments for environmental services did not begin in 2000, although the Fox administration was the first in Mexico to propose a national level payment plan. Throughout the 1990s, small environmental services projects cropped up in various parts of Mexico, ranging from the sale of carbon from forests in Chiapas, to the certification of forestry projects in Oaxaca for water services, to reforestation projects around Mexico City. In addition to these projects, several attempts were made to link water services from forests to nearby cities, including proposed projects in Durango and Puebla. Although these never came to fruition, they demonstrate a growing awareness of the idea of environmental services throughout the early 90s.

Between 1995 and 2000, the federal government, in the context of international agreements to contain global climate change, formed a working group composed of representatives from various environmentally-related ministries in order to discuss issues related to climate change. The participants in this group were all key actors in the environmental policy arena, and much of their discussion surrounding water services and forest conservation during this period set the scene for the current payment program. Subsequent to the meetings of this group, the formation of an Environmental Services Unit within the Secretariat of the Environment was proposed but never realized. The most tangible result of this early activity around environmental services is a project which continues to support sustainable community silviculture, known as PROCYMAF, a program designed by the World Bank and the Forestry Division of SEMARNAP.

The pre-2000 environmental services activities set the stage for the program that is the focus of this study. The political history of this program is told in three phases corresponding to different stages of advancement (design versus implementation) and institutional roles (the transfer of responsibility from research to implementation organizations).

[2] This section is a summary of the analysis conducted by Josefina Braña Varela and María Zorilla Ramos.

a. December 2000 – February 2002

As it assumed power, the Fox administration introduced substantial reforms to the environmental policy-making arena. First, the responsibility for fisheries policy was removed from the Secretariat for the Environment, Natural Resources, and Fisheries (SEMARNAP) and transferred to the Secretariat of Agriculture. Within the new environmental secretariat (SEMARNAT), a commission dedicated to unifying forestry and soil management policy was created: the National Forestry Commission (CONAFOR). This Commission is responsible from projects like PROCYMAF and others which provide support to commercially harvested forests[3]. Alberto Cárdenas Jiménez, whose previous positions include municipal president of Ciudad Guzman in the state of Jalisco and governor of that state, was named by Fox as the general director of CONAFOR.

One of the first concrete accomplishments of CONAFOR was to create an implementation plan for 2000-2006 under the umbrella of the Strategic Forestry Program, which was first outlined in 2000 in a document resulting from an agreement between SEMARNAP, the Inter-American Development Bank, and the Finnish government. The new version was entitled "Strategic Forestry Program for Mexico 2025". It is within this document that environmental services were placed squarely on CONAFOR's agenda, despite the fact that it did not yet have any projects related to PES.

Victor Lichtinger, a non-partisan environmentalist and consultant who at one time was the Mexican representative to the North American Commission for Environmental Cooperation, headed SEMARNAT during this tumultuous period. Simultaneously, the National Ecology Institute (INE) in SEMARNAT underwent an important restructuring which eliminated its management functions and converted it into a research institute. Even though CONAFOR had positioned itself to be a player in the environmental services game, the mandate for developing a PES program was given directly to the Department of Policy and Environmental Economics (PEA) of INE and to academics from the Iberoamerican University (UIA).

[3] The average annual investment for these programs (PROCYMAF, PRODEFOR, PRODEPLAN, PET and PRONARE) in the last 3 years has been close to US$52 Million.

The early stages of the PES program were characterized by the direct control of the proposal by SEMARNAT through PEA at INE. The initial idea was to target payments towards areas of the country defined as "high" or "very high marginality" according to a municipal marginality indicator based on information from the population census (CONAPO). This poverty-environment approach in part reflected the sympathy of the of PEA's director for anti-poverty projects. In addition, and perhaps more importantly, this approach would allow to involve in the program a more diverse set of funding agencies. Specifically, INE sought a partnership with the Secretariat of Social Development (SEDESOL). However, this relationship never came to fruition due to lack of interest on the part of SEDESOL. The INE also intended to begin with a pilot program, which it hoped to have administered by an NGO or an academic institution, before launching into a larger, nationwide payment scheme.

At this point, INE began research upon which they hoped to base the program. In particular, they focused on previous experiences within Mexico, on programs in other countries, and on a series of case studies conducted by INE together with the Iberoamerican University, the Centre for Research and Education in Economics (CIDE), and the University of California at Berkeley, which would provide an assessment of the possibility of establishing a PES program in Mexico.

In October of 2002, the proposed pilot project was intended to last for two years and was slated to begin in the spring of 2002 with the following features:

- The pilot would be the responsibility of a Subsecretariat of SEMARNAT.
- The project would be focused on water services, partly because SEMARNAT had recently made great efforts to promote the conservation of forests and water at the federal level and thought that it would be the environmental service for which it would be the easiest to develop local markets. Hydrological services were thought to be easy to finance at the municipal level, since fees could be attached to existing water bills.
- The beneficiaries would be *ejidos* and *comunidades* with forests in "priority watersheds", meaning those which are both overexploited and serving as the main water source for large population centers.

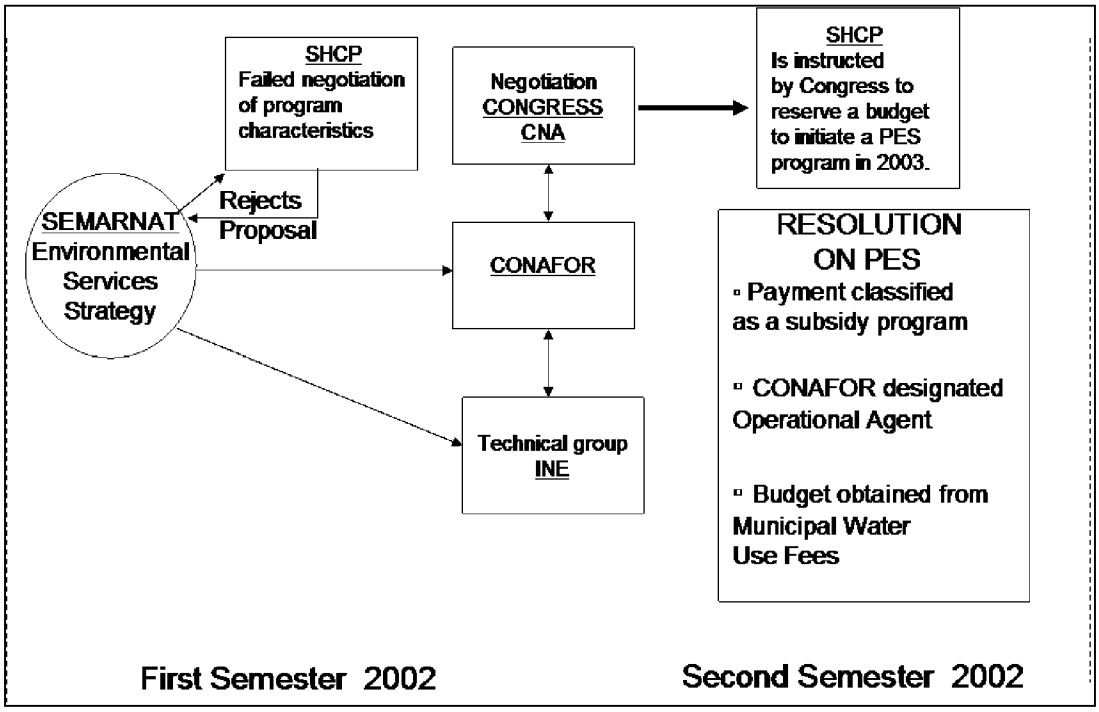
- The selection of participants would take into account forest cover density, clear property rights, different ecosystems, and relative levels of marginality.

In addition, INE would undertake a baseline survey detailing social, economic, and environmental conditions that could later provide a reference point for the monitoring and evaluation of the project, which would be the responsibility of the Mexican Institute of Water Technology (IMTA) and CONAFOR, both in SEMARNAT. The pilot project was to include 100 ejidos with a proposed annual payment of $20 per hectare.

This proposal was presented to a Subsecretariat of SEMARNAT, entitled "Fomento y Normatividad", the directors of which initially allocated 2 million US$ intended to last two years beginning in 2002. However, confronted with a budget cut to the Secretariat, the program ended up without a budget for the following year. The lack of defense of the program may have occurred for three reasons. First, the project was an initiative of INE, not of the Subsecretariat, which was promoting its own very similar program – "Green PROCAMPO" – which would subsidize farmers to take land out of production and implement soil conservation or reforestation activities. Second, the US$2 million allocation was only for one year, which implied that continuation of the program would require re-submission of the project and further debate in order to renew its budget. Finally, the final project would not be the responsibility of the Subsecretariat, which would only manage the pilot project. This gave the Subsecretariat very little incentive to adopt the project as its own.

Given this lack of support, Secretary Lichtinger presented the project to Alberto Cárdenas Jiménez, president of CONAFOR, who agreed to take responsibility for it and operationalize it through CONAFOR's Cooperation and Financing Unit (UCF). Cárdenas saw the program as the fulfillment of CONAFOR's objective of including environmental services in its operations, very much in line with the involvement that the Commission already had in several local environmental services initiatives. In addition, INE's proposal targeted non-commercial forests, a group which could allow CONAFOR to expand its sphere of influence outside of its traditional constituency. Finally, it gave CONAFOR the opportunity to develop a new program, rather than just managing programs created by the previous administration, and there was certainly an expectation that the program would translate into an increase in the organization's budget. The sequence of events of this first stage are summarized in Figure 5 below:

Figure 5. Chain of events from 2001-2002.



b. March 2003 – September 2003

This period begins with CONAFOR's adoption of the PES program and ends with the publication of the rules of operation in the Federal Registry, rules that govern the program which is currently in process of implementation. Cárdenas immediately began to look for a way to finance the proposal. INE, with technical support from UIA, CIDE, and UC Berkeley, proposed to link the financing of the program directly to the services obtained, which, given the focus on hydrological services, implied an additional payment on water use. The team responsible for the program design proposed designating 2.5% of the annual water fees, which for 2002 were around 200 million pesos ($20 Million), to finance projects in priority watersheds. Water fees in Mexico are collected at the municipality level, even if the service provider is a private company. Because the water is officially property of the nation state, the fees collected are sent to the federal government, who then returns them back to the municipalities to invest in infrastructure. The final objective of the program was to calculate a budget by watershed in

order to link the benefits more closely to the costs. Unfortunately, this was impossible to do with the existing data.

As part of the federal government, CONAFOR and SEMARNAT had to present their proposed PES program to the Secretariat of Hacienda and Public Credit (SHCP). The head of the department to whom the proposal was presented opposed the idea of using water fees to pay for the program, arguing that SHCP had an informal agreement with the municipalities to devolve 100% of their water fees in order that they invest it in infrastructure projects. It is likely that part of the opposition came from SHCP's desire to give the municipalities full incentive to collect and pay their water fees, which have notoriously low collection rates in Mexico. Having encountered resistance in SHCP, Cárdenas decided to present the proposal directly to the National Congress through the PAN party. Both the Congress and its Environmental Commission accepted the proposal. SHCP attempted once again to block it in the Finance Commission, but only succeeded in getting rid of the 2.5% levy on water fees and converting the financing into a fixed amount equivalent to 200 million pesos ($20 Million) per year taken from the water fees collected. This eliminated the possibility for the program to benefit from future increases in water fee revenues. It has been estimated that, had the 2.5% levy remained in place, the program would have tripled its budget by 2005.

At this point, several changes occurred in the original proposal. First of all, the idea of targeting marginalized communities was removed from the discussion, partly due to SEDESOL's lack of interest. The other reason was related to the fact that the funding for the program was slated to pass through the Mexican Forest Fund, a financial instrument created under the umbrella of the General Law for Sustainable Forest Development to funnel funds from various sources into projects related to forest conservation and restoration. In the discussion surrounding the creation of the Fund, it was argued that budgeted projects should be "profitable in the short term" which, in the eyes of CONAFOR, shifted the focus away from poor communities. However, the marginalization criterion was subsequently reinserted into the program during the revision of the rules of operation for 2004. The second important change was that the program would no longer to be targeted toward overexploited watersheds, but instead implemented nationwide. The justification for this change was, as described before, that the tax revenues could not be divided up by watershed.

Finally, the pilot project was cancelled. The idea of a pilot was first weakened as the proposal passed through the Subsecretariat of SEMARNAT initially chosen to support a pilot, and CONAFOR did not insist upon it. Although CONAFOR was aware that the budget allocated for the program was not sufficient to finance the project at a national level, the progress of the political calendar made it risky for the agency to run the pilot and then advocate for a national level program. This was because the pilot, if begun in 2003, would end in 2005, which would leave less than two years in the presidential term to begin the project at a national scale. In addition, a practical reason to eliminate the pilot was that the program's negotiation did not specify a pilot, but rather that payments would be made to forest owners in general, which limited the ability of CONAFOR to specify only particular regions for receipt of the payments.

Soon after, CONAFOR initiated a national tour to promote the program, even though at this point it was unclear exactly what the shape of the program would be. This premature promotion was undertaken because the responsible parties at CONAFOR were worried that the program would fail due to lack of demand for the budgetary resources, given that the target audience might never have heard of environmental services. Unfortunately, this strategy created more problems than it solved. The promotion failed to adequately convey the concept of environmental services, but was very successful in generating false expectations. Given that the policy had yet to be well defined, many of the vague concepts described by the CONAFOR representatives were not incorporated in the final program. The most important problem stemmed from the idea that the Mexican Forestry Fund would open the program nationally, and that any state government could create a state-level trust fund through which payments could be funneled to forest owners. As a result of the tour, municipalities scrambled to create their own trust funds so as not to be left out of the program.

Meanwhile, SHCP classified the new program as a subsidy instead of a payment for service. Given the direct link between the payments and water fees, the program is really a fee for service rather than a subsidy. Furthermore, this seemingly bureaucratic definition had an enormous impact on the shape of the program, since it implied that it had to submit "rules of operation" in lieu of criteria, and these rules would have to be debated in a public forum. In addition, within the government, this gave the impression that the program would be yet another case where "money was given away for no purpose", which did little to create support for it within SHCP. Finally, this implied that the money could no longer be distributed in a

decentralized manner through the trust funds which had already been created by CONAFOR in each state.

In April/May 2003, internal negotiations over the rules of operation began in earnest, with CONAFOR taking the draft prepared by INE and submitting it for discussion by its staff. The two main changes which took place at this time were as follows. First, wanting to avoid the technical problem of measuring forest density, the payment schedule changed from three payments (40 $/ha for high density cloud forests, 30 for medium density cloud forests and other forests of high density, and 20 for forests of medium density) to only two payments (40 $/ha for cloud forest and 30 for others). The monitoring scheme originally built into the rules of operation was also eliminated, again due to the fact that CONAFOR did not have the technical or operative capacity to continuously monitor recipient communities.

Political events also influenced the definition of the program. 2003 was the date set for the liberalization of most of the agricultural products under NAFTA, and with it an organization composed of various rural opposition groups gained strength under the umbrella of the movement "El Campo No Aguanta Más" – translated as "the countryside can't take it any more". After several weeks of negotiations, President Fox signed the National Agreement for the Countryside, through which, among other things, he gave the right to a commission of representatives to review and discuss all of government programs having to do with the rural sector. Although the majority of these programs were subsidies to agriculture or coffee production, rural interest groups linked the production of environmental services with some semi-perennial and perennial crops making the payments for environmental services on the list of negotiable programs. This meant that CONAFOR was forced to submit the rules of operation of the program to negotiation with "El Campo No Aguanta Más" and other rural interest groups as well.

The negotiation process was exhausting, with the principal demands of the organizations being:

- Direct the program to poor producers; distribute funds to benefit the greatest number of producers
- Include agroforestry and coffee production in the definition of environmental services

- Create an Operations Committee in the National Forest Council that would include an equal number of producers and governmental representatives. The Committee would have the responsibility of defining the selection criteria for the program, authorizing local trust funds for the operation of the program, and authorizing payments to beneficiaries.

- Modify the payments to 500, 400, and 300 pesos ($50, $40 and $30 respectively) per hectare according to a classification determined by the Committee.

- Distribute 90% of the resources to *ejidos* and 10% to private land owners.

- Include in the program *ejidos* with productive forestry projects.

CONAFOR was at a major disadvantage in the negotiations as a result of the fact that it could not meet with SHCP and the rural organizations separately. Once at the table, the two created an alliance which forced CONAFOR to make concessions on several points. They agreed to target the most needed producers and to create a "Technical Committee", but left the definition of the committee vague, so as not to have to include representatives of the organizations. In addition, they agreed to include lands under management for timber harvest, although they limited the number of allowable hectares to 200 per beneficiary. The SHCP/rural organization alliance may have resulted from the fact that the program was passed in Congress despite SHCP's opposition or also because SHCP had an enormous number of programs to negotiate with the organizations and decided to "sacrifice" the PES program in order to create goodwill for the negotiation of much larger and more costly programs.

At the end of the negotiations, the rules were sent to the Federal Commission of Regulation, and were finally published in the Federal Registry on October 3, 2003.

c. October 2003 to the present

At this date, implementation of the program began under the responsibility of CONAFOR. We include this section within the story of the development of the program since substantial changes occurred during the implementation phase. The fact that the rules of operation were published in October created some problems for CONAFOR, which, due to the rigidity of the governmental fiscal year, had to spend 4 million pesos in less than three months.

Normally, funds allocated to federal programs must be spent within the fiscal year, but the managers of the PES program wanted to use the 2003 budget allocation to guarantee payments to participant communities for five consecutive years. Fortunately, the Mexican Forest Fund (FFM) facilitated this process by allowing to set aside the remaining $16 million from the program's annual budget to cover the next four years. Although the existence of the FFM was a great advantage, allocating a budget of this size in such a short period of time is a difficult task, and it was complicated by a lack of personnel for program implementation – in October, only 3 staff members of CONAFOR had been assigned to promote the program and review requests for payments.

Application for the program was very simple – all it required was to fill out a two pages form and present proof of legal ownership. For ejidos, an "Acta de Asamblea" was required, a document verifying that a general assembly had been called in the participating community and that a vote had taken place. At this point, the program contracts gave payments for a specified area of forest within each community's boundaries. The aforementioned dual pricing system was maintained, with prices per hectare ser at $40 for cloud forest and $30 for other types. To avoid slippage, in most cases the contract specified that removal of trees from the community's entire forested area (even outside of the area for which payments were being made) constituted a contract violation and subsequent non-payments, but not in all cases. Contracts were assessed and renewed on a yearly basis. The official criteria for selecting properties were as follows:

- Properties with forests with more than 80% density (*i.e.*, hectares with more than 80% tree cover),
- Located in overexploited aquifers,
- With nearby population centers greater than 5,000 inhabitants.

The third criterion was introduced based on the justification that markets can only be "created" where there is a sufficiently large population to demand the water which is linked to the conservation of nearby forests.

CONAFOR, after lobbying its internal budget committee, hired supplemental workers to assist in the promotion of applications and the selection of recipients. Unfortunately, by the time the hiring and training process was over, there was only one month left for these activities.

As a result, the promotion of the program was only done to CONAFOR's traditional constituency– *ejidos* and private land owners with wood extraction projects supported by its other programs.

Despite the limited time for promotional activities, but perhaps due to the earlier national tour, CONAFOR received many more demands than it could finance. With only 3 employees to review, catalogue, and evaluate 900 proposals, several changes were made in the program targeting in order to facilitate the process. First, a combination of misinterpretation of the rules and the fact that there was only one geographical technician to analyze the satellite images resulted in the elimination of the criteria of forest density in favor of forest coverage, meaning that only properties that were more than 80% covered with forest were selected. This resulted in the selection of much larger properties, and with lower population density and probably a lower probability of deforestation than if the 80% forest density criterion had been used.

In addition, CONAFOR had considered monitoring the program through high resolution satellite images. However, insufficient time and staff meant that satellite images of potential properties were not purchased, with the result that properties located in regions where images had not been purchased were not allowed in the program. In a related problem, if the properties were not already georeferenced, a task requiring significant work and technical support, they could not receive payments since placing them on a satellite image would be impossible. Finally, in the communities with forest extraction activities, it was often impossible to determine if the area chosen for environmental payments overlapped with area earmarked for tree harvests.

The time constraint resulted in one final exercise in financial acrobatics – the contracts were designed to make payments after a full year of conserving the forest cover. However, given that one fifth of the budget had to be spent before the end of the fiscal year, 2003 payments were given for forest conserved during 2002 – that is, before the owners knew that they would be participating in a program. The following year, the forest cover was assessed and the 2004 payments were given for forest conserved during 2003. It is, however, unclear whether recipients understood that these were the terms of the contract, given that it was not stated in these terms in the contracts that they signed.

In the 2003 round, the 900 applications encompassed more than 600,000 hectares of land from 25 different states. From these, 271 were accepted, covering 127,000 hectares of forest from 15 states.

At the beginning of 2004, program operations were switched internally within CONAFOR from the Cooperation and Financing Unit (UCF) to the Production and Productivity Department within the Office of Silviculture and Management, the office in charge of managing most of the forest conservation enhancement programs at CONAFOR[4]. One of the Department's first actions was to organize the Technical Committee described in the 2003 rules of operation, which had never been constituted. The Committee was headed by the director of CONAFOR and composed of a representative from the National Commission of Protected Areas (CONANP), one from INE, one from the National Commission on Water (CNA), and two from the National Forestry Council (CONAF, with one representative from the social and one from the private sector). There were various changes to the program through the Committee, which saw the program as a way of supporting the National Protected Areas. The Committee began with the definition of clear eligibility criteria for the program and opened the program to public scrutiny through meetings with different sectors and actors from civil society. Two important new selection criteria were added: a piece of land could be in a National Protected Area or in a "Priority Mountain" and receive the same priority as a property in an overexploited watershed. The Priority Mountain criterion was justified by the objectives of the Program for the Sustainable Management of Mountain Ecosystems (PMSEM), which focuses the protection of the water-production, carbon capture, and biodiversity capacity of the 60 most important mountains scattered throughout Mexico. This program, also administered by CONAFOR, began in 2002 as a derivative of the UN's Agenda 21 and the subsequent denomination of 2002 as "the year of the mountain". Like the PES program, the PMSEM is a new program for the agency, with a slightly smaller budget of around $1.7 million per year.

Table 3 summarizes the overall changes in the targeting criteria from the original proposal to the program's 2003 implementation.

[4] These programs are: Program for the Sustainable Management of mountain ecosystems and the Program for payments on Carbon sequestration, biodiversity services and agro forestry systems establishment.

Table 3. Changes in the Targeting Strategy.

Original targeting rules (SEMARNAT/INE)	Final targeting rules (SEMARNAT/CONAFOR)

• Pilot program with an Experimental Design	• Nation wide program
	  • Rules of operation
	  • Establishment of a Trust Fund

• Beneficiaries ejidos and comunidades located in priority watersheds
  • Overexploited
  • Serving large populations
	• Beneficiaries augmented to include private owners

• Other selection criteria:
  • Forest cover
  • Clear property rights
  • Ecosystem type
  • Marginalization
	• Added selection criteria
	  • Priority mountains
	  • Availability of satellite image
	  • Protected areas

• Priority given to forest with high deforestation	• Subtracted selection criteria
	  • Marginalization
	  • Deforestation risk

The Committee was also concerned with ways in which it could actually use the program to create markets for water services. It put more weight on field work for the promotion and diffusion of the program, and it established a minimum forest area of 50 ha, given that this is the smallest area that can be observed with satellite images.

By the year 2004 CONAFOR received again applications far in excess of what it could finance, 960. This time, payments were allocated by giving a point for each of the criteria listed in the rules of operation and awarding contracts to those properties with the highest point values.

The program continues to evolve based upon institutional changes and lessons learned from the first two years. The coming year will see further changes in the selection process, with a new, more transparent, and detailed point system to be put into place. In addition, INE is working on a deforestation risk model with the intention of including risk of forest loss as one of the parameters used to evaluate applications for payments.

The future will clearly see large changes in the program design. As part of CONAFOR's strategy to support local payment mechanisms, it received $100 million in financing from the World Bank. This funding is intended to help support research into the effectiveness of environmental services programs, as well as to promote and manage private environmental service contracts for water, biodiversity, and ecotourism. The project was approved in July 2004 and is intended to last for 20 years. Its long duration is expected to have a significant impact on the evolution of PES programs in Mexico.

d. Summary

The design of Mexico's PES program was strongly influenced by the political process. Although the program's stated objective was never modified – the preservation of hydrological services through payments to forest-holders – the nature of the contracts and the targeted population changed considerably between the day Secretary Lichtinger delegated the job of designing the policy to INE in 2000 and the first payments made by CONAFOR in 2003. The most substantial changes – the removal of the pilot program, the elimination of the focus on marginalized communities, the inclusion of commercial forests and private properties, and the decision to give payments based on percentage of forest rather than on forest density – all occurred with the transfer of responsibility from INE to CONAFOR. The reason for many of these changes and for some of the significant barriers to implementation originated in SHCP's early decision to categorize the program as a subsidy. This seemingly bureaucratic modification forced CONAFOR to spend considerable time drawing up rules of operation and negotiating them with rural organizations. This later constrained the Commission to squeeze the promotion of the program, the selection of communities, and the allocation of payments into a very short three months period. Instead of allowing CONAFOR to expand its constituency, the time crush encouraged the agency to use its existing relationships with commercial forest communities to distribute the payments. In addition, the rush to implementation led to a lack of transparency in the selection process in 2003, some of which was corrected in 2004. The 2005 process appears to now be moving towards more systematic and clear selection rules. Table 4 provides a summary of the evolution of the program.

Table 4. Evolution of the PES Program.

	Stage 1	Stage 2	Stage 3
Political Force	Victor Lichtinger, Secretary of the Environment	Alberto Cárdenas J. Director of CONAFOR	Alberto Cárdenas J. Director of CONAFOR
Design	INE with academic support	INE/CONAFOR	CONAFOR and Technical Committee
Responsible Agency	Subsecretariat of SEMARNAT is suggested	CONAFOR-Cooperation and Finance Unit	CONAFOR – Production and Productivity Department
Other relevant actors	UIA, CIDE, UC Berkeley	El campo no aguanta más.	World Bank Civil society
Financing	2 Million from water fees	20 Million from water fees	30 million beginning in 2005
Beneficiaries	Marginalized or very *marginalized ejidos and comunidades*	Private property is included. Marginality is removed as a criterion.	*Ejidos*, *comunidades* and private properties in forested areas.
Selection	Common property areas of *ejidos* and *comunidades* with forests of low commercial value and high deforestation risk, not to exceed 2,000 hectares under contract.	80 % density. Fallow areas of properties with extractive forestry can be included. Limit is extended to 4,000 hectares.	The 80% criterion is interpreted by putting together small plots of forest throughout the *ejido*.
Region	Priority watersheds are proposed.	The convocation is opened nationally with the following criteria: Properties are in overexploited watersheds, water scarce areas or areas subject to hydrological disaster (flooding, etc).	Targeted regions are expanded to include areas at risk for hydrological disasters. Additional possible criteria: properties are in a Natural Protected Area or "priority mountain"
Contracts	Beneficiaries commit to no change in the forest cover	Same	Same

IV. Results of implementation, 2003-2004

a. Summary statistics for participating communities

This section describes the recipients of the initial payments made by the program. The data used to characterize the participants come from an evaluation of the program conducted by the Colegio de Posgraduados (COLPOS, 2004) and a survey conducted by INE (INE, 2004). The Colegio de Posgraduados survey was comprised of over 300 randomly selected participants (community members, and private owners), while the INE survey covered 27 participant *ejidos* selected to reflect the mean characteristics of the ejidos participating in the PES program in 2003. Except where otherwise noted, the statistics presented come from the INE survey.

The program was supposed to be operated nationwide. Although applications were received from 25 states, only 15 actually received PES contracts. Table 5 shows the distribution of payments by state.

Table 5. Distribution of PES contracts by state, 2003.

State	Number of contracts†	Hectares enrolled†	Hectares Forested††	Percentage enrolled	Payments †††
Baja California Sur	2	2,231	442,874	0.50	63,749
Coahuila	29	7,188	514,771	1.40	205,368
Chihuahua	8	11,279	7,702,586	0.15	322,269
Distrito Federal	4	5,058	38,301	13.21	144,507
Durango	16	15,224	5,870,668	0.26	434,959
Estado de México	2	709	740,205	0.10	20,271
Jalisco	24	11,801	4,407,937	0.27	337,175
Michoacán	10	8,633	3,510,806	0.25	254,317
Nayarit	9	3,222	1,731,879	0.19	96,721
Nuevo León	1	1,450	571,327	0.25	41,424
Oaxaca	20	28,469	6,392,049	0.45	813,396
Puebla	19	5,655	1,599,605	0.35	168,641
Querétaro	45	4,664	419,098	1.11	143,792
San Luis Potosí	7	9,874	857,912	1.15	282,121
Veracruz	75	11,361	1,135,089	1.00	328,434
TOTAL	**271**	**126,818**	**35,935,107**	**0.35**	**3,657,143**

† CONAFOR 2004 www.conafor.gob.mx

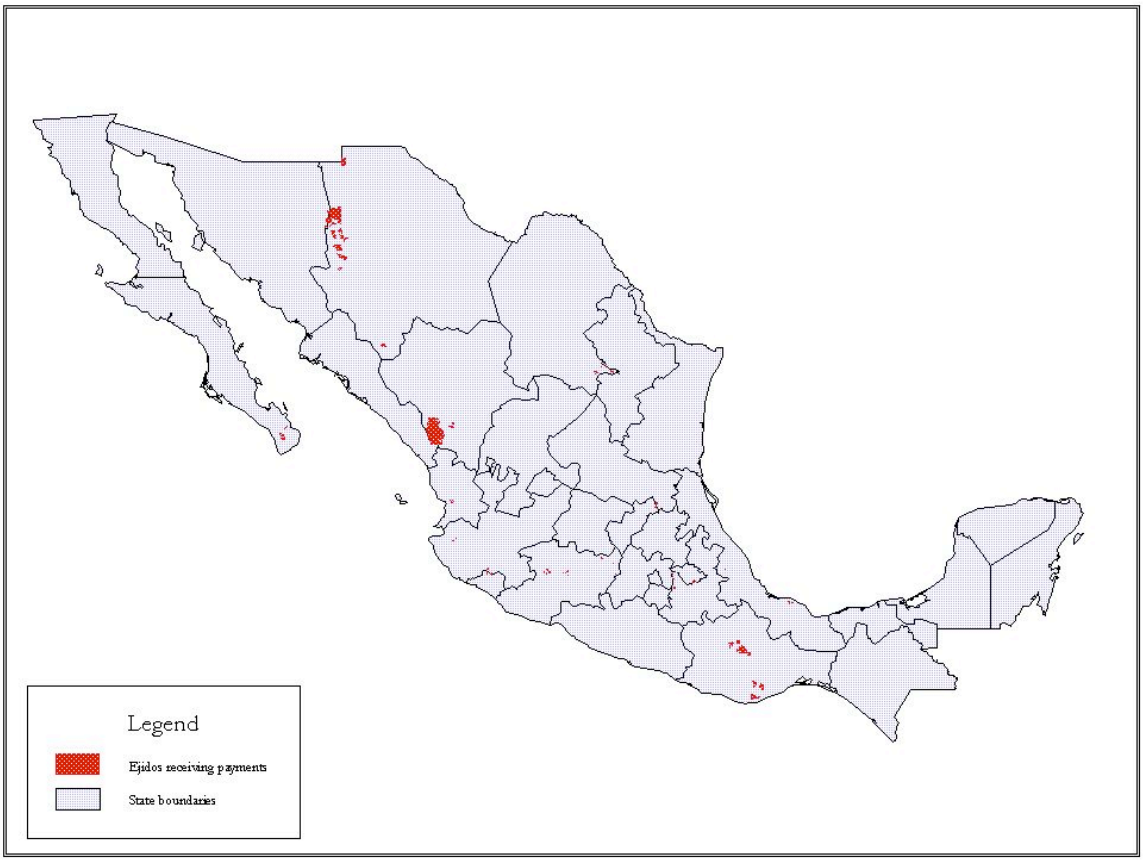
†† Estimate for year 2000 (SEMARNAT, 2002)

††† US dollars. Data from CONAFOR 2004 www.conafor.gob.mx

Observe that a few states – Oaxaca, Durango, and Veracruz – got a large share of the budget (43%). The states with the smallest number of hectares enrolled were the Distrito Federal, Nuevo León, Baja California Sur, and Nayarit.

For the first year of operation *ejidos* and *comunidades* accounted for 47% of the contracts and for 93% of the area contracted. The geographical distribution of the communities receiving payments is shown in Figure 6.

Figure 6. Distribution of ejidos receiving PES payments, 2003.



Most of the rejected applications were from *ejidos* or communities, but there was also a relatively high proportion coming from private properties. High *ejido* participation is due the high incidence of common property forests in the country. Transactions costs for *ejidos* are estimated in $237 per application compared to the reported transaction cost for private owners of $304 (COLPOS, 2004). In both cases, these costs are small relative to the magnitude of the payments received.

In spite of the fact that extremely large *ejidos* were selected in 2003, the average size of participant *ejidos* was 3,961 hectares, almost 500 hectares lower than the national average for forest *ejidos* with timber harvest permits. The mean number of hectares enrolled in the program is 466, with 2.8% of the total hectares in the sample being cloud forests. On average, 75% of the land in participating *ejidos* is considered common property, while the rest is parceled, mainly dedicated to housing and agricultural activities. The survey shows that nearly 26% of the *ejidos* have parceled a small proportion of their forest land (formerly in the commons) which, in general, is not used for timber harvest. Out of a sample of 23 common properties receiving payments, 15 (65%) had experienced deforestation over the 1994-2000 period. The average yearly rate of forest loss amongst those with positive deforestation was 1.5 percent.

It is estimated that nearly 63% of the participants harvest wood for sale. Within these *ejidos,* as much as 74% have reported illegal logging in their properties, mainly performed by people from outside the *ejido*. In some of these *ejidos*, the legal harvest volumes exceed 32,000 cubic meters, far beyond the national average of 4,546 cubic meters a year. In 61%, the logging operations are performed by the *ejido* members, indicating greater vertical integration, while in the rest they are performed by contractors who change every year. These figures also contrast with nation wide average where almost 50% of *ejidos* sell standing trees. Table 6 shows the main characteristics of participating communities.

Table 6. Physical characteristics of participating *ejidos*

Characteristics	Estimate
Average size of forested area, in hectares	3,961
Average hectares enrolled in the program	466
Total hectares of cloud forest in the sample	1,830
Total hectares of temperate forest in the sample	55,280
Total hectares enrolled in sample	12,680
Percentage of participants with cloud forest (from total)	2.9
Average annual forest loss in hectares, 1994-2000	38
Percentage of participants harvesting wood for sale	63

Source: Own estimates with data from INE (INE, 2004)

Given the program's focus on water services, it is useful to consider the distribution of payments according to overexploited watersheds. Table 7 details this distribution, where the population is all the participants in the program, not a sample. Clearly, the payments have not been going to areas where the aquifers are overexploited. Essentially zero percent of the hectares under PES are forests in aquifers qualifying as extremely or strongly overexploited. 78 and 85% of the PES hectares, in 2003 and 2004 respectively, are in aquifers which are not *over*-exploited, with the remainder of the hectares under PES in aquifers that qualify as moderately overexploited.

Table 7. Distribution of payment recipients by aquifer type, 2003 and 2004

Aquifer type	Total area (%)	Population living in area (%)	Hectares in PES, 2003 (%)	Hectares in PES, 2004 (%)
Extremely overexploited (+100% a +800%)	0.05	9.2	0.02	0.00
Strongly overexploited (+50% a +100%)	0.04	19.5	0.00	0.00
Moderately overexploited (+5% a +50%)	18.6	14.5	13.3	9.6
In equilibrium (- 5% a +5%)	2.9	11.3	0.01	0.00
Not overexploited (< - 5%)	65.1	45.4	78.7	85.0
No data	13.4	0.1	8.0	5.3
TOTAL	**100**	**100**	**100**	**100**

Source: Muñoz *et al*, 2005

Table 8 shows the distribution of PES hectares according to forest type. Recall that cloud forests are given a slightly higher payment per hectare under the current scheme, with the hope that a proportionately higher number of cloud forest hectares be enrolled. This is indeed what happened. Again, these results are based on a census, not a sample, of the payment recipients. The effort to enroll a larger proportion of cloud forests was successful; in 2003, 6.8 % of the enrolled hectares were cloud forests and, in 2004, 16.3 %, relative to the overall

percentage of 3.4 and the eligible area of 6.6 percent. The temperate forest categories of Pine, Oak, and Fir are over-represented as a group, both relative to the eligible areas and the national distribution. This may be because there are more commercial forests in these ecosystems, and the owners of these forests are likely to have a closer relationship with CONAFOR through other programs administered by the Commission. It is impossible to tell whether this bias results from greater promotional efforts by CONAFOR with these types of forest holders or is simply the result of self-selection**.**

Table 8. Comparison of forest types enrolled in PES, 2003 and 2004.

Forest Type	Distribution at the national level(%)	Hectares enrolled in PES, 2003 (%)	Hectares enrolled in PES, 2004 (%)	"Eligible" area† CONAFOR 2004 (%)
Pine and oak-pine Forests	37.8	60.1	43.9	46.4
Oak-fir forests	23.0	17.2	24.9	18.0
Cloud forests	3.4	6.8	16.3	6.6
Low tropical forests	25.0	3.0	4.9	2.4
Medium and high tropical Forests	10.8	12.9	10.4	26.6
TOTAL	**100**	**100**	**100**	**100**

Source: Muñoz et al, 2005

† In 2004, CONAFOR used three criteria to define eligibility: overexploited aquifers, priority mountains, and protected areas. This definition does not include the other criteria detailed in the rules of operation, but it was used as a guide in the selection process for this year.

The sources of deforestation pressures on forests held by PES recipients, detailed in Table 9, are not different from the deforestation pressures at a national level: agriculture and pastures, domestic use, and in some cases over extraction are the main causes. 25% of e*jidos* declared using forest clearings for subsistence agriculture while almost 65% of the *ejidos* use the forest for grazing of livestock. Nearly 15% of the *ejidos* stated that the incursion of cattle from outsiders is a greater source of pressure than that from *ejido* members' own cattle, while 50% of participants reported loss of forest to fire or pests. Almost 85% of the *ejidos* harvest logs for domestic uses such as housing, fencing, or road rehabilitations. Firewood is still a cause of extraction in more than 85% of the *ejidos*. Interestingly, even prior to receiving payments from the program, all of the *ejidos* in the sample declared performing forest conservation activities.

Table 9. Sources of pressure on forests in participating communities.

Source	Percentage of communities reporting the source
Agriculture	25
Pasture	65
Domestic Use	85
Firewood extraction	85
Incursion of cattle from outside communities	15
Pests and forest fires	50

Source: Own estimates with data from INE (INE, 2004)

Since past deforestation behavior is not necessarily equivalent to the risk of deforestation in the future, it is interesting to consider the distribution of the payments according to predicted deforestation risk. Table 10 shows the distribution of forest area among participants according to deforestation risk estimates, where risk is determined by many of the factors just discussed. It can be observed that most of the participant forests have low and very low deforestation risk indices, and it is very likely that they would have been conserved even in the absence of the program.

Table 10. Distribution of deforestation risk in participant communities.

Deforestation risk index	2003 Recipients		2004 Recipients		National
	(%)	Hectares	(%)	Hectares	(%)
Very high	3.6	5,922	10.9	18,550	20
High	6.7	11,034	16.8	28,529	20
Medium	17.3	28,446	20.5	34,953	20
Low	30.4	50,046	29.9	50,940	20
Very low	41.9	68,815	21.8	37,133	20
Total	100	164,263	100	170,105	100

Source: Muñoz *et al.* (2005)

Table 11 describes the participants themselves. The average number of households in the participant ejidos was 266, with an average share of 43% composed of *ejido* members with

legal property rights. In most of these *ejidos* there are no indigenous people: the statistics show that only 1.5% of the population speaks an indigenous language. Most of the selected ejidos have good communication services. The average distance to the closest town is 23 kilometers. In addition, all of them have elementary schools and 85% have a high school; no technical schools or colleges are available within these small communities. This is considerably higher than the national average for secondary school availability. Almost 82% of the participant *ejidos* have access to phone services and 71% have health clinics as well. The basic public services of electricity and water are available in all the sampled *ejidos* although only 55% of them pay for the water they consume. Sewage systems are available in 48% of the sampled *ejidos*. All of these services seem to be more available in participant communities than one would expect from the average *ejido*, which implies that the payments are being made to relatively wealthier communities.

The Colegio de Posgraduados (COLPOS, 2004) data show that, while the average daily income level in the participant communities is $5.54, the range is quite wide. Nearly 56% of the participants from *ejidos* and *comunidades* have a daily income of less than $3.82, while 86% have a daily income of less than $7.55. These contrast with the incomes from private owners (who control close to 35% of the participating forest area) where nearly 43% have a daily income greater than $ 30.30. The INE survey shows that 31% of the participant households are classified below the poverty line. In general, forest *ejidos* have a higher concentration of extremely poor people, and this result provides further evidence that the program did not reach the poorest people in forest areas.

Table 11. Description of participants

Characteristic	Estimate
Average number of members	114
Average population	266
Average daily income	$5.54
Percentage of participant communities with:	
Primary school	100
Secondary school	85
Health clinic	71
Sewage system	48

Source: Own estimates with data from INE (INE, 2004)

Table 12 describes the distribution of PES hectares according to the level of marginalization of the participanting communities. The definition of marginal is given by Mexico's National Population Council (CONAPO, 2000) and is based upon a combination of nine indicators encompassing literacy, education, employment, and quality of dwelling. Interestingly, even though marginality was removed from the program as a selection criterion, the majority of the enrolled hectares – 71.9% in 2003 and 82.9% in 2004 – are located in areas with high or very high marginality. It is important to emphasis that the correspondence between payments and poverty is **purely coincidental**, reflecting the fact that a 80% of the forest in Mexico is held by ejidos and comunidades, and that within this group, 86.3 percent of the forest is located in communities with high or very high marginality. There does, however seem to exist some bias towards including areas of high, rather than very high, marginality. One explanation for this is that the former communities are less likely to have commercial forests (and hence contact with CONAFOR), and are probably more remote and therefore difficult to reach.

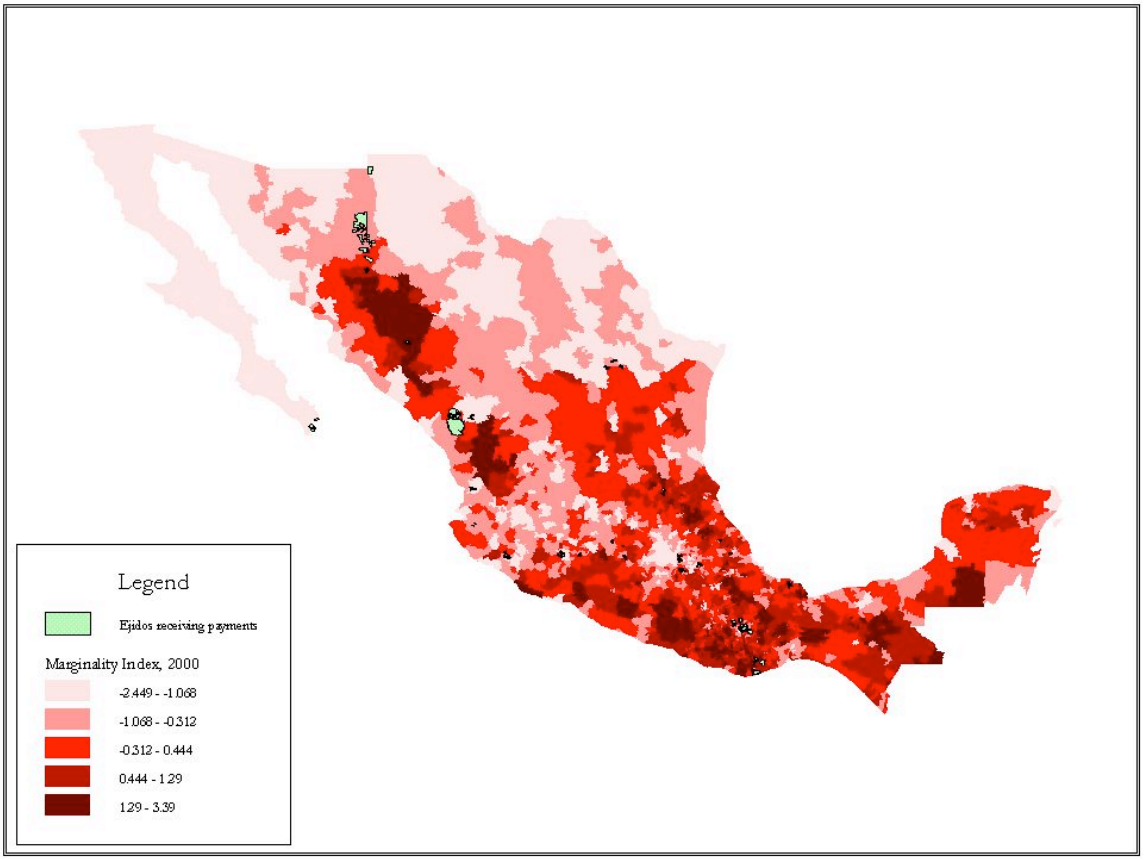
Table 12. Marginalization and PES payments

Level of Marginalization	PES 2003		PES 2004		Proportion in *ejidos* with > 100 ha of forests	National distribution across forests
	Ha	(%)	Ha	(%)	(%)	(%)
Very high	41,282	*25.0*	36,567	*21.5*	*69.1*	*31.2*
High	77,339	*46.9*	104,362	*61.4*	*17.2*	*16.3*
Medium	29,924	*18.1*	13,521	*7.9*	*8.6*	*22.2*
Low	13,018	*7.9*	9,741	*5.7*	*3.3*	*10.1*
Very low	3,386	*2.1*	5,839	*3.4*	*1.8*	*20.3*
Total	164,948	*100*	170,030	*100*	*100*	*100*

Source: Muñoz *et al. (* 2005) and own estimates with data from CONAPO (2000).

Figure 7 shows the distribution of common properties receiving payments overlaid on a map showing the level of marginality by municipality. This is the visual representation of Table 12 – it is clear from this that the PES recipients are located in the more marginalized municipalities.

Figure 7. Marginality and PES payments, 2003.



Source: INEGI, 2000, and CONAFOR, 2004

It is also interesting to consider how payments received were distributed within communities. This is because the payments must provide an incentive for individuals within a community to cease their deforestation activities or, in cases where deforestation pressures come from outside the communities, to increase conservation activities like forest monitoring for encroachment. These changes must either come through an income effect that is large enough to remove the need to extract goods from the forest, or through a price effect in the form of a transfer – be it in cash or kind – conditional on ceasing extraction or participating in conservation. The PES program belongs in the category of a conditional cash transfer (CCT) that creates a price effect on forest conservation. Per unit of payment received, a CCT should have a larger incentive effect on forest conservation than a non-conditional payment would have.[5]

[5] See by analogy the discussion on incentive effects from cash transfers vs. CCT for education under Progresa (de Janvry and Sadoulet, 2005).

The use of the 2003 payments varied from distributing 100% equally between all members, to the investing all the money into public goods for the community, with many intermediate cases where the allocation included a combination of direct distribution of payments, payment for guarding the forest and fire prevention, and investment in local public goods. The survey shows that 18% of the *ejidos* decided to distribute all payments directly among *ejido* members, 22% invested the entirety in forest activities related to conservation, 18% allocated the full amount to public goods not related to forestry, while the remaining 43% adopted a combination of the three strategies.

In 87% of the communities surveyed, participants declared that they had respected the contract, while 26% stated that they had deforested over the past two years. Note that deforestation is not necessarily a breach of contract, given that most contracts are not specified to be inclusive of all the forested area. In most cases, the activities implemented as a result of the program included increasing the surveillance of forest lands and revising the rules on individual members regarding the extraction of forest resources. In no cases were new activities introduced as a result of the program. Payments had not been withheld from any of the survey participants, suggesting that either compliance is very good or the monitoring system is not very effective.

Around 17% of the participant *ejidos* state that they are not happy with the program. The two main sources of their discontent are: 1) they perceive the payment to be too low and 2) they are unhappy with the way the payment is distributed inside the community. 78% of the participants stated that they would be willing to continue in the program. What is interesting about this is that nearly 59% of these *ejidos* would have been willing to accept the program with a payment of $23 per hectare per year. On the contrary, the *ejidos* not willing to continue the program (22%) ask for a payment as high as $71 per hectare per year to continue in it. The survey conducted by COLPOS reported that 27% of the sample complained about the constraints on timber harvest imposed by the program on the non-contracted areas.

Monitoring of the contract after the first year of operation was performed randomly in 28 ejidos (22%) in November 2004. All monitored *ejidos* met contract requirements. The annual cost of operation and monitoring for the first year of operation is estimated at $714,285, which yields an average cost of $5.6 per hectare, which is totally absorbed by CONAFOR. Compared to payments of $30/hectare, this indicates administrative costs that represent 19% of

the PES budget. In addition, there is an annual evaluation of program objectives, processes and expenses made by an external institution. For the first year, this evaluation amounted $98,214.

b. Case Studies

In the winter of 2004-2005, case studies of communities receiving the pilot payments were undertaken in the states of Michoacan, Puebla, Veracruz, Durango, Chihuahua, and Coahuila. Although it is quite early in the process to be able to measure the impact of the program on forest cover, one can still analyze some behavioral effects of the program in terms of forest management activities. In addition, the distribution of payments within the communities can give some insight into whether distinct groups within the communities are differentially affected by the program. Finally, it is also important to evaluate recipients' understanding of the program, since the program's ultimate intention is that communities 'sell' their forest services to outside populations. The intention of these studies was to detail the experience of the recipient communities, with a focus on the following questions:

- How were communities managing their forests before the PES program?
- Did this behavior change with the receipt of payments?
- Has receipt of the payments affected the internal dynamics of the communities?

Eleven communities were chosen and teams of two investigators were sent to each, where they conducted group interviews with available *ejido* members, as well as individual interviews with different parties of interest. Given that the majority of participants in the program are from *ejidos* and communities, rather than private landowners, and that we are particularly concerned with how payments might affect community dynamics, all case studies were conducted in these types of properties. This section summarizes the overall findings[6].

[6] The studies were conducted by Adán Martínez Cruz, Josefina Braña Varela, and Jaime Sainz Santamaría.

i. Descriptives

Table 13 describes the case study participants. The studies cover a variety of communities with varying membership and size in different institutional situations. The membership size varies from 40 to 225, while the area variation is from 493 to over 10,000 hectares. The forest area enrolled in the PES program in each community also varies widely, ranging from 73 to 1,400 hectares. In none of the cases is the total area enrolled equal to the total forested area in the ejido. Under the column labeled population, there are various terms which require further definition. "Ejidatario" refers to a member of the ejido, meaning a person who has rights to use the ejido land, vote in community assemblies, and can pass this right on to one family member. "Posesionario" refers to those who have permission to work on the ejidal lands, usually in the commons area, while "avecindados" have their homes located within the ejido, but are not entitled to use of land for agricultural or pastoral purposes. The total population refers to anyone living in the villages located within the ejido boundaries. This number usually includes relatives of the ejidatarios, a number which grows with time as a result of the fact that rights to the ejido can be passed on to only one family member.

Four ejidos (A, B, I, and J) include areas of forest that are organized for wood extraction under the permit system. Forests without permits are not legally allowed to sell wood. The communities located in Veracruz (C, D, and E) are found in the Biosphere Reserve las Tuxtlas, which constitutes a unique institutional context within Mexico, as there are rules specifying limitations on certain extractive uses. In fact, one of the three participating ejidos from this area had undertaken extractive forestry before its land was declared part of the reserve. The managers of the reserve see participation in the PES program as another way to help support the change in behavior from extraction to conservation.

Table 13. Description of participating *ejidos* in case studies

Ejido	State	% forest loss 1994-2000	Total area (ha)	Area enrolled	Population	Wood extraction?
A	Puebla	-2.8	1,232	356	81 *ejidatarios* 11 *posesionarios* 1000 total	Yes
B	Puebla	-7.6	724	113.5	57 *ejidatarios* 43 *posesionarios* 40 *avecindados* 2000 total	Yes
C	Veracruz	-7.1	493	73	84 *ejidatarios* 80 *avecindados* 2000 total	No
D	Veracruz	16.5	1,026	499.25	46 *ejidatarios* 25 *avecindados* 350 total	No (used to)
E	Veracruz	0	2,268	1,114	219 *ejidatarios*	No
F	Michoacan	0.04	1,446	1,400.18	40 *comuneros* 13 *avecindados*	No
G	Mexico	n.a.	1,801	572.24	225 *ejidatarios* 129 *posesionarios*	Yes
H	Michoacan	0	1,364	109.90	46 *ejidatarios* 40 *posesionarios*	No
I	Durango	12.1	10,573	415.13	102 *ejidatarios* 200 *avecindados* 1200 total	Yes
J	Chihuahua	6.6	9,340	581	105 *ejidatarios* 140 *posesionarios* 55 *avecindados* 1500 total	Yes
K	Coahuila	12.4	3,580	845	38 *ejidatarios* 20 *posesionario* 400 total	No

This table already gives an initial indication of how effective the program might be in these communities. Only 5 of the 11 *ejidos* was actually deforesting in the period previous to receiving payments. Although one cannot definitively say that an *ejido* which was not being deforested during the 1994-2000 period remains at low risk of deforestation, it does indicate that there is less scope for the PES policy to actually change behavior in these places. As was suggested by the statistics on deforestation risk of PES hectares at a national level presented in the previous section, the case study statistics imply that a significant proportion of the budget may be being paid to people who were not planning to cut down the forest in the first place. This is most certainly the case for forests in a Biosphere Reserve where extraction is forbidden by law.

ii. Forest activities before and after receiving payments

One way to assess the impact of the payments is to consider how activities undertaken in the forest may have changed as a result of the program. A summary of these results is contained in table 14. In many of the cases considered, the main sources of pressure on the forest were stated to be from outside the ejido – either from unidentified individuals stealing trees to sell, or from the incursion of cattle from neighboring owners into the forested areas. In two cases, that of ejidos A and B, both in the state of Puebla, the forest is used as a source of firewood, which is then sold both inside and outside the communities. This exerts some pressure on the forest resources, although the rising popularity of gas for cooking in the Mexican countryside guarantees that this pressure is decreasing over time, which may be one explanation for the *increase* in forest cover observed in these communities over the 1994-2000 period.

In the state of Michoacan, where ejidos F and H are located, there is very little pressure on the forest from within the ejido. There are two basic reasons for this. First of all, Michoacan is one of the main sources of migrants to the United States, which means that these communities both receive a considerable amount of remittances and also have a smaller population of younger people likely to make productive use of the forested areas. The second reason is that these communities are located near the Lago de Patzcuaro, a popular tourist destination for Mexicans and foreigners alike, and a considerable source of outside employment for these communities.

Table 14. Summary of results from case studies

Ejido	Pre-payment extractive activities	Pre-payment conservation activities	Post-payment conservation activities
A	Firewood extraction, felling of trees to get orchids, stealing of wood by outsiders	Fire breaks every 3 years	Fire breaks every year
B	Firewood extraction, stealing of wood by outsiders, neighboring cattle enter forest	Forest surveillance	Increased surveillance
C	Agricultural activities by *ejido* members, neighboring cattle enter forest	Forest surveillance and firebreak maintenance once a year. Biosphere.	Forest surveillance and firebreak maintenance twice a year
D	Wood extraction for sale and domestic use, firewood extraction	Maintenance of firebreaks. Biosphere.	Increased maintenance, surveillance of forest area
E	On private parcels (where there is forest), agricultural uses	Annual maintenance of firebreaks, surveillance of boundaries by all members. Biosphere.	Same activities, but only by members receiving payments (those with rights to the commons)
F	Neighboring cattle enter forest, stealing of wood by outsiders	Firebreak maintenance and surveillance	Increased surveillance
G	Forestry, stealing of wood by outsiders	Thinning of dead trees, pest control, surveillance and firebreak maintenance	Same activities
H	Neighboring cattle enter forest, stealing of wood by outsiders	Firebreaks, reforestation, removal of dry wood	Same activities
I	Wood extraction	Trimming, pest control fire brigades, reforestation where necessary.	Same, plus fenced in PES land.
J	Wood extraction	Firebreak maintenance, trimming of trees, thinning	Same, plus dug canals to aide in the infiltration of water from PES parcel.
K	Neighboring cattle enter forest, forest fire in 1998, cattle grazing by some *ejido* members	Surveillance of fire prone areas	Removal of cattle from PES area, otherwise same activities.

In two of the three *ejidos* located in the Biosphere Reserve of Veracruz, C and E, agricultural activities exert some pressure on the forest, but the source of pressure in *ejido* D -- what Reserve managers refer to as a "red light" for deforestation --, comes from the sale of wood and extraction of fire wood from the forest. The latter activity was not acknowledged by *ejido* members, but reserve managers indicate that the sale of wood without an official permit is an important pressure on forests in *ejido* D.

In the *ejidos* from Durango and Chihuahua, the main use of the forest is extractive forestry under a management plan designed by a forest technician from outside the community. These communities exhibited high deforestation rates over the period prior to the implementation of the scheme. However, their extractive activities began between 1994 and 2000, and the *ejidos* practice a rotation-style of forestry that involves harvesting a parcel and then allowing it to rest for ten years. It is unclear whether the initial 12% forest loss came from the first phase of the forestry process or whether it is the result of an unsustainable deforestation path. In addition to the extraction itself, there is some pressure on these forests originating in the expansion of the urban area of these communities. Subsistence agriculture is an important use of the commons in *ejido* J, although it is unclear if this presents a significant pressure on the forest. Two years ago, this community also lost several hectares of forest to a pest infestation.

In the final case, that of *ejido* K in Coahuila, the forest loss is mainly the result of a forest fire that occurred in 1998. Much of the area that is recovering from the fire is currently being included in the program. The other activity taking place within the forest is the grazing of a small cattle herd whose owners reside within the *ejido*.

All of the *ejidos* interviewed were already engaged in some form of conservation activity before implementation of the program. This suggests a selection bias in the program design - it is highly likely that communities with some experience in conservation would volunteer to participate in a program requiring conservation activities. In most cases, communities stated that they had intensified their conservation efforts by increasing their frequency. These facts were not corroborated by outside sources, and in some instances the case study teams perceived that community members had trouble locating fire breaks and forest roads that they claimed to be maintaining.

The forestry *ejidos* of the Northern states all participate in "conservation" activities which are actually part of their forest management plan. With implementation of the payment scheme,

they continue to manage their forests for extraction, and in fact see the program as a way of subsidizing their forestry project – the hectares of land integrated in the program are in fact hectares which are part of a ten year rotation and happen to be in fallow at the moment. In the case of *ejido* I, the PES land is located in what is considered a sensitive area for water conservation, and it has therefore been fenced in and is monitored to ensure that no one enters into the area. This *ejido* does not intend to put this particular piece of land back into production.

Ejido K is the only one within the group that has experienced significant loss of forest to fire. As a result of this, they are trying to recuperate the forested area and have created wildfire monitoring brigades. This community used the PES as a way to induce the cattle-owners to move the small herd away from the recuperating land, which constitutes an important change from a conservation perspective. It is unclear in this study whether or not these animals were moved elsewhere in the commons or if they were placed on private parcels.

The results of this section point out that, in many communities, there was not truly a possibility of major behavior change induced by forest conservation payments, mostly because these communities were already preserving the forest. In only 5 of the 11 cases was there net forest loss in the *ejido* and in all cases communities were already undertaking at least some conservation activities.

One might hope, however, that the PES program induced the introduction of new conservation activities, or a measurable increase in the existing ones. Why do we not see this change? It is true that, in some cases, it was possible to verify that forest maintenance activities had been improved by the introduction of the payment scheme, but in most cases it was not possible to detect true changes. The main reason for this is clearly that no change in behavior was really required – there was no pressure to cut down the forest, and current forest conservation activities seem to be sufficient to preserve the currently forested areas. However, it does seem that in many cases the payments were being used to provide a sustained incentive for mandated conservation activities – for example, the *ejidos* located in the Biosphere Reserve were forbidden to continue extractive projects in their forests, and the communities practicing commercial forestry are mandated to have "reserve" and fallow areas within their forests. The provision of payments to these communities is thus used to replace the command and control approach which is difficult to enforce and seen as unfair by forest owners.

In addition, it is important to note that, with the exception of the two cases in Northern Mexico, these forestry communities received no technical assistance in the design of their implementation schemes for the PES program, and in fact were not even aware of the contractual requirements of such a scheme. It is unreasonable to expect communities without technical assistance or experience in forest management to be able to create an effective management plan. One final possibility is that in many cases, the amount of money received by the communities was not sufficient to induce any sort of behavioral change. We will reserve a more detailed discussion of the adequacy of the monetary incentives for the next section.

iii. Payment distribution and changes in community dynamics

This section considers both the levels of payments made and the distribution of these payments within the participating ejidos. Table 15 lists the total payment amounts, the average payment per member (were it to be divided in such a way), the allocation of these payments within the community, and changes in intra-community dynamics, if there were any.

The total annual payments vary widely, from $2,200 up to nearly $45,000, as do the ways in which communities decided to divide up this money. In over half of the cases, the majority of the allocation was divided up and given to individual ejido members. Per capita payments, under the assumption that the allocation was equally divided between all ejido members, vary from $60 per member to $1,100. Given that GDP per capita in Mexico in 2003 was around $6,000, these amounts very from totally insignificant to substantial, with the majority falling on the low end (CIA, 2005).

Table 15. Effects of Payments on Participation and Collective Decision Making

Ejido	Effects on participation and decision-making	Payment amount in US$	Distribution of payments to
A	None	14,240 (176 per member)	70% to bank account in president's name 30% radio communication system
B	None	3,400 (60 per member)	100% in purchase of truck for surveillance activities
C	None	2,190 (26 per member)	75% divided equally between members with commons rights (50); remainder to common fund
D	Those with forest in their parcels threaten to cut down trees if aren't given payments proportional to their forested areas.	14,978 (57 per member)	100% equally divided amongst members; money invested in cattle. Proposed formation of microbank with the second payment.
E	Decreased participation in conservation activities - only those receiving payments participate. Non-recipients with forest in their parcels threaten to cut it down if not given payments in future.	33,420 (153 per member)	3% to fund for forest maintenance, 97% divided between those with commons rights; for next payments, each recipient will give ~10% of payment to microbank
F	Increased participation in conservation activities	44,805 (1,120 per member)	8% to road maintenance, 92% divided amongst *ejido* members according to their level of participation in forest maintenance activities.
G	None	17,167 (76 per member)	Divided equally between three sections of *ejido*. Each used the money to improve local schools.
H	None	3,297 (72 per member)	100% distributed equally among *ejido* members
I	Adjustments in forest management plan – moved extraction from PES parcel to another area	12,454 (122 per member)	18% to conservation activities and 82% divided up between *ejido* members.
J	Increase in participation in conservation of PES area	17,430 (166 per member)	First payment, 7% in salaries to those undertaking conservation activities, 93% distributed equally among *ejido* members. For next payment, 100% distributed among *ejido* members.
K	Small cattle herd moved out of PES hectares onto different land within *ejido*	25,350 (667 per member)	15% for conservation of forest area, 85% distributed equally among *ejido* members.

In only one case was 100% of the money distributed equally among all *ejido* members. In all of the other communities, a percentage ranging from 3 to 100 was invested in some kind of public good, where public goods in this case go from equipment used to monitor the forest commons (radios, trucks) to infrastructure like school classrooms and road maintenance. There are several reasons why *ejidos* might choose to invest the majority of the payments in public goods. First, it is possible that there are returns to scale in these investments. That is, giving a transfer of 75 dollars per year may not be as valuable to a family as using the same money to build new classrooms for the school where the family sends its children to study. Second, these goods can be enjoyed by non-members of the community who would not normally have rights to cash transfers from *ejido* funds. As we have seen, many communities have large numbers of non-members, including many from the family who did not qualify as members due to the unigenitur rule, with whom members are under pressure to share benefits received. Finally, there is evidence of sharing norms present in the *ejidos* and *comunidades* of Mexico, and it may simply be that it is preferable for them to distribute this money in a more egalitarian fashion through investment in public goods.

One very interesting development in two of the communities studied is the proposal to form local microbanks using the PES money as seed capital. These two *ejidos* both participated in the same PES workshop where this possibility was promoted, and it will be worth watching whether the banks founded with this money are able to help satisfy their communities' needs for credit and savings services. As was mentioned in the section on sources of deforestation, a lack of savings and insurance mechanisms may lead to overgrazing and deforestation as community members use cattle for these purposes. The development of these microbanks could help remove this incentive for forest conversion.

Although in many cases there was clearly no change in the social dynamics within the *ejido*, in two cases we did observe changes in the relative power of different groups within the communities that affected the distribution of payments. In both of these cases, forests were located in what the community had defined as parceled areas within the *ejido* boundaries. This is somewhat surprising, given that Mexican law prohibits the parceling of forested areas within the *ejidos*. However, the *ejido* members were able to show that the parceling had been done legally through the PROCEDE program, through which they had obtained individual land owning certificates. The outcome of this division was that it gave the owners of these forests the ability

to make a credible threat to cut them down if their demands were not met. In the case of *ejido* D, the forest holders were receiving payments but requested that they be adjusted to reflect the proportion of forest located in their parcels. This proposal was voted upon and accepted by the assembly and will be put into effect in the next round of payments.

In *ejido* E, a similar dynamic occurred, though in this case the members with forested parcels were not receiving payments and threatened to cut down their forest if they did not receive some proportional compensation in the next round. Part of this dynamic resulted from the fact that these forest-holding individuals had solicited payments for their parcels independently from the *ejido*'s application. Whether it applied to the individual holdings or to the commons was unclear when the final payment was awarded. An additional result of the program in this community was that participation in conservation activities was reduced. This phenomenon was a direct consequence of the way in which the payments were divided up – only those with rights to the commons received them. It is somewhat unusual that only a small part of the membership of an *ejido* would have rights to the commons. In this case, the decision had been made to give commons rights to those with very small private parcels. Prior to the program, all *ejido* members had participated in forest surveillance and maintenance. Once the payments were received, non-recipients withdrew from these activities. In two happy cases, *ejidos* F and J, we observe that the allocation of the PES funds resulted in an increased environmental awareness and participation of a greater number of community members in conservation activities. Although the authors of the cases noted that community F clearly had higher levels of social capital than some of the other participating *ejidos*, it also received a much larger payment, both in total and on a *per capita* basis. In addition, the payments were not divided up equally among members, but rather were distributed according to the level of participation in the activities they deemed necessary to fulfill the program requirements. In community J, members stated that they felt that, in addition to providing a source of employment for some of the able-bodied men in the village, the program had also improved the quality of the water available to them.

Finally, in *ejido* K, although one might expect that the owners of the cattle grazing in the PES area would have been paid additionally for displacing their activity toward other lands within the *ejido*, conversations with community members revealed that the social pressure from other *ejido* members was sufficient to induce this change without compensation.

iv. Other case study findings

a. Misunderstanding of the program

One of the most discouraging finding was that in none of the communities visited were the objectives and rules of the program clear to the members. This was not surprising given the time restrictions on program promotion. Interestingly, the majority of *ejidos* were able to identify the cities that benefited from the hydrological services provided by conservation of their forests, exhibiting an understanding of the links between forests and the services they deliver. On the other hand, none of them realized that the payments they were receiving were meant to be in compensation for these services. In several cases, interviewees stated that they thought the payments were a poverty-alleviation mechanism somehow linked with forests.

It is likely that part of the lack of behavioral adjustment thus resulted from not understanding that the program was intended to support conservation activities. Clearly, the lack of technical assistance in the elaboration of implementation programs exacerbated this problem. In addition, the premature promotion of the program that we discussed in the political economy section may have helped to generate some of the misinformation regarding program objectives rampant among participants.

b. Corruption

Another unsettling finding was that, in at least one case, the intermediary responsible for helping the communities fill out the paperwork for the program covered a 'fee' equivalent to some percentage of the final payment. This sort of corruption is exactly the reason why so many of the people interviewed were hesitant to participate in a government-initiated payment program.

c. Slippage

The term slippage, coined by Wu (2000) in his study of the Conservation Reserve Program in the United States, refers to the bringing into production other land as a result of removing land from production and putting it into a conservation program. Although in most of our cases this was not a risk, given that the forest integrated into the program was not slated for any use by the *ejidos* in the first place, we did observe slippage in two cases in the *ejidos* in Northern Mexico. In the case of *ejido* K, cattle were removed from the forest to be entered into the program and placed in another area not previously used for grazing, although it is not clear if this area was forested or not and whether it was located in the commons or in a private parcel. In another instance, *ejido* I, the community put in the program forested land that they had programmed for harvest, and instead harvested another area of the forest.

Another phenomenon which is related to slippage is the use of the program as a way of receiving payments for land which the *ejido* intends to use productively in the future. We saw this in several of the forestry cases in the North, where *ejidos* decided to enroll into the program hectares that are part of their ten year harvesting rotation. With permission of the forestry authorities, these *ejidos* then modified their forestry plan to put different hectares into production. This is clearly at odds with the intent of the program, which is to protect the forests in sensitive areas from any risk of future production.

v. Summary of the case studies

The 11 case studies undertaken over the winter of 2004-2005 took place in a variety of communities participating in the PES program: those practicing forestry and those living from other activities, *ejidos* with few hectares and others with many, as well as *ejidos* with varying membership size. In many of these cases, communities were not deforesting and in all cases were practicing some kind of forest conservation measures before receiving payments from the program. In some cases, payments induced an increase in conservation activities and, in two instances, greater participation of community members in these activities. Payments to communities located in protected areas that mandate zero impact on the forest, or to forestry

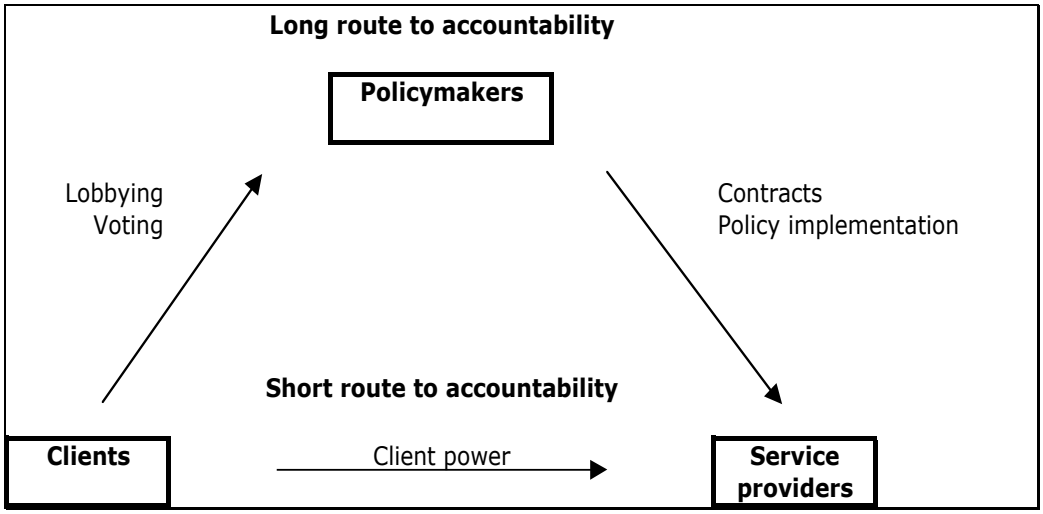
communities required to have ecological reserves, were used to provide incentives for forest conservation beyond the existing command and control approach.

In two instances, payments resulted in a shifting of extractive activities from PES land to other land within the *ejido*. In two other cases, the receipt of payments changed the bargaining power of particular groups within the communities – *ejido* members with forest on their parcels threatened to cut it down if they were not given larger shares of the payments in the coming year. Overall, the effect of the payments on the internal dynamics of the communities has not been very large, perhaps because in many cases the magnitude of the payments is quite small. An additional reason for the apparent small impact of the program may be that its goals and mechanisms were not well understood by recipients, and technical assistance that might facilitate this understanding had been entirely absent.

V. Putting the Mexican Experience into Perspective: A Conceptual Framework

The World Bank's 2004 World Development Report (WDR) entitled *Making Services Work for Poor People* presents a conceptual framework that highlights the importance of accountability in the provision of public services as a condition for greater efficiency as an instrument for greater program efficiency. We use an adapted version of this framework in our analysis. The WDR 2004 emphasizes how breakdowns in the relationships between the key actors – policymakers, service providers, and clients (in the case of the WDR, the poor) – can result in the failure to provide key services to the poor. Figure 1 shows a schematic for these relationships. Clients can hold service providers accountable through two channels. The short route to accountability is obtained through direct pressure on providers: the exercise of client power. This results in downward accountability of providers to clients. The long route to accountability is trough policymakers. Clients can use lobbying and voting to influence national and/or local policymakers, who in turn exercise pressures on service providers through contractual relations and in policy implementation. This is the long route to accountability. Both routes are complementary.

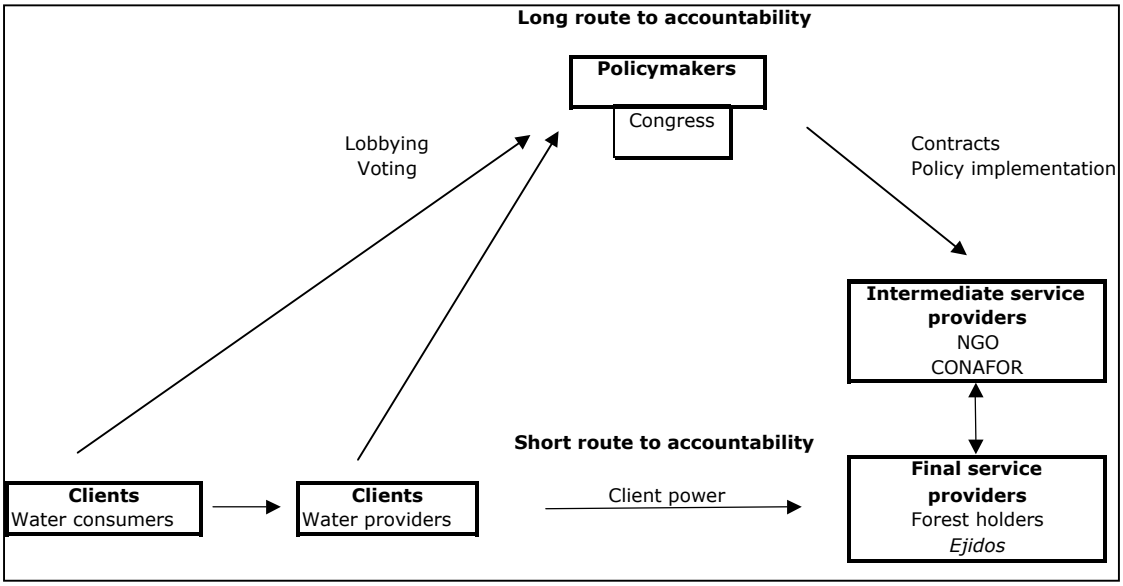
Figure 8. Basic accountability schematics



Accountability, both upward and downward, is important in the provision of services, especially the provision of environmental services for which no market has developed. The reason for this is simple – in a market transaction, like the purchase of a meal, the buyer can punish the seller if he is dissatisfied with the meal by going to a different restaurant the next time, demanding his money back, or, in extreme cases, bringing legal or social sanctions to bear. In the case of services provided through public agencies, there is no "other restaurant". For this reason, the desires of the three key actors must either line up very well, or contracts must be written which force accountability in all three relationships. However, it is usually difficult to write a contract that is "complete" in the sense that it takes into account even unexpected events (in the case of the PES program, the intervention of "El Campo No Aguanta Más"), while still allowing the service providers sufficient freedom to exercise their expertise. It is always preferable, if possible, to choose providers whose interests are aligned with those of the clients and policymakers.

In the case of the PES program, we modify this diagram to allow the service provider to be divided into two parts – the agency implementing the program, whom we will call the intermediate service provider, and the forest-holders are the final service providers receiving the payments and delivering environmental services. The service being provided is the conservation of forests in order to generate higher quality and greater quantity of water, and the "clients" are the institutions responsible for the provision of water at the municipal level.

Figure 9. Accountability schematic for PES, Mexico.



We add several other important actors to the PES accountability scheme. First, we have the members of the *ejido*. Because the payments are in many cases being given to common property forests, it is important to consider how the lump sum transfer to the entire community can be used to hold individual members accountable for the provision of the environmental services. In addition, we add the consumers of water. Since consumers are often voters, they are in a position to exercise power both over the federal policymakers and the water providers, who are in many cases (elected) municipal authorities or private companies overseen by the municipality. Finally, we add a dotted circle in the middle of the schematic representing a local NGO. We do this because INE's initial proposal was to find a local NGO to implement a pilot PES program before undertaking a national level implementation. We will discuss the possible implications of this choice below. In order to understand the present state of the program, let's consider the relationships between different actors, one by one, beginning with that between the policymakers and the intermediate service provider, CONAFOR.

a. Policymaker-Intermediate Service Provider Relations

The policymakers, in this case, the administration through Secretary Lichtinger and Congress, have the objective of preserving hydrological services, which they perceive are at great risk of being lost. The instrument they choose to reach this objective is a payment program to owners of standing forests. CONAFOR is chosen as the implementing agency for this program, and as such it is accountable to the policymakers to operationalize the policy that has been designed. The relationship between the policymaker and the intermediate provider is complex. CONAFOR is part of the Secretariat of the Environment and in this sense is not separate from the policymaker. However, CONAFOR, because it collects revenues from the forest management permit system, has a certain degree of budgetary autonomy. In addition, while the constituency of the policymaker is the entire country, the constituency of CONAFOR is a subset – the owners of commercial forests. Some differences between the policymaker's initial objectives and the reality of the program arose because the rules of operation were still subject to change when the program was transferred to CONAFOR. This gave CONAFOR considerable influence over the program design, which allowed them to include commercial forests and private properties among the final service providers, two categories that had not

been contemplated in the initial program design. We will discuss the final impact of these changes in the next section.

Had the program gone its proposed route through the Subsecretariat of SEMARNAT, it would have followed the dotted line in the schematic above, with implementation of a pilot program taking place through an NGO operating in the geographic area targeted by the pilot. It is impossible to speculate what impact this would have had on the final form of the program, because this would have depended upon the form of the contract between the government and the NGO, as well as the constituency of the NGO. However, had the program taken this route, it would not have been a national level effort, but rather a very small pilot program concentrated in one or two watersheds. In this sense it would have been easier to promote and implement the program, since the efforts of the administrative staff would not have been stretched over the entire country. A more concentrated promotion would likely have minimized some of the misunderstandings that occurred as a result of the pressured nature of CONAFOR's implementation. This takes us towards the next section, the relationship between the intermediate service provider, CONAFOR, and the final service providers, the forest owners.

b. Intermediate-Final Service Provider Relations

The reason why CONAFOR's inputs into the policy design resulted in big changes is that CONAFOR does not have the same objectives as the policymakers because it is subject to upward pressures from its existing constituency. This constituency, owners of commercial forests, may contain some members of the appropriate final service providers – forest owners whose properties are located in the recharge areas of overexploited aquifers – but not every member of this group is an appropriate target for payments. What is important is that the commercial forest owners have existing relationships with CONAFOR representatives that allow them to exert pressure on the way the agency implements its programs. It was simply easier for CONAFOR to communicate and negotiate with this group since they had already established relationships through other programs. As we saw in the summary statistics section, the result of this relationship was that 63% of participating *ejidos* extract wood for sale.

The characteristics of this constituency, combined with the very short time frame in which it had to allocate the first round of payments, resulted in payments being distributed not

according to water scarcity criteria, but rather to commercial forests or other types of forests already receiving benefits through other CONAFOR programs. In particular, it would seem that in some cases, the payments replaced traditional command and control policies for forest conservation. As we saw in the case studies, payment recipients located in Biosphere Reserves were previously forbidden to practice extractive activities in their forested areas. It is quite possible that the reserve managers were aware that this restriction could not be enforced in the long term, and that replacing the restriction with a conditional cash incentive through the PES program would become more effective in preserving the forest in the long term. Similarly, in the case of payments allocated to commercially held forests, CONAFOR and the programs it operates to encourage sustainable forestry may be using the PES program as a way to implement certain mandated policies – like not cutting forest in areas near rivers or springs. As we observed in the case studies, the ejidos practicing forestry had put in the program hectares that were either in their "reserve" lands – those where extraction is forbidden – or in the fallow lands of their harvest rotation. In this sense, CONAFOR using the PES program to fulfill its objectives of maintaining good relationships with its traditional clientele as well as of guaranteeing the success of its existing programs.

An additional objective which influenced CONAFOR's implementation of the program in later rounds was the desire to support another of its programs –the Priority Mountains Programs. This program's budget was somewhat smaller than that of the PES program and it shared the stated objective of preserving water production through forest conservation. These two features made it logical to funnel the PES funds towards these mountains, with the useful result of reducing administrative costs by concentrating the two programs in the same geographical areas. Linking the two programs together would help guarantee the probability of success of both of them by increasing funding and decreasing costs – a result with which any administrative agency would be happy.

The most important impact of CONAFOR's targeting scheme was to divert funds from lands in priority watersheds to commercial forests and to hectares in Priority Mountains. 46% of the 527,515 hectares enrolled in the PES program in 2004 were located in areas within the Priority Mountains program. Although some of the mountains in the program are located within overexploited watersheds, it is clear that many of the enrolled hectares were not simultaneously in Priority Mountains and overexploited watersheds. As we saw in section IIIb,

79% of the PES hectares in 2003 and 85% in 2004 were in watersheds which were categorized as "not overexploited." This is clearly not in line with the objectives of the program.

It seems that the maintenance of existing client relationships and of existing programs took priority in the administration of the PES program, as was clear from the lack of understanding of the purpose of the payments by final service providers. CONAFOR was limited by the political timetable and hence did not spend significant time and energy putting into place accountability mechanisms for the delivery of environmental services. Such accountability would require clear understanding by the final service providers that the payments were in exchange of the hydrological benefits provided by the standing forest. Upward accountability from the payment recipients to CONAFOR was partially guaranteed through the contracts which specify that payments are only awarded after a year of no change in the total forest cover of the contracted properties. This relationship was strengthened by the fact that the monitoring system uses satellite images to allow for the objective evaluation of forest cover at the beginning and the end of the payment periods. Currently, monitoring is done randomly on 20% of the enrolled properties. In the past year, no payments have been withheld.

It is extremely important to recognize, however, that CONAFOR brought to the program two essential benefits: the desire to implement the program and the political clout necessary to obtain a budget for it from Congress. Without CONAFOR, it is very likely that Hacienda would have blocked the allocation of money to a PES program indefinitely. The tradeoff here is an important one: one chooses an intermediate service provider whose incentives are partially misaligned with the objectives of the policymakers in exchange for obtaining a budget for the program.

c. Client-Service Provider

When we consider the relationship of the clients (water providers) with the forest communities, we find a clear breakdown in accountability which is partly due to the nature of environmental services. This is because environmental services are difficult to provide since there is not always sufficient demand at the local level to justify supplying them (think of the demand for carbon sequestered in trees in Chiapas). Even when local demand may exist, as is the case for water, clients are not always aware of the relationship between environmental conservation and the services it provides. As was described in the section on the evolution of the payments program, the provision of water in Mexico is usually done by the municipality, or by a private company under direct control of the municipality. There is a general sense among these types of providers (although there is significant variation) that problems with water supply are simply normal seasonal or yearly fluctuations which are not directly linked with overall management of the watershed. Where water providers are concerned about this link, as is the case in southern Veracruz and some states in Northern Mexico, this awareness was triggered by severe drought years and crippling water shortages.

In terms of our schematic, this means that the relationship between the clients and the policymakers can easily break down. Because water suppliers are unaware of the link between the forests and water, and because they are also unaware of the PES program, there will also be little pressure from water providers on the final service providers to see results in terms of increased water quality and quantity as an outcome of the spending that is allocated to the PES program. There will also be little pressure on Congress to continue allocating money to the program. There is room for water consumers, who clearly benefit through lower long term prices associated with preservation of their drinking supply, to exert an influence on policymakers either directly or indirectly through water providers. Since water is the responsibility of the municipal authorities, because they are either providing the water directly or supervising a private water provider, citizens presumably take this service into account through their votes. They might also go the long route and pressure Congress and the administration directly. Again, however, the will to apply such pressure relies directly on water consumers' understanding of the link between watershed management and water prices. This additionally requires that consumers "feel" the scarcity of high quality potable water, which is currently not

the case as the majority of municipalities have trouble collecting even a minimal fee for water service.

d. Relationships within Final Service Providing Groups

Because most of the final service providers in the case of the Mexican program are members of common property forests, we must also consider the behavior of the individuals within these communities with respect to the payments. There is, in fact, an issue of accountability here as well. The payments are given to the governing bodies of the communities, the councils, which then allocate these sums. The way in which the sums are allocated depends very much upon the relationship between the councils and the *ejido* members. In many cases, the communication between these two entities is very good – members vote on all activities concerning the *ejido* and there is transparency in financial matters. We saw this in many of our case studies. We also saw that, partially as a result of the poor translation of the program objectives by CONAFOR representatives, most of the communities did not know why they were receiving the payments. This could be quite detrimental to achieving forest conservation. Unless the payments are sufficiently large to cancel all individual needs to use the forest by increasing their income by a substantial amount, it is essential that individuals understand that the payments are being given **conditional** on not cutting down the forest. In other words, individuals within the ejidos receiving payments must be held accountable for their actions toward forest conservation by their internal governments.

e. Summary

In sum, looking at the provision of environmental services through a policymaker-provider-client lens helps us organize our thinking about the development and implementation of the program. This is a case where the lines of accountability have been blurred on several levels. First, CONAFOR is an essential intermediate service provider, but it is a provider whose accountability to the policymakers is weakened by its budgetary autonomy and its commitments to its traditional forestry constituency. In addition, at the moment of receiving the program, CONAFOR was allowed to make considerable changes to the targeting and implementation strategy. Because it experienced significant pressure from its constituents, the owners of commercial forests, the majority of the land under contract is now commercial forest. As we saw in the summary statistics section, the vast majority of the enrolled hectares are not in priority watersheds. This combination of facts suggests that the pressures on CONAFOR exercised by its constituency shifted funds away from forests in the watersheds that were intended to be targeted by the program. Implementation of the program was further complicated by the fact that the clients of hydrological services in Mexico are not able to exert significant pressure on policymakers and on the providers of the services (the recipients of payments) due to a lack of information about environmental services in general and the program in particular. Clearly, however, the program has been successful on many fronts, and there are many other aspects from which we can extract lessons. These will be the topics of the next section.

VI. Learning from the Mexican Experience

a. Lessons in political economy

There are multiple lessons to be derived from the administrative and political processes to which the Mexican PES program was subjected. Many of the forces which modified the program's objectives were not foreseeable and could not have been circumvented. Among these was the unfortunate resistance encountered in Hacienda which was partly due to the fact that key actors there were busy trying to design and implement a program very similar to the PES. In this section we focus on aspects of policy design and implementation which could provide useful guidance for the continuation of Mexico's program and for programs in other countries.

i. Lessons at the policymaker level

The first important lesson for policy designers is the need to establish clear objectives and criteria for the program before promotional activities take place. The nationwide tour resulted in confusion regarding the purpose, rules, and financial mechanisms of the program. This resulted in bad blood at the local government level in places where trust funds were set up for payments as well as an overabundance of unqualified applications, which merely exacerbated CONAFOR's staffing problem. Clearly defined criteria and objectives could also have helped minimize the problems that occurred during the implementation phase and increase transparency of the program. A well-defined program may have facilitated the early stage negotiations with Hacienda and improved the quality of the "rules of operation". In addition, a framework with clear objectives would have facilitated the promotion of the program and the understanding of it among the participants.

Participants in the early phases of the Mexican program emphasize the importance of forming an advisory group of both national and international experts to aide in the policy design process. The combination of expertise from outside the country and experts aware of the realities of implementing programs in Mexico expedited the design of the program and allowed recommendations to be made quickly and effectively. Whether or not these recommendations

get implemented depends very much on the relationship between the policymakers and the intermediate provider or implementing agencies, which leads us to the next point.

ii. Choice of Implementing Agency

In the Mexican case, the choice of CONAFOR as an intermediate service provider had very important impacts on both payment structure and targeting. Many of these changes resulted from the fact that CONAFOR's traditional program objectives and constituency differed from the program's objectives and target population. In addition, CONAFOR's contract for the implementation of the PES program with the Secretariat of the Environment was not clearly specified. There are two possible remedies for this situation: first, an implementing agency could have been chosen whose objectives and constituency were more closely aligned with those of the program. Such an agency could be one whose interests are more similar to those of the water providers and whose knowledge of target communities is more detailed. One alternative model might be to concentrate the responsibilities of program design in a federal agency like INE, and, once the design is well-defined and the funding guaranteed, allow implementation to occur on a local level through municipal offices or water districts.

It is important to recognize, however, that without CONAFOR's political clout, it is likely that there would have been no program at all. It may very well be that the tradeoff for getting the budget approved by Congress was the loss of a carefully planned pilot as well as some skewing of the targeting criteria.

iii. Intermediate provider service-provider contracts

The contracts between the intermediate provider, CONAFOR, and the final service providers, the ejidos, must give the forest communities sufficient incentives to cease their extractive activities in favor of conservation. This requires that payments be high enough to compensate for the loss of forest extraction, agriculture, or cattle-grazing and that there be sufficient monitoring and enforcement of program rules. The case studies and the statistics regarding deforestation risk show us that much of the forest currently under contract is likely to have a very low opportunity cost – that is to say, one would not have to pay very much in order to compensate for the loss of income from activities currently taking place in these forests. In this sense, the magnitude of the payments appears to be high enough given the forests that are enrolled in the program – whether or not these payments would be high enough to preserve all of the water services at risk of being lost is another issue, and one we will return to in the discussion of targeting.

One way to eliminate the guesswork in the magnitude of payment design is to use an auction process to induce potential participants to reveal the minimum payment which they would accept in exchange for conservation of their forest. Although we have yet to hear of such an approach being applied in an environmental services scheme, the Conservation Reserve Program in the United States did take a step in this direction by allowing potential participants to place a bid which can affect the probability that they will be included in the program.

One feature of the contracts which is important and easily replicable in other situations is that contracts should be made over the entire forested area. Although in Mexico this was not done for all of the communities, it is clearly an important lesson to be learned. In order to avoid slippage, or the movement of productive activities from PES hectares to other previously unused forests within the *ejidos*, it is very important that contracts for payments specified that there should be no change in the entire forested area. This does not imply that payments should be given for all of the hectares of forest within the *ejido,* but rather that the contracts should eliminate the possibility that deforestation be reallocated from one spot in the community to another. Agreements can allow for some pre-specified amount of forest conversion. Were the program not to have followed this strategy, an *ejido* receiving payments for 10 out of 100 forested hectares within its boundaries might then deforest with impunity the remaining 90

hectares not included in the program. Obviously the choice of which hectares to pay for should not be arbitrary. The logical option is to pay for those hectares of land which are at risk of being deforested. Such an approach is described in more detail in section c.iii

The timing of the payments would also be easy to replicate. Payments are given at the end of each period, after verification of the conserved forest cover. In effect, the payments, since they are made on a yearly basis, are a rental contract for the environmental services provided by the forest over the year. This arrangement is logical since it is much easier to withhold a payment than to request its return, and there is a clear moral hazard problem with paying before the receipt of a service. As a result of the need to spend the initial budget quickly, the first year's payments were given for forest conserved in the previous year. This is not a method we would recommend for other programs, although it was politically expedient.

An important part of being able to give or withhold payments relies on having an objective measure of change in forest cover. Here we find another positive lesson from the Mexican strategy, which was to use satellite images which are transparent and difficult to manipulate by interested parties. The monitoring scheme consists in choosing communities at random and assessing the quality of their forest cover at the end of the year, prior to receiving the payment.

iv. Within community contracts

Mexico is unique in having most of its forest held under common property. However, many other countries also have substantial tracts of forest under similar institutional arrangements, and it is important to mention lessons learned within this context. The magnitude of the payments is unlikely to generate forest conservation through an income effect. This leaves the PES program in the category of conditional cash transfer, and as such, it is essential that the conditions of the transfer be clear to recipients. As we saw in our case studies, oftentimes recipients thought they were receiving payments as an anti-poverty measure. This misunderstanding of program objectives can be very detrimental in the case where the opportunity cost of the forest is high. This is a case of incomplete within-community contracts that had at least some roots in the hasty promotion of the program.

v. Give voice to water service providers

One final political lesson is to allow water service providers to participate in the design and management of the program. Although bureaucratic limitations did not allow CONAFOR to funnel the payments through the municipalities, the early participation of the water service providers could have worked in several ways to bolster the success of the program. First, because they know their localities, these service providers could have helped to target properties which were particularly important for the provision of water. Although the general consensus is that municipalities and private water providers in Mexico are not clearly aware of the relationship between forests and water, participation in the program could have generated such awareness. This knowledge is absolutely essential for the development of markets for hydrological services, which is the final goal of the program. Finally, water service providers are an important link in the accountability circle. They can generate awareness among consumers of water, who can then pressure policymakers either directly or indirectly. The providers themselves are directly linked with the government because they are either municipalities or private providers operating under the supervision of municipal authorities who are in communication with the government. They are, therefore, in a position to demand results from the program – increasing the accountability of the environmental service providers, and helping provide another source of pressure on policymakers to continue allocating a budget for the program.

b. Financing lessons

i. Sustainability of the funding source

As was described above, the current financing from the program, consisting in an annual budget of $20 Million, has been approved by Congress. This does probably not qualify as a sustainable financial arrangement since, though it has been written into law, it is decoupled from the intentions of the program and subject to the political process. In some sense, however, the Mexican program is seeking sustainability through the development of local markets for environmental services, a criterion which led to the selection of *ejidos* with downstream populations of over 5,000. As we saw in the section describing the current participants in the program, the distribution of the enrolled hectares is widely dispersed. The small number of participants per large population area may make it difficult to establish markets for two reasons. First, there may not be a sufficient number of hectares enrolled to actually make a substantial impact on the downstream water quality and quantity. Second, dispersion of the participants may make it costly to organize such markets. Although the development of markets would be sustainable as long as demand for environmental services is strong, it is currently unclear how the transition from subsidy to market will occur.

In some Mexican cities, with Coatepec in Veracruz serving as an outstanding example, markets for environmental services have developed in the absence of the payment program (though the program has been used to support Coatepec in the past two years). It is important to note, however, that initiation of the program in Coatepec followed a water crisis in the city which raised the local demand for water services from forests in the mountains above the city.

ii. Guarantee long-term funding

Despite the potential tenuousness of the program's budget, we do extract one very positive lesson from the financing of Mexico's program: the usefulness of creating a trust fund which guarantees the ability to provide payments to recipient communities over an extended period. For environmental services programs to be taken seriously, funding must be guaranteed over a substantial period of time. The Mexican Forest Fund (FFM) is a clever mechanism which

circumvents the political budgeting process by allowing money allocated in one year to be used in subsequent years. This security, however, comes at the cost of a substantial part of the budgeting money sitting idle each year. In the case of the FFM, as each year's new budget comes in, four fifths of it is put into the fund, where it is paid in equal installments over the next four years. If one could rely on the yearly financing of the scheme, considerably more hectares could be enrolled in the first five years of the process than are actually in it. However, in the face of insecure political outcomes, the trust fund mechanism plays an important role in enabling long term contracts with service providers in spite of reliance on politically uncertain annual budget appropriations.

iii. Use bankable certificates

An alternative to the FFM approach is to use the strategy undertaken by PROCAMPO, an agricultural subsidy program introduced in 1994 to compensate farmers for the negative price effects of NAFTA. Under PROCAMPO, farmers are given payment certificates against which they can borrow money from the bank. Using such a strategy would allow for all of the money granted by Congress each year to be used to pay communities. Had such an approach been taken, CONAFOR would have been able to contract five times as many hectares in 2003. The key to making such a system work is a guarantee of funding from the federal budget for the length of the contracts, in this case, five years.

iv. Develop a plan for continuing participation beyond 5 years

Up until now, there has been a lack of foresight in planning for the continued enrollment of current participants in the program. In theory, land should continue to be enrolled until the cost of such enrollment exceeds the environmental benefits generated by the forest. In many cases, this will be in perpetuity, and planning must be undertaken in order to continue the financing of the enrolled properties over the long term. The development of markets is clearly a desirable way to satisfy this necessity. However, there may be many cases where markets cannot be developed but where land is still of high environmental value. FFM funds should be set aside to guarantee the financing of this land, while the development of markets where there is effective demand for water service should be a priority.

c. Targeting lessons

i. Target public goods important within national boundaries

Mexico was wise in its choice of hydrological services provided by forests as the focus of the program. Because the water quality and quantity associated with forests is a good that is solely consumed within watersheds, almost all of which are entirely within national boundaries, it was much easier to seek financing from Congress and to look towards the development of local markets.

Despite the fact that the targeting of the payments was skewed by the choice of the implementing agency (see section IVb), the current targeting scheme is moving towards achieving the goals of the program, with big improvements in the 2004 implementation, where communities located in priority watersheds are given preference. It is also a scheme which would be simple to apply in various contexts, although it does require having sufficient information to prioritize the watersheds that are key to preserve the environmental service of concern. One of the unforeseen benefits of the program is that the majority of the recipients are either poor or very poor. In 2003, 72% of the recipients fell into these categories while in 2004 the percentage was 83. This occurred without any additional poverty targeting criteria. This is the case in Mexico because the poor constitute the majority of forest-owners, but this would not necessarily hold true in other contexts.

ii. Take into account risk of service loss

The most efficient way of allocating payments in environmental programs is to pay the lowest cost possible for those hectares of land containing benefits that are at risk of being lost. If the risk of service loss (in this case, deforestation) is not taken into account, then large amounts of money will be spent paying for environmental services that were never at risk of being lost in the first place. Our summary statistics on program participants in Mexico (see section IIIa) showed that a large number of hectares enrolled (72% in 2003 and 52% in 2004) had either low or very low risk of deforestation. This implies that the current targeting strategy is inefficient. The efficiency of the current scheme could be enormously improved by taking into account both the risk of losing these benefits and the cost of conserving them. In a 2004

paper simulating the effects of different payment targeting schemes to *ejidos* in Mexico, Alix-García, de Janvry and Sadoulet (2004) showed that for the same budget, payments allocated to maximize expected benefits per dollar lead to a fourfold increase in efficiency over a scheme analogous to the current one which offers a flat payment per hectare with a cap on the number of allowable hectares.

Operationalizing this scheme means developing some measure of environmental benefits, weighting these benefits by the deforestation risk, and creating a ratio of expected benefits to opportunity cost which allows the ordering of properties. One then begins to pay those with the highest expected benefit/cost ratio and proceeds down the line until the budget is exhausted. Clearly, the three elements necessary to implement this scheme are: (1) some measure of the environmental benefits offered by land in each *ejido*, (2) a measure of the opportunity cost per hectare, and (3) an estimate of the risk of forest loss. It would be possible to implement this approach by using a bidding process (as suggested above) to reveal the opportunity cost of hectares in forest, and then use the ratio of the expected environmental benefits to the bid made as the targeting criterion.

There has been some suggestion of varying payments in the program according to vegetation type. To the extent that vegetation type is correlated with opportunity cost or the risk of forest loss, this may be an effective strategy. However, this seems a blunt instrument compared to the suggestion in the previous paragraph, or even compared to a system where existing land market prices are used to predict the opportunity cost based on easily observable characteristics (one of which may include vegetation type).

Payments in the second round of the program begin to fill one of the criteria of a targeting strategy that maximizes environmental benefits per dollar, that is to say, payments are broadly allocated to regions where water resources are over-utilized. They are, therefore, directed towards communities where the environmental benefits are relatively higher. Another related lesson is that, in general, where forestry projects are very profitable, forests will be conserved because it is in the interest of the owners of this forest that it keeps supplying lumber over the long term. Payments should therefore be directed away from these communities towards those with unprofitable forestry projects or to non-commercial forests.

iii. Avoid fragmentation

In 2003, the program enrolled 271 properties in 15 states. Figure 6 in section III shows the distribution of the common properties which were enrolled during this period. The wide dispersal of these properties works against the formation of local water markets. Although the number of hectares of preserved forest required to have an impact on the water-providing capacity of an aquifer will clearly vary by region, the wide dispersal of these properties suggests that removing the program will not have a visible effect on local water supplies, and therefore it is unlikely that water providers will be inclined to pay for the services provided. In addition, the wide dispersal of the properties in the initial phases of the program increased the costs of administration. The program would have been less expensive to promote and easier to monitor had funds been focused on a small number of states in the first few years.

iv. Allow for payments outside of forest conservation

As was mentioned previously, there is some scientific evidence that cloud forests provide more substantial water environmental services than do other types of forests. This has resulted in a payment scheme which is differentiated by vegetation types. It has also been suggested that other land uses might be associated with increased water infiltration, including some agroforestry practices. To the extent that different land management practices may augment water services, it is recommendable to allow them into the PES program. Such practices have the additional advantage of being easier to contract upon and enforce, given that they are easier to verify than a lack of deforestation.

VI. Concluding remarks

We began this report with an overview of the state of the Mexican forest, whose considerable riches are at risk of being lost due to a combination of perverse incentives, one of which is the lack of a market for the environmental services that it provides. This forest is a prime example of a natural resource which supplies services in addition to its extractive value; it sequesters carbon dioxide, shelters biodiversity, prevents erosion, provides a destination for local and international tourists, and plays an important role in regulating a complex hydrological system. Mexico chose to pay for hydrological services through a PES program. The possibilities and pitfalls of this experience have taught us lessons that will both help improve the Mexican program and assist in designing PES programs for other services and in other countries.

Our analysis showed that payments as they were distributed in 2003 and 2004 did not necessarily achieve the goals of the program – they were largely allocated to hectares of land which were not within critical watersheds. They are also so fragmented in their distribution that they are unlikely to be providing measurable services to downstream water providers. In addition, they were not targeted at forests which were at risk of being lost. Our case studies showed that there was little pressure to deforest in the communities chosen to receive payments and that, as a result, there were very few behavioral changes induced by the program payments. In some cases, however, the payments did serve to increase participation in conservation activities. One serendipitous effect of the targeting was that the majority of payments went to poor and very poor forest-holders.

The sources of this bias in the program are various. One of the most important was the choice of service provider, CONAFOR, whose objectives were not directly aligned with those of the proposed policy. The tradeoff in this choice, however, was a large one. CONAFOR was very successful in lobbying for a budget for the program and in ensuring that its first phase was implemented within a very restrictive political timetable. Other important factors which affected and will continue to affect the program's success are related to accountability. Without awareness on the part of water providers and consumers, accountability of forest-holders to provide environmental services will be very limited, and it is unlikely that local markets for hydrological services will emerge. In addition, without pressure from these groups, it will become increasingly difficult for the program to continue to receive budgetary support from

Congress. There are also problems of accountability within communities – if the program continues to be misunderstood by recipients, the contracts are likely to be broken and market formation hindered.

The program in Mexico is still quite young, and will surely have many future lessons to teach us. A thorough evaluation of the actual impact of the program on forest cover will eventually need to be done, and this will require considerable GIS work as well as further surveying of the participant (and some non-participating) communities. In addition, the question of the optimal design of payment contracts in the context of forest common properties has yet to be answered. As was clear from the introductory section assessing the risks of forest loss at a national level, there are at least two different types of common property communities – those that extract wood for sale and those that do not. It is entirely possible that different kinds of contracts will be required for these two types of forest-holders.

Furthermore, we do not know whether the payment level that is currently being used is appropriately set. It is clear that the payment level was high enough to attract a substantial number of participants, but it would seem that often those who chose to participate had no intention of cutting down the forest in the first place. As we saw in the case studies, some communities showed absolutely no change in behavior upon receiving program payments. Part of this may have been because the overall payment amounts were not very high; they could probably have been lower with the same result. Calibration of the payments must take into account the fact that forests at higher risk of deforestation, i.e., with a greater opportunity cost, will require larger payments. The logical conclusion is that payments must be differentiated according to the level of risk associated with a given forest. The design of such a differentiated scheme, however, requires considerably more research.

Finally, recalling that the goal of the program is to develop markets for environmental services within Mexico, an essential part of future research should include a rigorous assessment of where these markets can truly be developed. This requires knowing which forests are essential to which watersheds, if they are at risk or not, and the quality and quantity of the demand for services by downstream users. Integral to such an analysis is identifying forests which could be preserved through means other than environmental services payments –i.e., through changes in the incentive structure created by forest policy. The portrait of forests at risk could then be completed by those which cannot be saved by markets or through changes in

forest policy. It is these that will require either mandated protection or continuous payments from federal or international funding sources.

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