

EFFECTIVENESS OF PAYMENT FOR ENVIRONMENTAL SERVICES PROGRAMS
IN MEXICO

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ABSTRACT

Payment for Environmental Services (PES) Programs in Latin America and Mexico have dominated the market-based environmental policy realm in the past decade due to their new paradigm for solving the problem for ecosystem degradation. There are at least three reasons why a careful examination of the design and implementation of these types of programs is important for the environmental policy discussion in developing world contexts. First and foremost, PES schemes offer several advantages: they are cost-effective, they are institutionally simpler, and they are potentially good for poverty reduction. Second, PES schemes embrace the user-based principle instead of the polluter-pays principle and, in some cases, they have elements of a conditional cash transfer program. Third, from a geographical perspective, PES programs are flexible and adaptive to local, regional, national and international scales.

Despite the advantages from a design perspective, PES programs present a set of issues and barriers at the implementation stage, especially within developing world contexts where a set of preconditions must be in place in order for PES programs to work well. It is particularly important in this regard to evaluate the effectiveness of PES programs in the past decade in Mexico and Latin America. The main preconditions identified for an examination of the Mexican case were well-defined property rights and a bias against the poorest amongst the poor from PES program beneficiaries, which are mainly Ejidos. Based on my findings—in the PES literature and from the Mexican *Pago por Servicios Hidrológicos* (PSAH) program evaluations, I propose an alternative framework to account

for government, market, and communitarian failures that might arise at any traditional PES scheme within a context of imperfect institutions.

In this investigation, I have posed the following questions: First, have PES schemes as public policy interventions changed the behavior of landowners where the environmental services are provided? Second, have the PES programs been effective in Mexico during the last decade? And third, from a policy perspective, what can we learn from the government-based-to-user-based PES scheme transition that is currently taking place in Mexico?

I find that government-financed PES schemes have caused only modest or no reversal of deforestation, and that case studies of user-financed, smaller-scale PES schemes claim more substantial impacts to achieve environmental goals. So far, inconclusive evidence exists regarding side goals of PES in Latin America –mainly, poverty alleviation, land tenure, and local economic development.

Content analysis of cross-scale surveys nationwide indicates low environmental service awareness of Ejidos environmental service providers. I also find that the notion of additionality is partially supported, in the sense that most Ejidos claim that PES programs have made a difference towards environmental sustainability. However, the theoretical concept of additionality in the literature only suggests dichotomist results under an either/or approach.

Impact, process, and results-based evaluations of PSAH show positive impacts (30%) in deforestation reduction. However, after controlling for leakages and slippage, estimates show a very low 12 percent net impact of PSAH. By evaluating the criteria rules to allocate program benefits among enrolled and potential participants, I conclude that

suboptimal targeting has decreased the effectiveness of the Mexican government-based PES program throughout the study years. I argue that relatively low effectiveness levels of the government-based PES program in Mexico have since 2011 led to the construction of an alternative scheme under the same program, *Fondos Concurrentes*, which is deemed a transitional program towards user-based and market creation projects at the local level. So far, scant data of this section of the program is available.

Statistical Analysis of 35 locally-based schemes under the *Fondos Concurrentes* program shows, on average, higher payments and lower land extensions from enrolled participants as well as a multi-stakeholder participation at the local level and bundling of at least two environmental services in one project. So far, not enough evidence exists to report significant differences between additionality from government-based schemes and additionality from a user-based type of PES scheme.

Nonetheless, policy-oriented findings and recommendations were identified in a local case study in western Mexico at *La Primavera* forest, Ejido San Agustín. Six major factors have been identified: first, the need for a holistic and polycentric system that considers potential leakages and spillovers generated by public intervention through the PES-*Fondos Concurrentes* program; second, the communitarian appropriation of local best management practices, in addition to a focus on craftsmanship during the early years of the program; third, an evaluation of preexisting social capital conditions; fourth, monitoring and verification systems that combine local knowledge and GIS technology; fifth, pre-identification of potential environmental service users and market creation strategies; and, sixth, development of comprehensive technical support through academic institutions and NGO's, instead of a reliance on a single technician or middle man. Also, Best Management

Practices must be used during the first year to establish a baseline for the development of a monitoring and evaluation socio-ecological framework. In the near future, successful PES projects will serve as a good source of data for future programs under the climate change international agenda.

DEDICATION

This dissertation is dedicated to my family.

To my wife Marcela in Guadalajara for giving me the motivation to reach the final goal. To my parents, Vicente Berger and Graciela Garcia, my brother Alfonso and my sister Rocio in Mexico for their unconditional support.

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CHAPTER ONE

INTRODUCTION

Environmental policy preferences in Mexico have recently shown a transition from traditional command and control policies to market-based environmental policy instruments. In a parallel way, this transition has trended from an exclusive government-based policy orientation towards integration of multiple stakeholders, including direct environmental service users. Under this context, a particular set of programs known as Payment for Environmental Services (PES) has emerged as a market-based alternative instrument to compensate local communities and private owners for the provision of environmental services. Such services may include biodiversity, hydrological, carbon sequestration, recreational or aesthetic investments on their own lands. Technically, the ultimate goal of PES programs is to compensate for the positive externality that is created by the provision of environmental services.

The key question arising from PES programs in the last 10 years is: Have PES schemes as public policy interventions changed the behavior of landowners where the environmental services are provided? If the answer is yes, then the PES program or scheme is in a good position to achieve additionality and effectiveness, in other words, to add value and achieve its intended effects. If not, it would only be a wealth transfer from the environmental service user to the environmental service provider in the form of a traditional subsidy. Proponents of PES schemes claim that behavioral change is nurtured through the intervention. Market creation might come as a consequence. Skeptics argue that potential and actual barriers (what they call “leakages”) mitigate the effectiveness of the program. Within this debate, it is also claimed that both the effectiveness and efficiency of PES schemes crucially depend on its design. Therefore, in the Chapter 2 literature review, I

compare the positions of published academic authorities on the question of the evolution of Payment for Environmental Services in developing world contexts, mainly focusing on Latin America and Mexico.

The popularity of PES programs in Latin America derives from its theoretical *ex ante* advantages: First, PES offers a new paradigm for solving the problem of ecosystem degradation. The main advantages of PES are: PES is cost-effective, it is institutionally simpler, and PES can potentially achieve poverty reduction as a side goal. Moreover, PES embraces the transition from a user-based towards a polluter-pays principle. In some cases it has elements of a conditional cash transfer program. And finally, a PES program could be adapted to local, regional, national, and international scale.

Among scholars, the Mexican Payment for Environmental Services Program is an important case study in the policy debate for at least two reasons. First, the Mexican PES Program provides ongoing data with respect to implementation of sophisticated market-based environmental service programs in developing world and incomplete institution markets. Second, it offers a case study that vividly illustrates the contrast between the Pigouvian and the Coasian paradigms as well as the pros and cons that each approach has to offer currently. At the implementation level, a thorough and careful examination of the Mexican PES experience and program evolution provides valuable guidance for policy-makers in Mexico and Latin America as they face the issues that emerge in transitions from government-based to user-based programs.

Owing to the scale and the scope of the Mexican PES program, it offers a sound case study from which conclusions can be drawn. Overall, the Mexican Payment for Environmental Service is the highest scale program within countries with high

deforestation rates. From 2003 to 2013, ca. 5,800 forest communities have participated in PES programs in Mexico, with 3.2 million hectares enrolled and 600 million dollars allocated for PES programs in Mexico within the same period. Most program beneficiaries are Ejidos, the Mexican PES common pool resource property rights regimes. This institutional arrangement entitles Ejidos to become environmental service providers, with profound implications in terms of environmental governance and decisions regarding the provision, appropriation and exclusion of environmental services. Therefore, in Chapter 3 I analyze the Ejido institutional and governance dynamics.

One of the issues that most scholars agree upon in the environmental policy literature is that a typical PES should have the following characteristics: a voluntary transaction; a well-defined environmental service ‘bought’ by a minimum of one ES buyer from a minimum of one ES provider; and if and only if the ES provider secures ES provision or conditionality. In Chapter 4, I propose that this framework is a necessary but insufficient condition to achieve PES program effectiveness. To sustain this argument, I elaborate on each of these five program conditions that a PES scheme should have, and I account for at least one market, government or communitarian failure directly associated with each of the five mentioned characteristics focusing on the Mexican case.

At the policy implementation level, a consequence of the failures that are examined in Chapter 4 is that they might lead to poor selection and targeting of PES program participants and eventually lower its effectiveness and additionality levels. The purpose of Chapter 5 is then to explore the characteristics of the targeting criteria that were set during the last decade for Mexico’s Payment for Hydrological Services (PSAH) programs.

Furthermore, this chapter examines the policy implications of the targeting criteria that have been used in the last 7 years to allocate PSAH projects

In this regard, one of the most striking failures regarding the management of public PES schemes is lack of sound targeting mechanisms. Target rules determine justice, distribution and access criteria for potential program participants. Ultimately, targeting criteria decide the magnitude and direction of potential environmental outcomes and impacts of the program.

Targeting issues of the large scale, government-based Mexican PES program have partially motivated the need for program reconfiguration towards local user-based schemes. An additional driver for this trend comes from the empirical evidence in Chapter 4, which sustains that user-based, smaller scale PES schemes claim more substantial impacts and effectiveness than government-based large scale PES programs. The transition from government-based towards user-based PES schemes, however, is complex. I have found scant commentary in the environmental policy literature. Therefore, in Chapter 6 I examine the Mexican *Fondos Concurrentes Program*, which is a subset of the large scale government-based PES program and is viewed as a transition towards user-based, and market creation approach at the local level. Furthermore, I evaluate a pilot project in western Mexico at the *La Primavera Forest, Ejido San Agustín*, in order to illustrate the main issues and policy-making opportunities that are emerging from this innovative program. Finally, in Chapter 7, conclusions and policy recommendations are drawn.

CHAPTER TWO

LITERATURE REVIEW

In the 1990's, Payment for Environmental Services (PES) appeared as an innovative market-based policy instrument for natural resource conservation. From then, it expanded throughout most Latin American countries. After a decade of PES implementation, the empirical evidence regarding PES impact and effectiveness in Latin America is still diffused and inconclusive. Before we can evaluate the effectiveness and policy implications of PES, we must understand both its design and its implementation processes. Therefore, in this chapter I review the PES literature regarding five key issues: PES scheme and program design; the political economy of Payment for Environmental Services; market and government failures associated with PES implementation; PES program effectiveness determinants, and distributional issues regarding PES. Once these aspects have been addressed, in the next chapter I explore the effects of the Mexican government-based PES program within the developing world context of Latin America.

The key question that environmental policy has engendered in the last 10 years is: Have PES schemes as public policy interventions changed the behavior of landowners where the environmental services are provided? Or, would landowners have protected the ecosystem regardless of intervention? A more subtle discussion has evolved around the question of whether “forest conservation on enrolled land is undermined by displacement of deforestation to other areas through spillover effects” (Alix-Garcia et al; 2010; Pattanayak, 2010). Proponents of PES schemes claim that behavioral change is nurtured through the intervention while skeptics argue that potential and actual barriers (what they call

“leakages”) mitigate the effectiveness of the program. In the middle of this debate, practitioners, policy-makers, and scholars try to identify ways in which leakages of PES schemes could be minimized through careful consideration of institutional context, design, and implementation.

PES has become popular in developing world contexts because it is seen as a new paradigm for solving the problem for ecosystem degradation (Ferraro and Kiss, 2002). In particular, proponents of PES see it as a better course for environmental policy due to several *potential* advantages: cost-effectiveness, institutional simplicity, and poverty reduction. (Wunder et al; 2008). Each of these advantages is based mainly on theoretical grounds. In practice, though, institutional constraints and bureaucratic and implementation failures may hinder their effectiveness.

Under some circumstances, PES intervention has proven more cost-effective than traditional command-and-control instruments such as designating natural protected areas. PES design reflects the famous Coase theorem regarding social costs: if property rights are well defined, a Pareto efficient outcome will be achieved regardless of the initial distribution of benefits. Moreover, this result will be achieved without government intervention. Two crucial assumptions underlie Coase’s theorem: property rights must be well-defined, and transaction costs of the bargaining process should be low. How far away are these theoretical assumptions from actual PES design and implementation? These central research questions seeks empirical evidence and dominates the contemporary Payment for Environmental Services academic literature. Another key feature of PES design is that it is based on the beneficiary-pays rather than on the polluter-pays principle.

This change in notion implies a significant shift in traditional command-and-control environmental policy.

Payment for Environmental Services Schemes Design

According to Wunder et al. (2008), whose work represents the most generally accepted PES characterization among scholars, a Payment for Environmental Service scheme must contain three of the following five features. First, and similarly to other market-based instruments, a voluntary transaction must take place. Typically, there are four economic agents that might interact on a PES transaction: private owners, non-governmental organizations, firms, and governments. Any interactive combination of these four agents in a given scheme must be voluntarily. This is true even in the case of government-based PES programs. Second, and closely interrelated with the voluntary transaction condition, the environmental service (ES) must be bought by a (minimum one) ES buyer and, third, from a (minimum one) ES provider. Fourth, the ES must be well-defined (well-defined, in this case, the causal chain between the environmental resource and the service it provides is scientifically proven and ideally measured). Sometimes this relationship is not easy to establish either because little is known about the ES or because it is almost impossible to isolate a single ES from its ecosystem interactions. Despite this limitation, there are four conventional environmental services implemented in both developed and developing world contexts that scientists and policy makers agree on both the provision of service and the associated causal chain. These environmental services are carbon sequestration, biodiversity conservation, hydrological services, and agro-forestry environmental services.

The fifth characteristic is conditionality and it refers to the assurance that the ES supplier guarantees the environmental service provision. Conditionality implies that the ES provider must comply with the agreed upon rules that are typically set in a given contract and which norm the behavior of the landowner towards the natural resource in order to guarantee provision of the environmental service for a definite time period.

In addition to these five main characteristics, PES schemes may be differentiated by the “type and scale of ES demand, the payment source, the type of activity paid for, the performance measure used, as well as the payment mode and amount” (Engel et al; 2008). Consequently, the effectiveness and efficiency of PES schemes crucially depends on their design.

Although Wunder’s five-step definition has been broadly accepted and agreed upon by the environmental management scholarly community (as indicated by the number of citations), there is some disagreement about whether to include environmental policies that have PES characteristics but partially violate one or more of the five defining conditions (Sommerville et al; 2009).

A key difference between PES schemes involves the nature of the buyer of the ES. Government-based or supply-side PES schemes compensate ES providers in the form of a Pigouvian subsidy. NGO’s may also apply supply-side PES schemes. On the other hand, demand-side, also known as user-based schemes, imply that the compensation payment might be made to the ES receiver who is able to identify the direct benefits of the environmental service. Frequently, environmental services are ignored, underestimated, or

neglected by users, unless the scale and the consequences are directly perceived by the user. Watersheds with upstream and downstream users are a good example of this situation.

Drawing a sample of developed and developing world countries, Wunder et al. (2008) found that user-based and government-financed PES schemes have significant differences in terms of concrete performance indicators such as targeting; tailoring to local conditions and needs; monitoring and enforcement to achieve conditionality; and confounding objectives. In these four aspects, user-based schemes performed significantly better, on average. The policy implications of this key finding don't necessarily condemn government PES schemes to failure, nor do they suggest that user-based schemes are always the best way to go. A combination of both kinds of schemes may interact simultaneously, with the institutional setting determining which type of scheme might work better in a given space and time.

In practice, PES schemes may encompass a bundle of two or three environmental services at the same time. For instance, Asquith et al found that in Los Negros, Bolivia, a PES scheme compensated upstream farmers for not cutting down trees, hunting, or clearing forest on enrolled lands while downstream irrigators paid for upstream cloud forest conservation. Since the payment is an annual *quid pro quo* in-kind compensation scheme that includes “transferring beehives supplemented by apicultural training” (Asquith et al; 2008) to upstream farmers, a third environmental service in the form of pollination is considered in this complex scheme.

In general, bundling different environmental services is a frequent, advantageous practice that seeks to simplify information within a complex ecosystem context. If well

designed, a bundled PES scheme may provide benefits by expanding potential markets and increasing payments to a particular area. Services are either sold together or subdivided and marketed to different buyers (Kemkes et al; 2010). It may also be argued that bundling environmental services fosters participation since it increases the scope of the potential targeted population. Despite these potential advantages, especially if care is not taken in design, bundling may increase transaction costs and increase leakages if “each service has a different spatial distribution and therefore different beneficiaries”. (Kemkes et al; *op. cit.*).

The Political Economy of Payment for Environmental Services

Contemporary Payment for Environmental Services schemes utilize Coasian and Pigouvian insights. According to the Coase Theorem, if property rights are well defined, social and private return rates should be equal. Therefore, an efficient outcome could be achieved regardless of the initial allocation of those rights. The efficient outcome is achieved by bargaining between the two economic agents. For this to happen, transaction costs should be low and the number of participants should also be low. *Ex ante* government intervention is limited to make sure that property rights are well defined. *Ex post* government participation is limited to put in place conflict resolution mechanisms for potential disputes which, under Coasian conditions, shouldn't normally occur.

As the number of participants increases, however, collective action issues may appear. However, experimental economics literature has shown that the efficient outcome suggested by Coase may still hold even when the number of participants is relatively high. According to Hoffman and Spitzer (1986), the main conditions for the efficient outcome to hold even under a bigger than two person scenario are the capability of players –bargainers-

to have open communication, side payments and enforceable contracts. Well-defined property rights are the cornerstone of Coase's theorem. However, there is a vast literature in natural resources that distinguishes between *de facto* and *de jure* property rights. Coase refers to the former, while the latter are not considered under the theorem but may be equally important regarding natural resource management (Baland and Platteau, 2003).

Payment for Environmental Services programs that are government-designed also have a Pigouvian component. In a way, Payment for Ecosystem Services may be seen as a particular form of a Pigouvian subsidy. This kind of market-based policy instrument basically tries to identify the equilibrium price where social marginal benefits and costs meet, thereby correcting for a negative externality; (for example, excessive pollution levels) or augmenting production levels to ensure the optimal provision of positive externalities. Similar to a Pigouvian tax, the key challenge for governments is to set the level of the subsidy equal to the "price" at which marginal benefit and cost curves intersect. If this is not achieved, suboptimal results will emerge as a consequence and deadweight loss as well. Sometimes, PES schemes are a Coasian-Pigouvian combination. User-based and government-based PES schemes both imply a voluntary transaction between one provider and *at least* one buyer or consumer of the ES. However, under user-based schemes the buyer clearly identifies the externality and directly bargains and pays for the service without government intervention. In this sense, user-based schemes mimic the Coasian idea more closely. In addition, the key low transaction cost *Coasian* condition has different implications for user-based and government-based schemes. For example, it has been shown through case studies that user-based schemes have lower transaction costs than do government-based schemes (Wunder, 2008). This finding is not surprising since

government based schemes lend themselves more to “leakages” via middle man interaction, program design, timing, side goals, and program service delivery.

Another implicit assumption of the Coase Theorem is that the economic agents engaged in bargaining are single units, typically private firms or individuals. However, many natural resources in developing world contexts are appropriated, provided, or managed in the form of common pool resource governance systems (Ostrom, 1990). This circumstance shifts the basic assumptions of the Coase Theorem in a context where all sorts of collective action issues may show up. Additionally, and since the theoretical assumptions of the Coase Theorem –well-defined property rights, low transaction costs, few participants or small groups and no wealth effects- are difficult to achieve in practice, the bulk of the PES literature proposes alternative frameworks which take into account institutional contexts and settings where PES schemes may take place, such as distributional issues, uncertainty, social embeddedness, and power relations (Muradian et al; 2010). These frameworks do not directly challenge the Coase Theorem’s usefulness regarding PES-scheme design. Rather, they contest efficiency, the basic criterion of the theorem, as the only criterion for defining objectives and measuring performance.

Although PES has thrived as a market-based policy instrument *par excellence*, it is frequently the state- and community-based institutions, both formal and informal, that determine its success. Vatn (2010) argues that some PES schemes are nothing more than a “reconfiguration of the role of public bodies and communities becoming core intermediaries or buyers”. The critical role of the state regarding regulation of property rights on the participant lands, strong participation of public agencies in many PES schemes worldwide, and the facilitation of these agencies for creating markets in the

environmental realm are all factors that have to be considered for the “market-based” discussion (Vatn, 2010).

Not all contributors to the PES literature agree with the feasibility of applying the Coase Theorem to the environmental realm, particularly PES. In particular, the ecological economics approach, which differs theoretically in many ways from the neoclassical environmental economics approach, states that Wunder’s five main characteristics of an environmental service are not only unattainable in practice but also inappropriate in some cases. This argument hinges on the very definition of environmental services, which, for the ecological economics school, is as follows: “PES is a transfer of resources between social actors, which aims to create incentives to align individual and/or collective land use decisions with the social interest in the management of natural resources” (Farley & Costanza, 2010).

Implications of this definition are non-trivial. If the ecological economics approach is followed, distributional goals could potentially hold more weight than efficiency goals. Moreover, the instruments to achieve environmental public goods will follow more Pigouvian and state-based approaches rather than Coasian criteria. It is important to note that neither of these approaches explicitly considers the critical role that communitarian rules might play in PES design such as social norms and preferences towards public intervention.

Some authors have recently called attention to the inconsistency of government-based PES schemes in that a government-based policy is, in principle, incompatible with

the market-based mechanisms that it tries to promote (Fletcher & Breitling, 2012). This structural incompatibility may be one of the reasons for eventual implementation failure and leakages. According to Sommerville et al (2010), “PES-like” schemes –the ones that aren’t completely voluntary transactions- are often considered inferior compared to those that comply with all the delineated characteristics, especially the voluntary aspect. However, the same authors argue that the focus should not be placed on the strict definition of the term and its characteristics but rather on a more flexible definition “best seen as an umbrella term for a set of resource-management tools that are based on the philosophy of implementing conditional positive incentives in a wide variety of institutional contexts” (Sommerville et al; 2009; *op. cit.*).

Effectiveness and Leakages of Government-Based PES Schemes

PES literature offers two main pathways to measure effectiveness and efficiency of PES schemes. On the one hand, Wunder proposes a comparative framework between schemes which includes seven transaction costs-related variables: baselines and scenarios; opportunity costs; additionality; land use service link; leakages; permanence; and start-up and recurrent transaction costs (Wunder et al; 2008). Each of these variables influences the potential effectiveness of a given PES scheme. For example, the higher the opportunity costs, the more carefully implemented a PES scheme should be in order to correctly compensate the potential enrolled participant. Failure to do so will lead to greater leakages, since shirking may appear as a consequence of imprecise opportunity costs definition. Inclusion of these variables may paint a more accurate picture of potential leakages and spillovers of a given scheme. The inductive nature of this approach is helpful in identifying leakages at the design and implementation phases of a given scheme.

Pattanayak (2010) argues that this kind of typology is useful for descriptive purposes although insufficient to measure real impacts of the actual implementation of the program in terms of additionality. In order to reach the next level –impact measurement- it is necessary to apply impact evaluation techniques that account for additionality and effectiveness by controlling confounding variables and thereby responding to the basic evaluation question: What would have happened in the absence of the intervention? (Pattanayak, 2010).

A second approach that dominates the PES literature regarding the effectiveness of PES is a matrix diagram proposed by Engel et al. (2009). According to this approach, effectiveness of a PES scheme can be evaluated by comparing the value of environmental services. The most frequent and interesting possibilities are the ones that provide solutions that imply trade-offs between land use and environmental service benefits. Taking these trade-offs into account in designing PES schemes should improve efficiency. For example, PES schemes that offer potentially high environmental services value but low on-site profits for the private landowner are “leakage prone,” since, other things being equal, the enrolled participant will always tend to deviate to improve its private benefit at the expense of a social (environmental) cost. Given the heterogeneity of available empirical data from PES cases in the developing world, Wunder’s and Engel’s proposed methods are useful in identifying the potential characteristics of a given PES scheme design. Consideration of these attributes allows for better identification of the variables that might inhibit or foster program impacts. In other words, it is crucial to identify which variables favor spillovers or leakages.

Another leakage source for government-based schemes is incomplete contracts. Conditionality necessarily requires a contract between the environmental service user and the provider. As in any contract, but especially those concerning environmental issues, it is very difficult to include all the terms, conditions, and possible consequences of the provided environmental service (Barzel, 1997; Williamson, 1985). Moreover, there is a trade-off between simplicity of the contract and the omission of details that might be important. There might also be a bias against the poorest households, those that are unfamiliar with technical language, and who just sign off with little knowledge of the consequences and commitments surrounding the contract.

It has been shown that asymmetric information is a recurrent source of market failure under typical PES schemes. Normally, the environmental service provider has better information than the environmental buyer—including governments—regarding the conditions and management of their natural resources. This asymmetry may be used to advantage by providers in order to obtain “informational rents.” If a significant number of participants in the program use informational rents, program effectiveness and additionality will be reduced. Contract design is therefore a key instrument in potentially reducing asymmetric information. There are several ways to tackle asymmetric information and therefore reduce the leakages of a given program. Ferraro identifies three concrete mechanisms for this: “1) acquire information on observable landowner attributes that are correlated with compliance costs; 2) offer landowners a menu of screening contracts; and 3) allocate contracts through procurement auctions” (Ferraro, 2008). While the first option is the most standardized and used in different PES schemes, the second one implies a great deal of creativity and flexibility by the ES buyer. The third option is less common due to political difficulties.

The goal of each of these approaches is “to reduce informational rents without distorting the level of environmental services provided.” Which scheme is better greatly depends on the institutional context in which it will be placed. For instance, the third approach implies a sophisticated setting of community-level information and bureaucratic practices.

The contract period is also very important. There is a debate regarding the optimal time period a contract should encompass in order to ensure that the environmental service continues to be provided even after contract termination. This may imply a behavioral change from the ES provider. The experimental economics literature depicts a vast set of situations where participants of the environmental service scheme may fail to comply despite what is established on the contract. Credible commitment issues may appear once a contract is terminated. In other words, they may not be “morally” committed to preserving the ES once the agreement is enacted.

In many cases, the goal of environmental services conservation is not just to restrain people from using the natural resource base. It may also imply a series of actions or practices towards sustainability that aren’t necessarily appraised, embraced, or appropriated by the ES supplier once participation in the program is finished. Ultimately, a crucial goal of any PES program is to achieve a behavioral change among former program participants. The hope is that they will become pro-conservationists and environmentally educated in such a way that they might develop their own sustainable economic and environmental long term plans.

Another important leakage regarding PES design is known as *slippage*. Although individual compliance might be sufficiently high for some communities as a result of

participating in the program; neighbor communities may change their behavior adversely regarding program goals (Shapiro, 2010). Higher deforestation rates from neighbor communities, for example, may offset lower deforestation rates from participating beneficiaries.

At the implementation level, bureaucratic or government failures may also influence PES effectiveness. If several agencies carry out a given program, coordination is needed. Moreover, if different government levels are involved, legal and institutional frameworks must be fine-tuned. Pattanayak et al (2010) warn about the multiagency issue. Because each agency might play a specific role in the program and therefore has a vested interest on it, inefficiency may come as a result (Pattanayak, 2010; Libecap, 2006). For instance, in the Mexican PES case, a forest development agency is responsible for running the program while the water federal agency collects the fees and revenues that are used for funding the PES program. Simultaneous program participation by beneficiaries may also be a government failure that reduces potential impacts of the program and raises transaction costs at the implementation level. This is especially true for programs whose incentives are not aligned, thereby sending mixed and contrary signals to program participants.

A crucial factor in avoiding leakages of any PES scheme, thereby augmenting its effectiveness, is the development of a baseline to compare *ex ante* and *ex post* results. If baseline data is incomplete or poorly developed, it is very difficult to estimate impacts accurately. Geographical information systems may provide a substitute or complement as a resource for creating baseline data.

A key factor for the success or failure of a government-based PES program implementation is the middleman who works directly with the participant community at all stages of the program. In the absence of efficiency wages and/or low skills, intermediaries are prone to shirk in the form of weak supervision or collusion with the PES provider. This issue leads to leakages from the program. Obviously, the intermediary leakage is reduced when skilled intermediaries are already in place, but this is often not the case, so training is crucial. Another way to improve intermediation performance is by utilizing existing nonprofit organizations as intermediaries. Yet another way under user-based PES schemes is to take advantage of the participation of the users in a group organization, such as a local utility department that lets users “make a payment through an additional fee on their bill” (Kemkes et al; 2010). *Ceteris paribus*, the nearest potential participants with lower learning curves will be favored by the middleman. Bribing in the form of “unofficial tips” may be another source for inefficiency and participation bias. There are several ways to tackle the middleman issue: sound training; efficiency wages; and the implementation of quotas that favor minorities and reduce potential poverty biases. Despite its importance, the middleman or intermediary issue is scantily addressed in the PES literature. Pascual et al. (2010) maintain that the bargaining power of both the agents and the intermediary or middle man critically influence the performance, and hence the effectiveness and additionality, of PES schemes (Pascual et al; 2010).

Other leakages may arise when PES beneficiaries are communities rather than individuals. There is a vast literature that studies common pool resources dynamics as well as the risks and opportunities that communitarian arrangements offer (Ostrom, 1990). The fact that an agreed-upon contract takes place between a public sponsor and a community in

order to guarantee and preserve conditions for ES provision tells us very little about the internal dynamics of the community itself and, ultimately, which outcomes and impacts will be generated as a consequence. Local *rules of use* may be incompatible with PES program requirements. Internal agreements or disagreements within communities may hinder or scale up program outcomes and impacts. For example, by comparing the design and implementation of three different programs in Cambodia, Clements et al. (2010) found that PES program effectiveness was significantly greater where local rules of use were taken into account (Clements et al; 2010). The mechanisms of this inclusion were through local institutions empowerment and intrinsic motivation reinforcement. The latter aspect addresses the “crowding out” market failure that occurs when there is a gap between a community’s intrinsic motivation and government or market-based logic. Crowding out occurs because “introducing monetary incentives can undermine collective action that is motivated by social norms” (Kerr, 2012). Because payments may introduce a purely instrumental or utilitarian logic that disrupts environmental virtues that were historically practiced by local communities, crowding out may appear even under conditions where the scheme was set properly and according to market principles (Vatn, 2010). There are not Pareto efficient cases where, in addition to no additionality being made, the landowner acts as a poorer steward of the natural resources than before the program was implemented. This phenomenon is known as “*crowding out*” because government programs crowd out former institutional arrangements (Cardenas, 2000).

If PES beneficiaries hold property in common, the three factors that are stressed by Ostrom (1990) directly apply to PES schemes, namely, institutional supply, credible commitment, and monitoring. Externally, and due to asymmetric information and

incomplete contracts, the ES buyer monitors the accomplishment of predefined goals regarding the environmental service. Internally, and at a communitarian level, another set of rules to ensure monitoring are required to comply with the environmental goal as defined in the transaction. Good communitarian monitoring, based on trust, punishment, and informal interactions are crucial to PES scheme compliance.

At first glance, if a participant community does not comply with predefined rules, it seems reasonable that they be admonished or ejected from the program. The payment then would go to a community that shows more potential to attain program goals with the respective transferring and transaction costs. However, in some cases it might be more productive to identify the main drivers from the non-compliant communities. Perhaps they share characteristics with other *ex ante* rejected or non-participant communities that have not participated in the program, yet have similar weighting on providing and preserving the environmental service at the relevant unit of analysis. Therefore, if we explore and gain a better understanding of the nature and characteristics of the local dynamics drivers, the consequent knowledge generated might be used for PES program or scheme redesign in terms of contracting, monitoring, and, ultimately, goal achievement.

Taking account of communitarian dynamics is crucial for PES scheme performance. This is especially true when the benefits of the scheme are transferred to communities that either hold land in common or where the environmental service is associated or is perceived by the community to be a public good. In these cases, “there is a danger of cooption of benefits by subgroups within the community that leads to widespread disillusionment” (Sommerville et al, 2010). Alternatively, those who receive the transfer as representatives of the community may apply informal command and control internal policies or patronage

practices in order to manage their program performance as a group. In a way, these practices countervail the original spirit of the program which is incentive-based and market driven.

All in all, the literature on PES focuses on ways in which additionality levels become high and leakage effects remain low (Wunder, 2008). It is not uncommon to find cases in which participating landowners' behavior is not altered by the implementation of the program. If this is the case, then the program or PES scheme is not really adding to the preservation of the natural resource that provides the ES. Another way to consider additionality is what happens after the PES contract is terminated. In theory, ES providers should behave post PES as if they were still participating in the program. For this to happen, long term behavior must be altered in such a strong way that it changes preferences, values, or cultural attitudes. If this does not happen, then we can say that additionality is not obtained. (Pattanayak, 2010). Rather, beneficiaries of the program made sustainable practices in order to receive program benefits while they were enrolled, yet endurance wasn't developed to guarantee long term results.

Lack of additionality in a PES program may have several behavioral implications. First, there is a debate on how much time is needed before a behavioral or preference change is made, assuming that the ES suppliers did not already have a consistent PES behavior (Bowles, 2008). If all other market failures are addressed but Payment for Ecosystem Services is directed to beneficiaries who would have conserved the ES supply in the absence of the program, it is just a transfer without positive net impacts. Therefore, it is crucial to efficiently target the object population under a scheme where participants need to realize a tangible environmental benefit.

Preconditions for Payment for Environmental Services Schemes

As argued by Engel et al; careful design is critical for PES efficiency and effectiveness. Consequently, program design should be aligned with the institutional and social preconditions that prevail within the targeted population context. The question then becomes, should PES schemes respond to the preconditions that already exist in a given context, or, should PES schemes foster desirable conditions that have not yet been put in place?

Considering local communitarian dynamics is especially important under a weak institutional context. As Engel and Palmer (2008) demonstrate for the case of Indonesia, PES schemes that are not carefully developed to account for communitarian dynamics may be counterproductive in their outcomes. For example, where logging communities do not have clearly defined property rights (even after decentralization) and, at the same time, there is economic pressure from logging companies to obtain timber, a standardized PES scheme that ignores local informal dynamics may merely serve as a leverage negotiation tool for informal landowners to get better deals with logging companies (Engel & Palmer, 2008). This is a good illustration of what Ostrom calls policy prescriptions as “the only way” referring to the common mistake that environmental policy makers make when they deem the prisoner’s dilemma, the tragedy of the commons or Olson’s group theory as the only possible results when collective action issues arise (Ostrom, 1990). If a PES scheme is implemented in a market-based structure without first understanding of local rules in use, then the natural resource management outcomes may well be worse than no intervention at all. Furthermore, such a scenario may also lead to a “tragedy of the commons” (Hardin,

1968). In this sense, public intervention may hinder self-enforcement mechanisms that work at the informal level in local communities and result in positive outcomes.

In the same vein, Kosoy et al (2007) found evidence in Central America that PES schemes may serve as an environmental conflict-resolution mechanism between upstream and downstream environmental service users and providers (Kosoy et al; 2007). Other scholars like Cranford and Mourato (2011), suggest that PES are more effective if designed and implemented in a “two-stage approach.” This means that a community-based environmental management (CBEM) approach should be implemented in the first stage in order to foster education, alternatives, and social consensus. Such preconditions might be followed by the typical incentive-based mechanisms under which a traditional PES scheme works (Cranford & Mourato, 2011). These kinds of preconditions (cognitive, alternative, and social agreements) differ from market preconditions, such as property rights definition, financial markets, or contracts that are typically discussed. From the policy perspective, one drawback of the two-stage approach is timing. Robust knowledge and potential change at the first stage might take a great deal of time and thus be incompatible with policy agendas. However, at least taking into account the communitarian variables at the first stage might improve further design, implementation, and effectiveness of a given PES scheme.

In the two-stage approach, the government has several roles. First, it is responsible for ensuring that preconditions hold, that is, guaranteeing that property rights are well defined and encroachment is punished and enforced. Second, it collaborates to maintain low transaction costs. Third, it develops a legal and institutional context, such that flexible schemes may be put in place without need of complex reforms. Fourth, it certifies sound environmental practices under potential user-based PES schemes.

Consequences of incomplete preconditions on eventual program implementation are uncertain. If the potential target population is sufficiently large, there might be a bias against the poorest households (those lacking the preconditions to participate). Following the Coase Theorem, clear property rights definition is a basic pre-condition. However, in many developing countries where the PES operates, property rights for potential participants are ill-defined, especially for the poorest households. Although not properly a market failure, this inconsistency may have important distributional consequences.

Preconditions are important to ensure the development of any PES scheme. For instance, if property rights are not well defined, interchange and bargaining between buyers and sellers of the environmental service simply cannot take place. Given the fact that many developing world countries have incomplete property rights definition at a national scale, it is common for PES programs to be targeted to geographical units where there are enough potential participants that possess with the basic preconditions of a PES program.

Distributional Issues of Payment for Environmental Services Programs

Distributional issues are often overlooked in the PES literature. This is not surprising since, following the Coase Theorem, it doesn't matter what the initial allocation of property rights is, as long as it is well defined and transaction costs are negligible. The problem with relying on the Coase Theorem is that the initial allocation of property rights might be very unequal. Hence, the bargaining power of the involved economic agents isn't the same. This feature of the Coase Theorem has led some authors in the PES literature to argue in favor of equity and to question efficiency as the sole criterion for PES-scheme design. Even under efficiency grounds, distribution matters if potential win-win situations regarding poverty

alleviation and environmental service provision are to be achieved. These situations are not uncommon considering the potential trade-off deep connection between environmental sustainability and alleviating poverty environment and poverty that prevails in many developing world contexts

Pascual et al (2010) go one step further and argue that not only is equity advisable under win-win PES scheme contexts that seek for efficiency as the main goal and poverty alleviation or another distributional rule as a by-product (Pascual et al; 2010), but also that PES schemes should aim for equity even when equity is achieved at the expense of some efficiency (the classical efficiency-equity trade-off). This tradeoff in favor of equity is justified by fairness procedural reasons in order to break up power imbalance among the social groups involved and to address path dependence issues and bias against poorest households. Typically, these programs have a high income bias, since the existence of clearly defined property rights is associated with higher income levels. Hence, there is a bias against the poorest amongst the poor (Muñoz, 2008). Other experiences have shown that the mere existence of PES schemes might encourage nonparticipants and local governments to speed up property rights definition and certification processes in order to become participants in the future (Sommerville et al; 2010).

A second key precondition is minimum poverty levels thresholds. Very poor communities are automatically excluded from participation in the program since they are incapable of complying with all the requisites that participation demands. Some of these communities live very close to the forests from which they make their livings. Some of them apply sustainable practices; some of them do not. Therefore, if the PES scheme does not include a component that addresses the lowest income households, who happen to live

in areas where significant environmental services are provided, conservation success at a global scale might be hindered.

Much of the literature says that PES programs should not have only a single environmental goal, especially in developing world contexts (Pagiola, 2005). Depending on contextual circumstances, a sound PES program may also contribute to social benefits in addition to ES preservation. The most popular side goal found in the PES literature is poverty alleviation. Defenders of this approach say that, because a significant number of PES beneficiaries are poor and live within marginalized areas, a well-targeted PES program may contribute to both goals simultaneously: ES supply and poverty alleviation.

Not everybody agrees with the idea of including poverty alleviation and/or other side goals in government PES programs (Landell-Mills et al; 2002; Kerr, 2002). The argument stresses the fact that there are already too many market failures and potential leakages surrounding PES schemes in developing world contexts. Adding yet another goal component to a given program would further reduce its chance of success. The more side goals that are added to a program, the more difficult it will be to manage. Side goals, reduce flexibility and divert focus from key issues of PES programs such as additionality. Therefore, according to this view, a sound PES program should limit its scope to environmental service provision regardless of distributional and equity concerns. In this sense, the only concern of an efficient PES should be the achievement of Pareto efficient levels. Adding side goals to a PES program implies a detour to the main efficiency goal of an environmental service provision. Policy-makers and some economists are attracted by the idea that poverty alleviation can be met through environmental service provision.

CHAPTER 3

EJIDOS AND PAYMENT FOR ENVIRONMENTAL SERVICES PROGRAMS

Roughly 80 percent of Mexican forests are owned by social and institutional arrangements known as Ejidos (Muñoz Piña, et al; 2003). Moreover, 90 percent of Mexico's Payment for Environmental Services (PES) recipients are also *ejidatarios*, people who live under Ejidos. Therefore, in order to evaluate the effectiveness of PES programs in Mexico, it is crucial to understand the basic dynamics of the Ejido.

This chapter has two parts: first I present a short, general background of the structure and functionality of Ejidos. Next, to illustrate how Ejidos interact with environmental policy interventions, I explore how Ejidos have responded to command and control policies (in the form of natural protected areas) and market-based policies (in the form of PES). In doing so, I use various primary and secondary data sources.

An Ejido is a property-rights institution that was developed after the Mexican Revolution of 1910. There is no agreed-upon definition for "Ejido," although its main characteristics help to conceptualize it. First, Ejidos are at least partially commonly-held. There might be sections within the Ejido that are parcelized or individualized for individual, small landholders. An Ejido's governmental structure somewhat mimics the Mexican federal government system. Its formal governance structure has three components: a president, who is elected every three years and might be re-elected every three years; an assembly *Asamblea Ejidal* in which all members participate and make collective decisions; and a surveillance committee, which is tasked with making sure that the agreed-upon arrangements are complied with and self-enforced at the Ejido level. This

ejido commissary *comisario ejidal* is a liaison or representative between a group of Ejidos and local and regional governments and programs.

The original landholders in the Ejido system were families of peasants. Until 1992, Ejidos weren't allowed to sell their land, only rent it in usufruct. Moreover, land transfers were only allowed to occur via direct inheritance to Ejido members' children. However, it has always been the case that an Ejido's assembly may incorporate additional members to the Ejido in the form of *posesionarios* (possessors), usually extended family members or kin who are allowed to work or rent common lands but lack voting rights in the Ejido's decisions. In practice, though, "*posesionarios* often farm on Ejido lands ceded or rented by others or illegally taken from the commons," (Jennifer, A. et al; 2005). This leads to encroachment and potential conflict between Ejidos or between an Ejido and private owners. To make matters worse, presidential decrees throughout the 20th century gradually expanded the amount of land under the Ejido ownership regimen. In some cases, the same land has been granted more than once. In other cases, privately-owned land has been claimed by Ejido groups citing past presidential decrees. These situations have led to encroachment and, in some states, to social conflict among those seeking land ownership.

The Ejido is one of Mexico's land tenure regimes, and it accounts for 57 percent of the country's arable land (Thompson, 1994). An Ejido property unit typically contains a number of individual landholdings along with a portion of commonly-held land. Ejido members have their own governance mechanisms in order to make decisions regarding inclusion and exclusion, renting or selling part or all the land, and production and participation. In terms of program participation in a PES program, each Ejido develops an ecosystem service project to be considered by The National Forest Commission. Three

possible outcomes are possible: projects that were approved, projects that were presented but not approved, eligible communities that chose not to participate. Kosoy calls the determinants of participation “Factors that affect eligibility to participate, desire to participate and ability to participate in the program” (Kosoy, 2008). Therefore, one way to predict the PES incidence in poverty is to focus on ex ante participation conditions and the procedural processes that occur before potentially applying to the program. Another way to find out if Mexican PES programs can improve targeting is to focus on the internal decision-making analysis and perceptions that different Ejido communities have towards PES and, ultimately, towards environmental management.

One of the main preconditions for market- and non-market-based forest policy is the existence of well-defined property rights. For the Mexican context, structural reforms were put in place during the nineties in order to organize the land market. Constitutional reforms were undertaken, a new agrarian law was crafted, and a property certification system was created for Ejidos. Typically, the land that is held in common within Ejidos is forest land. This is so because parcels that are already used for agricultural purposes are exploited first. If economic conditions worsen, there is more pressure for the common forest to be deforested and adapted to agriculture and livestock (Merino Juarez, 2003).

Following the Mexican Revolution and subsequent land redistributions, nearly half of the arable land was controlled by *Ejidors*. The *Ejidors* fall into three main categories: (1) parcelized, (2) partially parcelized and partially-held as communal land, and (3) all communally-held land. From the Revolution to the land reforms of 1992, the national government placed strict limitations on what *Ejidors* could and could not do with their land. *Ejido* owners, known as *ejidatarios*, often ignored land-use restrictions and engaged in *de*

facto rental and leasing obligations (Thompson & Wilson, *op. cit.*). Market forces overcame the restrictions, and the government eventually legalized such transactions with the 1992 reforms, which were a comprehensive set of constitutional and legal changes that provided *ejidatarios* with the prerogative to reallocate and trade land use and property from the communal property regime to individual parcels and vice versa. As a result of the reforms, (1) parcelized *Ejido* land can now be rented and sold, (2) corporations can own land, and (3) foreign persons and corporations can own land outside restricted zones.

After 1992, important reforms were made to Mexico's 27th Constitutional Article, setting new rules for some of the most important *Ejido* decisions. The *Ejido* internal governance structure and decision-making processes underwent important changes due to these reforms. *Ejido* land market transactions were expected to increase significantly after the 1992 reforms. However, conversion to individual ownership did not occur at the expected level. Different scholars have studied the circumstances preventing parcelization. For instance, Muñoz et al. (2003) identified four situations that may cause the *ejidatarios* to choose the Common Pool Resource CPR over individual-property schemes: high expected benefits from keeping the land in common administration (e.g., economies of scale in production, mutual insurance), effective collective action (e.g., low cost of monitoring and enforcement), a privatization cost that is higher than expected gains, and concerns with distributional issues (*i.e.*, stock and income)

One benefit of keeping land in common for *Ejidors* comes from the Mexican government's rural development and conservation-oriented programs. Overall, according to the Organization for Economic Development and Cooperation (OCDE), an *Ejido* may obtain resources from as many as 27 public programs (OCDE, 2009). These programs are

very diverse. Some of these programs were designed in the 1990's to directly foster agricultural production through subsidies. Others are matched grants. A third set of rural development programs, which were more recently developed, try to incentivize sustainable agricultural practices. The main conservation program from this latter group is Mexico's Payment for Environmental Services Program (*PSA-Pro Arbol*). This program is carried out by Mexico's National Forestry Commission (CNF), and it aims to prevent deforestation in the country's most overexploited aquifers by paying a subsidy to land owners – communal and private- to keep their forest mostly untouched.

For those Ejidos whose common land is forested or located on a rich, biologically diverse ecosystem (and thus, eligible to participate in conservation programs) there also might be a set of individualized parcels suitable for crops such as corn and soybeans. These parcels are therefore eligible to participate in agricultural, production-based programs. Relative subsidies from both types of programs may lead to different conservation-production behavior within a single Ejido. If subsidies are greater for typical agricultural activities, a more intensive use of resources (soil, water, fertilizers, and electricity) will occur in order to enhance agricultural productivity. In some cases, the incentive to produce might be so high that it leads to Ejido rearrangements in order to make use of the previously untouched common land or forest. If this is the case, the incentive will lead to higher deforestation levels, either within a sustainable forestry and agricultural approach or under a tragedy of the commons scenario, where Ejido members could not achieve agreed-upon land usage rules. Another possibility is that the Ejido may develop a sustainable plan to participate in public programs that combine common land conservation and sustainable production on parcelized lands. Trade-offs between program objectives may arise.

In some cases, collective-action problems faced by Ejidos have led to the classic tragedy of the commons. In other cases, local institutional arrangements at the Ejido level have succeeded in preserving the forest—maybe not in an optimal or efficient way, but sustainable enough to avoid the tragedy of the commons. Payment for Environmental Services are not framed to resolve internal collective action issues at the Ejido level. However, they are intended to change economic behavior through compensation and relative price compensation.

Ejidos and Natural Protected Areas

In order to explain potential conservation outcomes, it is necessary to add to the institutional framework the interplay of Ejidos with other institutions, environmental laws, and policies that have influenced Ejidos' conservation decisions (Merino Juarez, 2003). The three main command-and-control instruments used in the 1990s by the Mexican government were: Natural protected areas decrees, official Mexican norms, and land-use plans.

Natural Protected Areas initiatives in Mexico date back to the early seventies with UNESCO's Biosphere Reserve and United Nations Man and Biosphere (MAB) initiatives. There were examples in the early 20th century; the *Desierto de los Leones* was designated as the first national park in 1917 (Pare, 2007). Although a thorough description of natural protected areas in Mexico is beyond the scope of this chapter, it is fair to say that, unlike like United States' national park models, the Mexican National Park Policy did not imply displacement of local indigenous communities and Ejidos that were settled before the

creation of national parks. Sometimes displacement was substituted by expropriation. In other cases, ill-defined and informal de facto property-rights arrangements prevailed.

In essence, it is the interplay between an Ejido's internal decisions –expanded and clarified with recent reforms- and natural protected areas federal policy and local land-use plans that determines the basic framework for an Ejido's conservation decisions. Furthermore, other stakeholders (NGOs, universities, or private corporations interested in buying communal land, for example) shape conservation outcomes (Jardel, 1992). These institutional arrangements do not necessarily conflict, but they certainly overlap with convolute standardized international schemes such as UNESCO's Biosphere Reserve Initiatives. As of today, one hundred years after the Mexican Revolution, some Ejido land still hasn't been properly certified and remains under de facto property rights (Kosoy, et al; 2008).

Ejido-Government Interactions

The Ejidos' annual deforestation rate of 1.4 percent is higher than the 1.2 percent national rate, which includes all deforested land (Alix-Garcia et al; 2005). The differences are mainly located in tropical forests in a few states, namely, Veracruz, Yucatan, Colima, and Quintana Roo. Muñoz Piña (2003) estimated that it is approximately 10 percent less likely for deforestation to occur when land is located inside a protected area. Most land located inside or adjacent to protected areas is communal. The Muñoz results include all types of forests around the country. While this result is statistically significant, the coefficient is not very large. This limited impact may be explained by other socio-economic

characteristics such as the poverty levels of communities living inside protected areas. In other words, poverty and forest property among Ejidos are highly correlated.

In general, the main drivers for deforestation nationwide have been proximity to cities and rural population centers, low slope, and soils appropriate for agriculture. None of these three variables is completely removed under a protected area status. For instance, illegal deforestation occurs on a regular basis on protected areas, located very close to large cities, where real estate projects and sprawl occur at a fast growth rate with poor urban planning. Under low enforcement conditions, protected areas could achieve worse results in terms of sustainability than forest located in unprotected areas. In addition, there is evidence that community enterprises formed by indigenous communities with very similar governance schemes to those of the Ejidos compete with Ejidos in natural protected areas natural protected area Ejidos in terms of conservation (Antinori & Barton Bray, 2005).

A key variable differentiating Ejido conservation behavior is wood permit tenure. Only about a third of Ejidos hold permits allowing them to extract wood for sale. There are significant behavioral differences between Ejido permit holders, and the data suggest that Ejidos with a vertical organizational structure and larger amounts of capital goods, such as machinery, tend to deforest less. Unfortunately, most Ejidos, both with or without permits, are poor and have no access to credit markets.

The behavior of non-permit-holding Ejidos regarding deforestation lies in their own collective-action capacity to avoid encroachment in the short term and the tragedy of the Commons in the long term. Garcia points out that the key to avoiding these unsustainable results lies in qualitative attributes of Ejido members. Young households with sufficient

private land within large Ejidos as well as experienced leaders within small Ejidos are more likely to avoid encroachment and overharvesting of common lands. There's also some evidence that non-rural income potential for Ejido communities is also an essential determinant for common conservation purposes.

It is up to the Ejidos to obtain forestry permits. The underlying reasons why only approximately one-third of them decide to apply for a permit remains a puzzle. One reason might be the high transaction costs generated by governmental structures and institutional arrangements. There is evidence from other programs and qualitative case studies demonstrating that a community's willingness to participate in these kinds of programs is hindered by a long tradition of mistrusting government. This is not the case if the program is tied to other entitlements (Kosoy et al; 2008).

Ejido Governance

The 1992 property rights reforms changed the makeup of Ejidos and thus altering the way they make decisions. Before the 1992 reforms, decisions made by Ejidos were very limited in terms of market transactions. After the reforms, Ejido market possibilities expanded significantly. Now they are able to lease or rent their parcels after some legal procedures. Due to the reforms, Ejidos are also able to use part of their parcelized landholdings and even communal land within the Ejido as collateral for credit or to associate with private corporations. Moreover, they can, with the approval of two-thirds of the assembly, divide their common property into small private individual parcels. Finally, they can accept new members. In sum, with the 1992 reforms, Ejidos became more flexible organizations, able to incorporate some market and private-sector mechanisms (Merino

Juarez, 2003). It is important to highlight the fact that, in order for an Ejido to make these changes, it is first necessary to comply with the national certification program PROCEDE. Then the Ejido assembly must be involved in the specific decision-making processes of the Ejido. Ultimately, some of the changes derived from the Article 27 reforms might have a direct connection with conservation decisions, such as the ability to divide communal land into small parcels or to create partnerships with the private sector. This is especially important for Ejidos that are located in the buffer zones of Biosphere Reserves.

Although there is currently not enough research to evaluate the changes in terms of general patterns toward conservation nationwide, limited evidence from case studies shows some interesting patterns. For instance, empirical evidence suggests that Ejidos, inside or outside an NPA, will not be willing to sell, rent, or parcelize their common land. If common land within the Ejido is relatively abundant on a per capita basis, there is a higher probability of subdivision, sale or lease. However, most Ejidos located in Biosphere Reserves are highly populated, in some cases with hundreds and even thousands of members, and their common land subject to division is scarce or unattractive for economic activity purposes due to the constraints of being in a protected area. The direction of these variables regarding conservation outcomes is currently unknown. It might be that inaction and deadlock come as a result of size, membership, and complex decision-making, thus leaving the forest relatively unexploited (Thompson & Wilson, 1994). However, it might also be the case that complex governance and economic necessity lead to overharvesting and unsustainable behavior by biosphere Ejidos. More empirical evidence is needed.

The bottom line of this comparison between Ejidos, both inside and outside of natural protected areas, is twofold. First, the natural protected area designation in Mexico,

as in other countries, is just an initial step. It doesn't guarantee that communities will employ conservationist behavior. Actually, it is the underlying set of variables inside the protected areas and communities such as park visitors, fire management, plagues, illegal logging and poaching and real estate project development adjacent to natural protected areas that explain conservation or overharvesting decisions. Second, well-managed communities—ones that are able to internalize externalities, cut the middle man, receive training, and develop a sound organizational structure—do not need to be within a natural protected area to become conservationists. These communities already work to preserve their environment and have sound ethics regarding sustainability. The modernization of the Ejido sector in Mexico has been a necessary but insufficient condition for the development of property rights, and the global conservation outcomes of these reforms are yet to be seen.

Ejidos and PES: A Preliminary User-Based Approach Evaluation.

Before analyzing the current effectiveness of PES programs in Mexico, it is important to take into account the main drivers and ideas that are held towards the program by its own beneficiaries. The main objective of this kind of analysis is to identify and depict the variables that significantly promote or hinder effectiveness and additionality of PES programs.

In order to develop hypotheses about the implementation of PES programs in Mexico and the consequences in terms of participation, qualitative research was done. Using a 2007 beneficiary program evaluation, the perceptions of participants in *PSA-Pro Arbol* were analyzed. This survey was the largest evaluation that has been done of the *PSA-Pro Arbol* program to date. It was carried out by *El Colegio de Postgraduados (Colpos)*, an

academic institution located in the state of Mexico and specializing in rural development and forestry issues. The COLPOS research evaluation project included stakeholder focus groups, secondary sources analysis, and the development of a survey that was randomly applied within a sample of 57 participants currently enrolled in the program. In addition, they included in the survey some non-participants whose projects were rejected, but these respondents do not represent a direct pairwise match with respect to the above-mentioned participants.

This analysis focused on the open-ended questions included at the end of the survey. Typically, in these kinds of program evaluations, evaluators focus exclusively on the quantitative answers of the survey, leaving the open-ended questions open for discussion. Significant qualitative data from 32 Ejidos in 15 states was found. Four main issues or themes were identified as recurrent and significant: Coverage, Timing and Service Delivery, Additionality, and “Others,” which include a set of themes closely interrelated with the program such as property rights, the middle man, environmental awareness, and common-pool resources.

The open-ended questions were primarily answered by members of Ejidos located in three southern states (Veracruz, Puebla and Oaxaca). It may be that the participants in those states were more willing to share their perceptions of the program. On the other hand, it might have been the case that the surveyors applying the questionnaire in those three states were better trained. One way to lay out the main specific responses is to place them in general themes, making them more manageable for analysis and conclusions, and linking them to the theories that might be behind those perceptions.

Coverage and Payments: One fourth of Ejidos complain about coverage and payments. All of them conclude that the payment was insufficient to cover their community's economic needs. In general, no PES program in the world is expected to provide a payment that covers family income except for the poorest families. In spite of their disappointment concerning payment amounts, Ejidos in *Chapultepec, Galeana, Pueblos Mancomunados de Oaxaca, Platanar del Teguino, Plan de Arroyos, and Ruiz Cortines* couched the negative answer "it is not enough" with some sort of positive thinking, such as "it is better than nothing" or the payment "helps us to some extent." In a sense, these kinds of answers can be viewed as supportive of the program, implying that Ejidos will not violate program rules even though they would like larger payments in the future. This is probably a rare, yet real, possibility, given the contract constraints. For example, *Ruiz Cortines* points out that the surface covered in the contract diminished from one year to another, and therefore the payments for environmental services were also reduced. Ejido *Coatepec* in Veracruz not only responds that the payment was insufficient but also says that participants would tend to deviate from the program rules, namely, by "cutting down some trees anyway." Finally, Ejido *Vidal Ruiz* complains that the payments were too little and late. This is a bad combination that could eventually impact the goals and objectives of the program.

Timing and Service Delivery: As in several public programs, timing is always an issue. Bureaucratic processes generate lags in service delivery. For *Pro Arbol*, timing is the most frequent theme that generates discomfort among the participants in the program. According to the analyzed survey responses, the most important finding is that the time lag is significant, six months according to *Plan de Arroyo* Ejido response. This is long enough to

compromise the environmental goals of the program, especially for Ejidos whose contract or scheme includes in-kind payments, such as trees for reforestation. In these cases, responses to the surveys show that there were occasions when trees that had to be planted were not delivered on time. According to *Chiteje de la Cruz* testimonial, by the time the trees were delivered, the rainy season was over and they had less opportunity to grow and some of them dried out.

Financial management to compensate late payments is not always possible. The big problem with late payments is manifested in low-income Ejidos whose waiting window is very short. Ejido *La Lapara* claims, “Sometimes we can’t afford to wait. We could be using the forest in a more productive way while the resources come.” If they have a loan to compensate late program payments, these Ejidos may deviate from the conservation practices that the program promotes either in the first year of participation or in subsequent years of the contract because of the debt burden that they face. The surveys don’t show income data that could be matched with perceptions towards the program. Nonetheless, it is known that 80 percent of the participating Ejidos are poor.

Additionality: The Ejidos’ responses to open-ended survey questions give interesting findings regarding the theoretical concept of additionality. With only eight responses that deal with additionality, three main categories of additionality in practice were identified.

No Additionality with gratitude: Ejidos like Xmaben and Campeche *state* that they would conserve their forest even without participating in the program. These cases clearly reflect a lack of additionality of the program and should be avoided from an optimal target population perspective. However, the same responses are also complemented with positive

thoughts such as: “It is better to have some extra money from the government.” This may be interpreted in different ways. It could be that they see the payment as a reward for their conservation practices, which may further incentivize their efforts or influence nearby neighbors to do the same and be “rewarded” in the future as a demonstration effect. This thinking might be too positive, and, in reality, payments that generate no additionality may disincentive neighbor communities to participate in the program –or even conserve their forests- since they identify no real difference in community behavior inside or outside the program. The latter interpretation might be synthesized by *Guadalupe Bustamante’s testimonial –rejected*. She felt bad to have been rejected. She spends a lot of time on conservation activities and thought she would be rewarded by the program

Partial additionality: Responses from three Ejidos reflect partial additionality. Some communities in Oaxaca state that if they had not participated in the program, they “would practice some conservation but probably not at the same level.” Furthermore, they claim that by participating in the program now they are committed to maintain preservation practices for a longer time in the future, something that was not certain in the absence of payments.

Pure additionality: Finally, we have testimonials of pure additionality, like this comment from *San Baltazar Atlimeyaya, Puebla*: “If we hadn’t we been eligible for the program, we would have done traditional foresting and crop growing along the pastures.” These communities represent the highest social and environmental benefits of the program. On the other hand, some responses from communities that weren’t eligible for the program were analyzed, and they reflect potential additionality. For example, Ejido *Yeni Navan* says that they would have liked to conserve the forest to improve the environment, water, and

biodiversity if they had been eligible to participate in the program. A key issue of program redesign is to identify these cases and encourage them to maintain conservation efforts even without current eligibility by providing a credible possibility for the future.

Other issues: Common-Pool Resources, Remoteness, The Middle Man and Environmental Awareness: Several responses refer to a property rights dilemma that stems from the Ejido's mixture of common held land with individualized parcels. Basically, some Ejido members complain that the benefits of the program are not equally distributed among community members. The rules of the program favor Ejido common land over individual parcels, thus generating some conflict between participants who think that they should receive a higher payment because they have more individual land and those who are considered equal with less Ejido common land. In short, is up to every Ejido to define their specific redistribution rules for the PES that they receive from the government. Failure to accomplish an agreed-upon distribution among participants may lead to slippage and shirking. It is interesting that respondents always blame government for these "unfair" distributions. They say that payments are too low, when in reality the distribution makes the payments seem low. This happened to individual members of the Ejido in *Emiliano Zapata, Veracruz*, who say that they only received three pesos per hectare.

Environmental Education/awareness: Although responses are scattered, there appears to be a good level of environmental awareness reinforced by the program. Respondents pointed out different issues that reflect environmental awareness, such as the notions that conservation generates benefits for everybody, that the program enabled them to work on shaded crops to some extent and that this kind of program is good for future generations, and that fire incidence has decreased since the program was launched. *Remoteness:* Some

Ejidors in Campeche and Puebla are somewhat skeptical of the measurements of their forested surface and hence argue that they are receiving a smaller payment than they deserve. They claim that their land is located in remote areas without roads, and they do not fully trust satellite images.

Finally, there are opinions regarding the role of the middleman of the program, more properly known as the technician or advisor of the program. In *San Bernardino, Puebla*, *ejidatarios* claim that the forest conservation process was going well with the help of government advisors, who verified and monitored the land that was subject to conservation. These *ejidatarios* received valuable feedback from middlemen as a byproduct of the program. However, there are other cases, like the one in *Plan de Arroyos, Veracruz*, where a lack of transparency or corruption is an issue since they had to pay the technician from their own pocket.

Ejido Dynamics under a PES Context.

Most of the survey responses regarding PES are positive. However, given the fact that the surveyed Ejidos are beneficiaries of the program and see it as an additional income benefit that wouldn't be available otherwise, these answers might be biased. Despite this potential bias, specific findings show interesting differences between beneficiaries of the program.

Another bias comes from an Ejido's governance structure. As some of the answers show, survey responses were given either by the Ejido's commissar *-comisario ejidal-* or its mayor. There's not enough information about how perceptions about the program spread through the community or the Ejido. The governmental structure of an Ejido is theoretically

suitable for democratic participation. However, it is also prone to patronage and lack of democratic mechanisms. In *Ixtlahuacan de Reyes, Veracruz*, the interviewee was the treasurer of the Ejido, yet he never received money for participating in the program. He said that the *Ejido President* managed all the issues.

Ejidos that participate in the program but shirk –by cutting down trees, developing agricultural, or not developing conservation practices- discount the fact that next period they will not have any participation in the program and their income will come mainly from forestry exploitation. We don't know how sustainable their forest practices are. However, given the program rules, if they were eligible then it must be the case that their land lies on the 300 most overexploited aquifers of the country.

There are three hypotheses proposed to explain why Ejidos may shirk from following the rules of the program: 1) the Ejido just participates in the program in a year when timber prices or outputs are low, strategically waiting for a better year in terms of economic revenues; 2) The Ejido participates in the program and cuts down trees in a way that doesn't become noticeable enough to lose the payment (or they attribute the surface change to other causes *e.g.*, fire); and 3) The Ejido may collude with supervisors to pretend that they are conserving when in reality they are not.

One can also distinguish the perceptions that different Ejido communities have regarding their participation in the program and how they respond to the payments that they receive. Some Ejidos seem to be very grateful for the payment, despite realizing that it is low. Other Ejido responses reflect some anger or resentment towards the program. The latter behavior is consistent with the theoretical “crowding out” concept, which basically

deals with the issue of a community's natural resource mismanagement that results from state intervention through public programs.

In cases where Ejidos receive cash transfers, responses reflect some obvious discomfort with the program. However, the responses also show that, in some cases, Ejidos are able to somehow manage the late payments by putting in money from their own pocket. This situation may generate several problems that may be framed as hypotheses. First, the motivation of Ejidos to conserve and participate in the program may eventually diminish significantly. Second, late payments may generate a bad reputation for the program itself, which may also discourage participation from other Ejidos, especially the poorest, that were either rejected in the past or who are eligible to participate but have not participated so far. Third, richer Ejidos are more capable of managing difficult financial situations as a consequence of late payments, thereby discouraging successful participation of lower income communities. Medium income-level Ejidos still participate in the program despite timing issues, and perhaps they would have practiced conservation even without participating in the program. Ideally, PES programs would target populations which, to put it simply, would conserve with the program and wouldn't conserve in the absence of the program. The difference is then attributed as a program impact. In practice though, finding a perfectly targeted population is a real challenge. In sum, I conclude that additionality is a complex issue that depends not only on the structural variables of the Ejido but also on the preferences, behavioral perspectives from the set of individuals (Ejidos) that receive the potential benefit. In the next chapter I will explore the evolution of PSAH, considering available data on all variables.

CHAPTER FOUR

THE MEXICAN PAYMENT FOR ENVIRONMENTAL SERVICES PROGRAM

In this chapter I will analyze the Mexican Payment for Environmental Service Program. First, in order to contextualize the Mexican PES program, empirical findings in Latin America's PES programs and schemes are examined. Second, I provide a general background about the Mexican PES program. Finally, a research agenda is presented for program redesign based on the drawbacks and strengths of the Mexican PES program.

Payment for Environmental Services programs and schemes in developing world contexts such as Latin America have been attractive in the last 20 years both for policy makers and researchers. The appeal of these programs lies in the fact that PES schemes are a combination of two theoretical concepts in neoclassical economics, namely, the Coase Theorem and the Pigouvian subsidies. PES has also been considered a market-based, sophisticated new paradigm for solving the problem of ecosystem degradation by offering several advantages in terms of cost-effectiveness, simpler institutional design as compared with command and control policies and even as a tool for simultaneous poverty reduction, a permanent policy concern in Latin America (Ferraro and Kiss, 2002; Wunder & Albán, 2008). There is a need for a framework that encompasses the main conditions that a given PES scheme might face given its particular context, particularly under developing world conditions such as PSAH. These constraints are faced both at the design and the implementation stage of the program. Following Wunder et al. (2007), there are at least five main characteristics that any payment for environmental service scheme should have in order to be workable, feasible and practical at the policy stage. These characteristics are

taken from the literature review in Chapter 1 and listed in column 1 of table 4-1. These characteristics include: a voluntary transaction, a well-defined environmental service to be provided, bought by at least one environmental service user, sold by at least one environmental service provider, and conditionality (Wunder, 2005). By reviewing these characteristics, I propose that at least one assumption of the Coase theorem is linked with at least one of the five criteria proposed by Wunder et al. In the last row of the matrix, I add the concept of additionality as a desirable outcome for a PES scheme. If additionality is fulfilled, the other five previous conditions must hold. It is important to note that even if additionality –effectiveness- of the program is not achieved, there could still be a valid PES scheme that complies with the other five characteristics. In this sense, additionality is not the only criterion to evaluate a PES program overall, although it is the term that is used to specify an impact evaluation with baseline data¹. Finally, it is undeniable that there are market, government and communitarian failures associated with each of Wunder principles and with a Coase theorem attribute as well. Hence, the third column of the matrix specifies which kinds of failures are associated directly or indirectly with each PES principle.

¹ Other forms to measure effectiveness are, for example, cost-benefit and cost-effective analysis.

Wunder et al., 5 main characteristics of a PES Scheme plus additional features	Coase Theorem assumptions that might be associated with a given PES scheme	Market, government or communitarian failure for the Mexican case.
1. Voluntary Transaction	Enforcement and rule of law if one economic agent deviates.	Willingness-to-participate is inhibited by sociodemographic and institutional factors (Kosoy, 2008). Poverty and Property Rights inhibit participation on the program.
2. Well-defined environmental services	Well-Defined Property Rights	Uncertainty about the causal relationships around the environmental service (Engel et al, 2008). (For PSAH the interphase between forests and watersheds)
3. “Bought” by at least one environmental service user.	No Wealth Effects Low or Zero Transaction Costs	Incomplete Contracts and Asymmetrical Information. Principal-Agent problems
4. “Sold” by at least one environmental service provider.	Distribution doesn’t matters. Complete Information No arbitrage Parties are price-takers	Middle Man Targeting Failures Program Service Delivery Collective Action Issues associated with Common Pool Resources at Ejido beneficiaries.
5. Conditionality	Enforcement and rule of law if one economic agent deviates.	Moral Hazard, Monitoring, Free-riding, enforcement and motivational crowding out.
Additionality	Distributional Issues at Local Markets. Bargaining Platforms in CPR contexts	Market and Spatial Leakages and Slippage. Additional Goals i.e. Poverty Alleviation vs. Environmental Service Provision.

Table 4-1. Characteristics, Assumptions and Failures that might be associated with Payment for Hydrological Environmental Services (PSAH).

Payment for Environmental Services in Latin America

There are a number of reasons why the the majority of cases in the PES literature for developing world contexts are depicted in Latin America. First, it the Latin America is pioneered by Costa Rica, which is the largest laboratory for PES programs and schemes implementation in the last 20 years in any developing world context. Secondly, the region includes large government-based programs such as Mexico's PSAH. Third, many government-based PES schemes in Latin America offer similar institutional contexts that in many cases eventually lead to common outcomes especially in terms of spillovers and leakages and are likewise driven by underlying conditions, *i.e.* poverty levels of the targeted population and ill-defined property rights of potential beneficiaries. Finally, the region has been a robust laboratory to start "PES-like" schemes which include hybrid experiences that combine government and user-based schemes in Bolivia, Ecuador, Central America and Mexico. One of the main factors that has attracted attention from the international scholar community towards the region is its great environmental service potential reflected in its forest coverage and biodiversity "hotspots", many of which are endangered and therefore attract global attention through PES and PES-like programs.to tackle environmental problems and foster conservation practices and interventions. Especially important in this context are carbon sequestration PES schemes and Reduction of Emissions from Deforestation and Degradation (REDD+) initiatives, which are mainly funded by international organizations, firms and governments to offset carbon emissions and globally mitigate climate change (CNF, 2011).

Other important findings that can be drawn from the PES case study literature in Latin America are that environmental services projects attract, on average, four times more funding than traditional biodiversity projects such as natural protected areas, although, in some contexts, a significant number of PES projects are located very close or even coexist inside natural protected areas. Second, government-financed PES have caused modest or no reversal of deforestation (Goldman et al., 2008). Pfaff, found this evidence for Costa Rica (Pfaff et al., 2008); while Shapiro et al estimated only a net 12% reversal deforestation rate for Mexico (Garcia et al; 2012). On the other hand, case studies of user-financed, smaller-scale PES schemes claim more substantial impacts. Additionally, clear baseline data is very important for future success of any PES program. Evidence suggests that only a few countries in Latin America have sound baseline data in order to make appropriate comparisons based on monitoring, reporting and verification systems that also account for social capital indicators. Baseline is crucial to determine the impacts of any PES program. However, for government-based programs such as PSAH, baseline data has been difficult to gather due to implementation failures of the program and lack of sound monitoring, verification and report (MRV) systems (CNF, 2014).

A major issue in the region regarding PES is the role that side goals play in PES program design. Not only has poverty alleviation been proposed as the key side goal for PES programs, but also other side goals such as land tenure and local economic development. Other than local case study experiences that have shown that the PES government-based program served as an incentive for poor communities in southern Chiapas to improve their property rights situation (Kosoy & Brown, 2014), the main finding here is that, despite the importance of side goals, no broad evidence exists about

environmental service effectiveness in addressing those side goals in addressing those side goals?

Despite these findings, institutional heterogeneity between and within countries have made comparisons between Latin American countries very difficult to establish. Insufficient data and the impossibility to control for institutional differences have made comparative quantitative models difficult to develop (Pattanayak et al., 2010). Still, some patterns emerge to explain the performance of PES programs in this region. Institutional environmental and economic preconditions of potential program beneficiaries face similar challenges across Latin America. These challenges include land tenure and property rights definition, lack of sound participatory arenas, and the implications of common pool resources for government-based schemes management.

Case	Buyers-Providers Voluntary Transaction	Targeted Resource	Conditionality	Spillovers & Leakages	Additionality	Side-Goals
Costa Rica PSA (Pfaff et al, 2008)	FONAFIFO (Autonomous State Agency)/ Private Landholders, Indigenous Community.	Water, Biodiversity, Carbon Sequestration and Agroforestry Projects.	High and subject to future payments.	It is complemented with Command and Control policies.	Little Effect: Approximately 2% (Pfaff et. Al.)	Poverty Alleviation
México PSAH (Muñoz Piña, 2008)	Federal Government as main buyer; Three Public Agencies interact directly with the Program.	Strategic threatened watersheds	High	Rent seeking by Communities with Timber Firms.	Explicit Baseline for the Program. However, divergent results from different evaluations.	Poverty Alleviation, - from 2007-ongoing) Natural Protected Areas (NPA's)
Mexico. Lacandon Forrest (Kosoy et. Al. 2008).	Federal and Local Governments Frame. Participatory Rules have an upper income bias.	Biodiversity and Carbon Fixation	Not Determined.	Increase in Land-Tenure Security. Neighbor Non-Participants feel Excluded Collective Action Issues at the Ejido level.	Not determined.	Poverty Alleviation (The Evaluation focused on one of the poorest regions of the Country).
Pinampiro, Ecuador (Wunder, Engel and Pagiola, 2008)	NGO's and external donors buy services of local villagers	Watershed Protection	High in the first years but declining	Unmetered water Users tend to Free-Ride	Implicit Future Scenario	Complements weakly enforced forest rights.
Profafor, Ecuador	User-Based scheme. FACE, a Dutch Consortium, pays forest villagers.	Carbon sequestration through reforestation	Additional Funding after third year, subject to 80% reforestation rate.	Climate Change Mitigation Offset beneficiaries	"High"	No
Los Negros, Bolivia (Turiansky, 2010)	Fundacion Natura (NGO)	Watershed and Biodiversity Protection	Untested	Low	"High"	Complements Weak Rules on Deforestation.

Table 4-2. Latin American most Relevant PES schemes in the last 10 years in terms of Scale and Scope.

Adapted from various sources: Pattanayak 2010, Wunder et al. & Cabrera and Kosoy

Table 4-2 summarizes the most fundamental PES cases that have been put in place and evaluated over the last 15 years in Latin America in terms of scale and scope according to the international literature. It includes the main features of a PES scheme and follows the same approach discussed in Table 1 by emphasizing actual failures in terms of leakages and spillovers as well as the additionality impact that has been identified throughout the implementation of each program in its own particular context. These environmental services findings are either based on case study evaluations of PES in the region, or developed through rigorous econometric quasi-experimental analyses that include baseline and control group data,

Three types of schemes are identified with regards to their buyer-seller composition: i) market-based schemes were either financed by non-governmental organizations and/or international donors, who buy environmental services directly as in *Los Negros*, Bolivia and Pinampiro, Ecuador; or a private firm that buys the environmental service as in the PROFAFOR program ii) the government as the only or main buyer of the environmental service, namely, the Mexican Pro-Arbol program and all its derivatives, including, of course, PSAH and iii) the Costa Rican case using quasi-governmental or government-like scheme types (Pfaff, 2008). In this case, a semi-autonomous public agency or a public-private partnership funded by a mixture of public, private, and international resources is the main buyers of the environmental services. On the other hand, the providers of the environmental services are mainly local communities, some of them indigenous with their own rules of use.

Each of the most renowned cases in Latin American are integral as they try to encompass the four most important environmental services: carbon sequestration,

biodiversity, agroforestry and hydrological services. While government-based and government-like cases such as the Costa Rican and Mexican experiences encompass the four main environmental services through different components, the NGO and private-based PES schemes are much more specific and focus on only one kind of environmental service at a time.

A remarkable result of program evaluations that have been carried out in Latin America, as Table 1 shows, is that all of them provide a “high” or “very high” level of conditionality as defined by a contract in which both parties agree to preserve the environmental services. Compliance with this provision is verified by monitoring, verification and compliance mechanisms which are also agreed upon between both parties, typically satellite images. However, in terms of additionality –the most difficult goal to achieve- significant differences might be found between the low levels of public-based programs in Costa Rica and Mexico compared with high levels that have been demonstrated in small-scale firm and NGO-based programs in Ecuador and Bolivia (Turiansky, 2010). *Ex ante*, this fact does not imply that user-based, small-scale schemes are superior as a general rule. Given the large scope and scale of government-based schemes, it might be the case that under the government-based scheme umbrella, there are particular projects that will eventually become PES user-based or REDD+ projects at the local levels, and then have relatively higher effectiveness results. However, right now they depend on government for a transition process. In this sense, current projects that are beneficiaries of the program will eventually be transformed into actual environmental service markets with a user-based approach fashion and with an undefined time horizon (Alix-García et al; 2010; Pattanayak, 2010). Clearly, not all selected projects will

automatically be transformed in user-based ES markets after five years of public intervention². Still, the additionality levels for public programs are low, but positive, and they can increase in the next years if proper adjustments are made to the targeting criteria.

All scheme types inevitably present some sort of spillover and leakages that are different in kind from the environmental service provision itself. In fact, user-based small schemes are not absent from leakages. For instance, in in Los Negros, Bolivia there is some evidence of negative effects of PES implementation such as job loss, competition for land and social tension between those receiving payments and those who do not (Grieg-Gran, et al; 2005).

Overall, any environmental service scheme either government or user-based needs to be constantly recalibrated and adjusted for actual and potential leakages. In the Mexican case, the main leakage sources that have been identified are: i) a set of targeting failures in the changing criteria selection throughout the recent history of the PSAH and ii) the low level of environmental market creation after public intervention through five year PES programs. As for the Costa Rican government-based program, it is very interesting that FONAFIFO has been calibrated and adapted to the country's international tradition and worldwide leadership on the management of one of the main command and control instruments in forest policy: Natural Protected Areas. FONAFIFO is actually vastly implemented in a Natural Protected Area geography and basically, the program has accounted for the fact that, in principle, additionality is not achieved when a PES program is embedded inside a Natural Protected Area (FONAFIFO, 2012). Therefore, when monitoring, enforcement, and weak property rights exist, a PES scheme might provide

² The main reason why this is very unlikely to happen is because there are targeting failures in the aim to achieve the "optimal" targeted population of the program. Therefore, projects that provide low, very low or null additionality levels during the project are also those with relatively lower incentives to attract potential private and NGO buyers and create a market.

some additionality to the community in which it is implemented, even in an NPA. In this sense, it is not an either/or policy design, but a hybridization process between a command and control, and a market based instrument.

Unfortunately, thus far positive spillovers in the form of substantial “demonstration effects” for neighbor communities with similar characteristics haven’t been clearly documented in any case. On the contrary, there’s some evidence of “negative demonstration effects” in the Lacandon Forest in Chiapas, Mexico, where non-beneficiary neighbors have expressed their discomfort at being unfairly excluded, and perceive that the selection process hasn’t been equal for all participants (Kosoy et al; 2008).

Finally, poverty alleviation seems to be the primary complementary goal for governments that run PES programs in Latin America. For the user-based schemes in South America, no income variables have been measured before and after the intervention of private and international funding that consider the opportunity cost of enrolling their land in the scheme. Another poverty correlated variable in which small-scale schemes have focused regarding side-goals has been in complementing weakly enforced forest rights or weak rules on deforestation. In short, there are three main issues that need to be addressed regarding the implementation of PES schemes in Latin America: the environmental behavioral change of former beneficiaries of PES programs; the feasibility of user-based PES schemes with government co-management; and the role of side goals on PES programs. The Mexican experience offers a sound laboratory in which to explore these three issues.

Payment for Environmental Services in Mexico Background

During the 2003-2012 period, roughly 5,800 forest communities participated in a Payment for Environmental Service program in Mexico. This participation encompassed 3.2 million hectares and the average annual payment per hectare averaged between \$36 and \$47 USD (CNF, 2011). All in all, the PES set of programs in Mexico is the highest-scale program in countries with high deforestation rates. In 2012, 16.2 percent of PSAH projects were approved, which equals 27 percent of the feasible allocated land. Adjusted to projects that effectively cover all the program requisites, the success rate is a little higher (25.5 percent). About half of the selected projects (47 percent) are located in selected municipalities (UNAM, 2012)³.

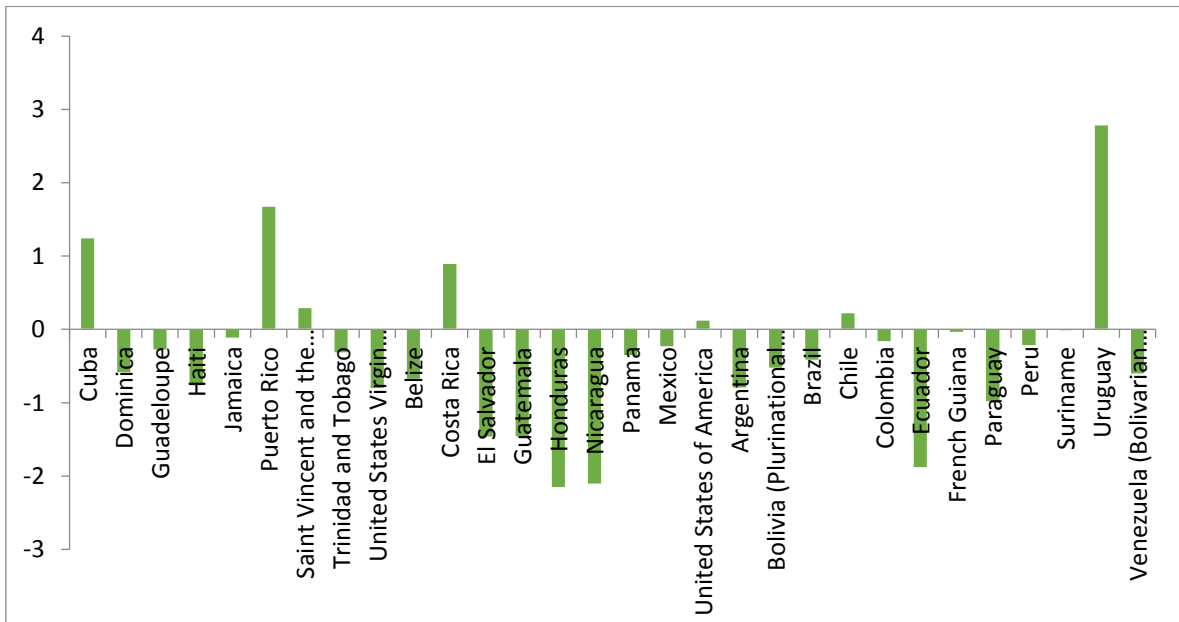


Figure 4-1. Mexico's Annual Deforestation Rate in the International Context: Selected Countries

Source: Food and Agriculture Organization. Forest Resources Assessment 2010

³ A list of priority municipalities has been issued by the National Forestry Commission (CNF) based on human development and poverty indicators as well as forest coverage variables.

The evaluation literature (Rossi, 2007) suggests that any public intervention, usually through a public program, should have a causal theory. Therefore, in essence, a public program may be defined as “a discrete and exogenous intervention (X_{t1}) about a public issue (Y_{t1}) that seeks to alter the *status quo* in the desired direction” (Maldonado, 2013). The public issue at stake is that Mexico simultaneously has a high degree of deforestation and aquifer overexploitation around its territory, issues that call for public intervention.

Figure 3-1 shows Mexico’s deforestation rate for the period 2005-2010. According to FAO, and compared with other Latin American countries, a negative 0.05 annual deforestation rate is not as bad as countries like Brazil, Argentina or Guatemala. However, given the country’s size in absolute terms, Mexico’s acreage of forested land is the second highest in Latin America and it is in the top 10 around the world (FAO, 2012).

As mentioned in Chapter 1, in Mexico, 70 percent of forests are held in common property in the form of Ejidos or indigenous communities. Three thousand communities develop some kind of productive forestry activity. One-fifth of those communities have been formally constituted as a forest enterprise. Five million people who live in Mexican forests are indigenous. Overall, the Mexican PES experience has focused on four different environmental services: hydrological environmental services that include capture, infiltration, and provision of enough water quantity and quality in selected areas; biodiversity conservation; climate change effect mitigation through capture sequestration and storage; and soil retention through agroforestry techniques, formation and scenic beauty.

As part of a global strategy to foster PES in Mexico, the federal government through *Comisión Nacional Forestal* National Forestry Commission (CNF, 2011) set out two initiatives. In 2003 the Program of Hydrological Environmental Services (PSAH) was initiated, and in 2004, the program to develop an environmental market for carbon sequestration and biodiversity derivatives and also to forge the establishment and improvement of Agroforestry Systems (PSA-CABSA). These last two programs merged in 2006 in a single comprehensive program known as Pro-Arbol. Budgetary allocation has increased steadily to these kinds of programs. For example, in 2007, the federal budget increased five-fold with respect to the previous year (CNF, *op cit.*). Funding for PES programs has been volatile mainly due to the nature of its sources. A national Forestry Fund was established in 2003 in order to avoid political and budget cycle uncertainties and to have a multiannual and long-term perspective in order to guarantee funding for five-year long contracts.

Overall, during the 2003-2011 period, roughly 5800 forested communities have participated in a PES program. 600 million dollars were allocated for PES programs in Mexico within the same period. This amount translated into 5000 projects that were executed through an extension of 3,113, 000 hectares. Currently, the environmental service concept of *Pro Arbol* is broken up in two subprograms: hydrological environmental services and biodiversity conservation. Both programs are based on opportunity cost compensation to local forested land holders and were created with the main objective of maintaining certain ecosystem conditions that favor different environmental service generation. A contract between the land holder and CNF is signed. Land holders commit themselves to maintaining forest coverage or to carrying out best management practices in

order to conserve the natural ecosystems that interact around the forested land. CNF pays a fixed compensation per hectare during five years. Program participants agree not to change land use and are encouraged, but not forced, to carry out surveillance activities under the enrolled pieces of land in order to avoid poaching, fires, and other negative activities within the forest. Monitoring activities are done by the National Forest Commission (CNF), which determines payment continuity. Technically, PSAH offers some elements of a Conditional Cash Transfer (CCT) program since monitoring and verification activities through forest coverage satellite images at the macro level are overseen by the government annually to authorize the next year's payment. Inside the participant communities at the micro level, activities and labor to improve forest condition are encouraged, but not required.

Evolution of Payment for Environmental Services Programs in Mexico

Mexico's PES program consists of a set of subprograms according to different environmental services including hydrological Payment for Environmental Services *Pago por Servicios Ambientales Hidrológicos*, which PSAH designed for watershed protection and launched in 2002; Pro-Arbol, a subprogram for biodiversity conservation also launched in 2002; and PSA-CABSA, originally launched in 2002 but redesigned in 2007 (Muñoz et al; 2008). Although these three subprograms have clear linkages between them. For this research, I will focus on PSAH *Pago por Servicios Hidrológicos*.

PSAH offers direct cash transfers to land owners of Ejidos or privately held property. The cash transfers depend on the amount of land that the owner has. Land that is subject to participation is mostly forest that is located throughout the 300 hundred most exploited aquifers in the country (Edgar et al; 2012). The scheme payments try to

compensate land owners for conserving the forest, limiting farming, livestock or timber activities.

Five-year contracts that are subject to yearly renewal or adjustment are granted by the Mexican government to land owners. Verification and monitoring is carried out through satellite images. Less than 10% of former beneficiaries are granted a second-term contract thereby neglecting the long term horizon that some authors claim is needed to achieve additionality (Pattanayak, 2010). Sometimes, unusual changes in the forested area are found. As analyzed in Chapter Two, land owners usually claim external causes for these changes—weather, inaccurate measurement devices, encroachment, etc. Despite these difficulties, satellite images have proved to be a cost-effective deforestation monitoring policy.

Figure 4-2 shows the historical distribution of the program's enrollment; Oaxaca, Chiapas, Michoacán, and Chihuahua are the four leading states participating in the program. There are 10 states that have very little or no participation in the program. Coastal forests are the most frequent type of ecosystem to be incorporated in to the program, followed by cloud forests and template forest *bosque mesófilo de montaña* to a lesser extent (García et al, 2012).

Still today, a significant percentage of projects with high willingness-to-participate—and with a high degree of additionality potential- are excluded from program participation. According to 2010 data from CNF, for every ten potentially eligible program participants, less than three were actually selected for a PES scheme. The other seven were excluded primarily due to budgetary reasons or, to a lesser extent, because of incomplete or

inaccurate project proposals. No data exists about the potential target population ignorant of or disinterested in the program, perhaps due to high poverty, isolation and marginalization. It is commonly known that the potentially excluded participants are amongst the poorer households. A challenge for the program is to persuade rejected participants that they have a real chance to become eligible in future years and thus, they should continue to preserve the forest.

Fig 2b: Rejected applicants to PSAH 2004-2009

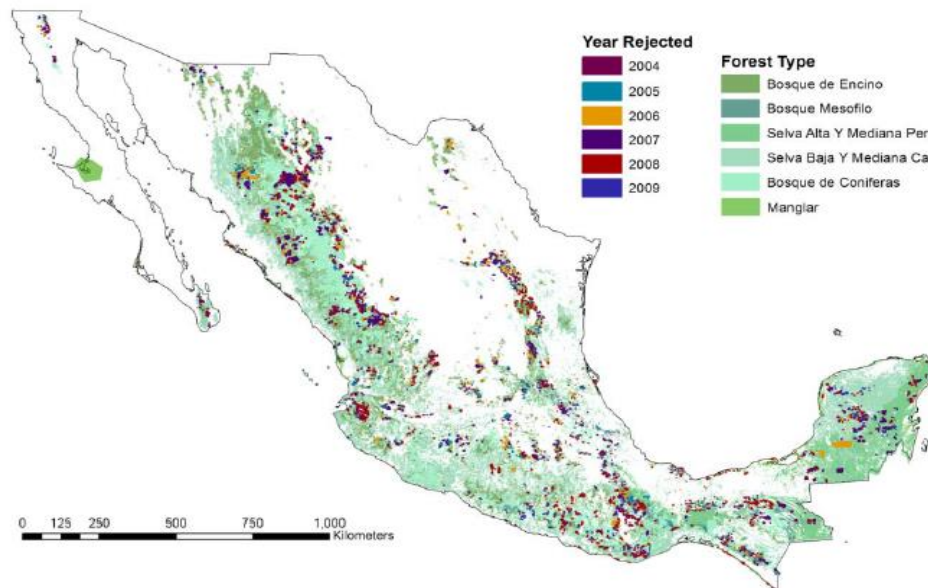


Figure 4-2. Rejected applicants from the Payment for Hydrological Services Program (PSAH) with data from National Forestry Commission (CNF).

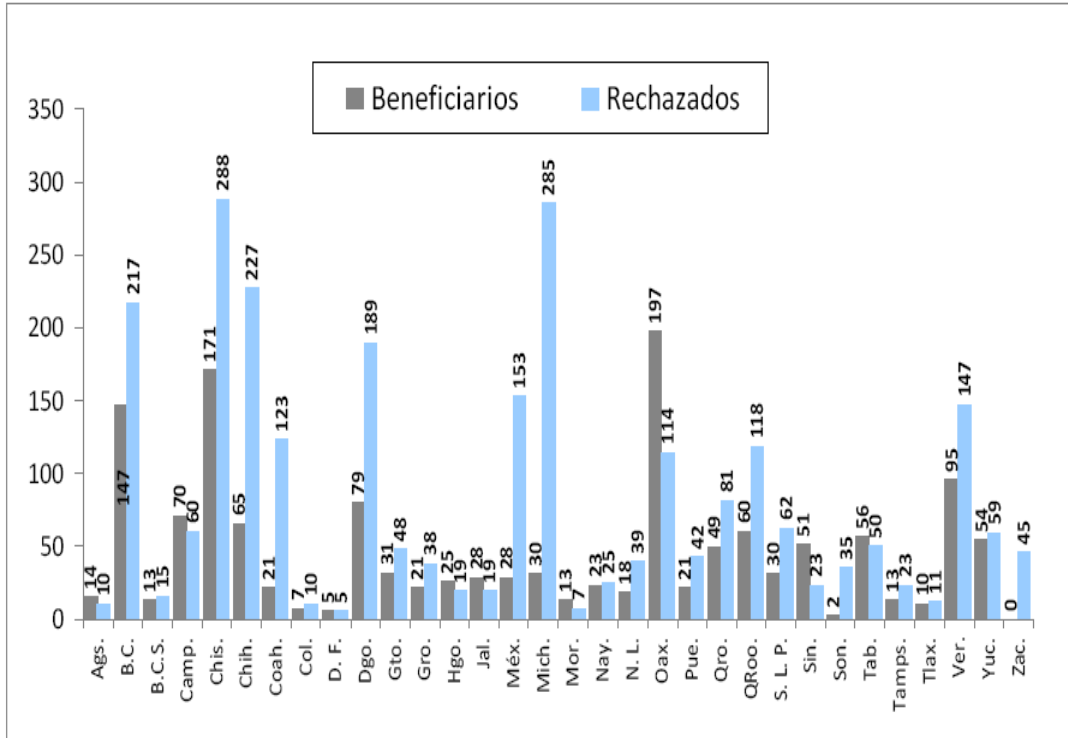


Figure 4-3. Recipient-Rejected Comparison by State 2010. Source: Author's elaboration with data from CNF.

Recipient and rejection patterns have also been very asymmetrical between states for the PSAH program. Interviews with policy makers and program executers explain these asymmetric patterns as a result of significant difference in terms of capacities, human capital, technological platforms and skills within state and municipal offices around the country.

Payment for Hydrological Services: Evaluability and Main Outcomes

In order to make valid conclusions about a public intervention/program a venue of the public policy literature claims that a public program should have at least 10 years of implementation (Sabatier, 1999). Sabatier's conclusion is a general rule and it is mainly

focused on a developed world context. For the Mexican PSAH, this theoretical prerequisite was satisfied in 2013 not only in terms of time span, but also in terms of information availability beginning from the design stage in 2000. Rossi (2007) argues that the evaluability of a program crucially depends on the causal theory that is embedded or articulated either implicitly or formally in the program's rationale (Rossi, *op. cit.*). PSAH formally assumes that there is a clear and unequivocal causality between forest coverage and water recovery⁴.

At the practical level, PSAH has been evaluated from different perspectives drawing different preliminary conclusions. In this section I will highlight the main insights that have been drawn from PSAH design and implementation evaluation in the last years. As in the Latin American trend, most of the evaluations that have been carried out in the last years for PSAH have been impact evaluations based on GIS regressions that seek to tease out and control for all other confounding variables and estimate the net impact of the program given a robust enough pair of datasets that match program beneficiaries with a rejected pool of voluntary participants with similar characteristics. Ultimately, this kind of analysis looks for significant differences between both groups (Khandker, 2010). In a nutshell, advantages of Propensity Score Matching (PSM) methods rely on the fact that it enables one to obtain statistically significant differences between groups if “only observed characteristics are believed to affect program participation” (Khandker, *op. cit.*). On the other hand, possible drawbacks of these kinds of evaluations are the lack of quality data that a) guarantees conditional independence, that is, that unobserved factors do not affect participation and b)

⁴ During the design stage of PSAH from 2000-2003, there was a thorough discussion about the plausibility of the forest-water interphase between national and international interdisciplinary groups. At the end, the conclusion was that, in general, most eligible ecosystem for program participation in Mexico reflect aquifer restoration as a dependent variable of forest coverage See Muñoz & Guevara (2003). After 10+ years of PSAH implementation, no proposals have been made by stakeholders at the technical level to reform this basic causal relationship.

attainment of a sizable common support or overlap in propensity scores across the participant and non-participant samples. Additionally, tests have been created in order to elicit institutional preconditions that determine willingness-to-participate on the program (Kosoy & Brown, 2008).

Finally, Mexico's National Evaluation Council (CONEVAL) has developed process and performance evaluations from the program by. This third set of evaluations mainly focuses on the process and implementation phases of the program, seeking articulation between inputs, outcomes, and results in a Logical Framework and Monitoring and Evaluation (M&E) trend that has also taken place in Mexico during the last decade (OCDE, 2013).

Altogether, impact and qualitative evaluations, along with process-based and performance M & E exercises in the last year for PSAH provide a battery of useful insights regarding the nature, evolution, and future policy perspectives of the program. In the next section, I will summarize these insights in order to clarify them and determine which lead to improved public policy decision making in terms of program continuity, termination or adaptive adjustment and specifically which PSAH components are still in need of further research.

Impact Evaluation Results

Different studies show different results. All of them specify that the program has had positive effects, but there is no agreement on the measurement and scale of these positive effects. The reasons for this inconclusiveness are an inaccurate baseline and different methodologies. Evidence for the Mexican government-based program also

suggests that there are a number of leakages that might lower the final impacts of the program (Shapiro, et al; 2010).

First evaluations of Mexico's PSAH *Pago por Servicios Hidrológicos* program suggested that its impacts have been positive but small (Shapiro, E., 2010). More recently, impact evaluations of the program have shown relatively higher impacts of about 30% deforestation reduction (Alix-García et al; 2012). Two issues emerge in analyzing this indicator. First, leakages of the program should be subtracted from the general impact. Second, there is no objective international benchmark to define how good a 30% deforestation rate is, given the variety and uniqueness of Mexican forested ecosystems. In any case, though, the two main lessons are i) that the effectiveness of the program has enhanced significantly in the last three years of operation of the program and ii) that there's still ample room for further improvements of the intervention.

The results show that Mexico's program has had a small positive impact in terms of preventing deforestation. The impact is highly heterogeneous by property type and region. Additionally, Alix-Garcia et al. (2012) find evidence of some deforestation spillovers to other lands, specifically within communal properties in remote regions. "Between 2003 and 2009, approximately 2.27 million hectares of land were entered into Mexico's PES programs, making it one of the largest in the world" (CNF, 2011). These findings were determined by analyzing the 2004 beneficiary's cohort. During the 2004-2006 period, PSAH went through an adaptive phase in terms of targeting criteria (Muñoz et al; 2008). Rules of operation modified criteria in order to include higher deforestation zones, marginalized and poorer zones. In order to improve the targeted population of the program,

significant changes took place during 2007. More recent evaluations that consider 2007 cohorts show larger positive effects of the PSAH program.

In principle, impact measurement efforts of PSAH establish a coefficient of 30% of less deforestation. However, after controlling for leakages and slippage, estimates show a lower 12 percent net impact of PSAH (Alix-Garcia et al; 2012). Unfortunately, there is no international benchmark to compare these results. Therefore, it is crucial to understand the determinants and dynamics that dissipate the impacts of the program and that are reflected in high levels of leakages and slippage. The main explanatory determinants that have been explored are rent seeking groups that capture a significant percentage of program benefits, and targeting failures based on a pool that could be enhanced not only in the selection process criterion, but also in actually improving recruitment and generating a higher quality pool of potential beneficiaries.

The land, credit, and labor market rigidities that prevail in the Mexican rural context might be sources of spillovers and leakages of the Mexican PSAH program. This is particularly true when land is held in common in the form of Ejidos. The mechanisms in which spillovers and leakages can take place are through prices, wealth effects and substitution. Ostrom (2012) identifies two types of leakages regarding public interventions that try to reduce GHG such as PES and REDD+, especially in a developing world context. One is the leakage between locations where any project could be shifted from location X to location Y due to a PES, REDD+ or climate change related project in X so that no net reduction in X is produced. The second is a market leakage that is produced due to a price increase due to reduced supply which leads to increased production of timber due to market distortions. Some evaluations of the PSAH program have tried to control for these leakages.

Although they are difficult to measure, the net result is a positive impact of the program is that is more than 10 percent of land that would have been deforested in the absence of the program, even in the presence of leakages.

Non-Impact-Based Evaluations

Non-impact and results-based evaluations have also shown some crucial findings for the program. Critics of these evaluations claim that they do not measure for deforestation, use counterfactuals, or account for potential spillover effects. In short, “environmental benefits could be substantially reduced if environmental damages are simply displaced to other locations”. Despite these limitations, anecdotal, descriptive, qualitative and outcome-based evaluations show interesting insights into the program dynamics and effectiveness.

The National Autonomous University of Mexico (UNAM) recently carried out a survey as part of a comprehensive evaluation based on program beneficiaries perceptions (UNAM, 2012). Results of this work show that, in general, program recipients do not consider oxygen and water as ecosystem services that are provided by the natural resource. Rather, they consider them only as local benefits without a watershed or global perspective. They are not familiar with the main objectives and instruments of the program and, finally, they consider the program only a direct subsidy in exchange for preventing deforestation for a limited period of time, and in some cases in exchange for some recommended activities by forest technicians. From an economic perspective, surveyed beneficiaries are not aware of the potential for creating a market with other direct users in the absence of the subsidy. From an ecological perspective, there is a lack of awareness of the regional and global implications of their forests.

Final use of financial resources is not conditional, although certainly encouraged, on conservation activities by program beneficiaries, since PSAH is an outcome-based and not an action-based program. Even so, and according to UNAM's survey, a majority of PSAH beneficiaries reported to have spent or invested the subsidy in conservation activities. In contrast, some of the projects that are located in the most marginalized zones but with high levels of social organization have invested the subsidy amount in the provision of public goods such as local health centers, transport and local trusts for health and death insurance.

In sum, the main conclusion of this evaluation is that, based on the perceptions of beneficiaries, future continuity of PSAH in the long-run is compromised by a lack of basic knowledge about the program objectives, ecosystem services, and awareness of the potential for market creation. Therefore, after contract termination, ex-beneficiaries most likely will switch their land use into short term profit activities such as agriculture and livestock.

Finally, regarding process-based evaluations of the program, coverage of PSAH has consistently increased each year during the program's life span. However, as pointed out by impact evaluations, one cannot infer that increasing forest coverage has led to the ultimate goal of the program (CONEVAL, 2013). Even so, monitoring conclusions of PSAH carried out by the National Evaluation Council (CONEVAL) show that, in terms of service delivery, PSAH performance is observed to be generally effective. Outcome and process goals and indicators of PSAH have been reached and even surpassed, with the exception of the plant survival component, whose lower achievement is attributed to "operative issues in reforestation activities, that might be hindering its effectiveness"⁵ (CONEVAL, *op cit.*). As

⁵ The other set of forest programs that are included in the same Results and Indicator Matrix (MIR) of PSAH are: Forest Research Projects', Forest Certification, Commerce Forest Plantations, Best Management Practices for Forest Cultivation, soil and reforestation and biodiversity.

a preliminary conclusion, the institute affirms that significant transaction cost scenarios for PSAH are disregarded for running the program. This is important since it sets the path to clarify the main findings of PSAH either at the design stage or at the *ex post* impact stage which we will focus on for the remainder of this work.

Finally, based on m the two principal components of the most recent Logical Framework in 2013 namely, i) incorporated surface for payment for hydrological and biodiversity services and ii) durability of incorporated surface for PES programs in Mexico, one can conclude that PSAH has been operationally effective. A federal government surplus combined with earned interest on the Mexican Forest Fund allowed for the incorporation of 19 percent more land to the program than was projected at the beginning of 2012. These positive trends led to 387,471 hectares being enrolled for the PSAH for that fiscal year (CONEVAL, *op. cit.*).

The second main component relies on the permanency of the surface that was incorporated to the program in the previous three years within the 2008-2011 period. Of the originally enrolled PSAH projects continue to be in place, 98.5% percent are complying with the conditions of the program, mainly based on vegetation coverage. The original goal was 95 percent. These results show that, operationally speaking, PSAH is an efficient public program and there are no significant bottlenecks or bureaucratically failures that hinder program procedures. Once projects are approved, there is no evidence of significant drop-outs either at the beginning or in the middle of the contract. In conclusion, both indicators are very positive conditions for program effectiveness. However, these conditions are necessary yet insufficient conditions for the achievement of additionality. Even in the logical framework context, the ultimate “Goal” indicator states that the program

seeks to “contribute to maintain the environmental goods and services in the country, through incorporation of forest surfaces to sustainable forest development schemes” (CNF, 2013).

Mexican Environmental Policy and Institutional Background for PSAH Implementation: First, Second and Third Generation Reforms

It is crucial to briefly analyze recent institutional evolution in Mexico in order to better understand the design of PSAH, where it has been implemented, and also to get a better sense of the limitations and potentialities of the program. At the micro level, the Ejido context was covered in Chapter 3. In this section, I examine the context of PSAH at the Mexican environmental policy macro level.

Although PSAH is a market-based instrument, its development, performance, and implementation take place under command and control and in a context of imperfect institutions. Likewise, the Mexican environmental policy transition has changed from a government-based to a new environmental governance approach, also known in the literature as community-based environmental management approach (CBEM). These institutional trends have derived into cross-cutting policies and a set of environmental programs such as PSAH, whose evolution has not been sequential or linear. On the contrary, nowadays it is possible to observe the overlapping and coexistence of three simultaneous kinds of environmental policy: command and control, market, and community-based, which will be interchangeably called in this chapter first, second, and third generation reforms, respectively.

Changes in institutional arrangements in the form of laws and operation rules have been put in place in order to introduce innovative environmental policy instruments as well. There have been different levels of success at the design and implementation phase of these kinds of programs, particularly for Payment for Environmental services and REDD+ *Reduction of Emissions for Deforestation and Degradation* policies.

The first generation command and control approach and, more recently, second generation market-based approaches have been the cornerstones that have been discussed by scholars and followed by policy makers. These approaches have been applied to different contexts that involve deforestation both in developed and developing world contexts. In the last decade though, a new set of alternative approaches have been proposed for hydrological environmental services and adopted in countries like Mexico. As mentioned earlier, frameworks like the new environmental governance and the community-based environmental management appeared as a response to both the global climate change adaptation and mitigation coordinated policies from international agencies, grassroots and non-governmental organizations, companies and governments to develop CO₂ emissions offset schemes.

Both the environmental governance and CBEM paradigms are still works under construction and sometimes lack a mainstream methodology. They are referred to by different terms across the literature: environmental governance (Speth, 2006); (Hempel, 1996), environmental conflict resolution and consensual approaches (Maguire, 2003), common pool resource management (Ostrom, 1990), community-based and grassroots (Lubell, 2004), stakeholder analysis and sustainable ethics approaches (Harremoes, 2002), among others. Often, these approaches pursue the same goals as command and control and

market-based approaches, namely, hydrological services provision, biodiversity conservation and carbon sequestration by preventing deforestation.

Although command and control and market based approaches continue to interact on most natural resources realms, including water and deforestation, there are some segments where neither command and control nor market based approaches provide an optimal solution that seeks for additionality and is consensually adopted by and embedded within local communitarian dynamics. This is the case for PES and PES-like programs in the rural Mexico Ejido context. Therefore, I suggest that a twofold perspective should always be taken in order to better understand the results of the PSAH program within the Mexican context. The first perspective takes into account market schemes and market and government failures in order to understand efficiency and additionality issues. The second adopts general communitarian and cognitive views and “bottom up” policies that are adopted, interpreted and implemented by communities.

Under some environmental settings in Mexico, neither regulatory nor market-based approaches have been enough to countervail overuse, depletion or overconsumption of environmental services. As a consequence, non- mainstream or alternative approaches have been proposed to fulfill this vacuum. It is important to note that these approaches are neither mutually exclusive, nor sequential. Rather, they can be blended in an optimal mix of processes that enable their coexistence. For this, it would be necessary to set up the platforms, rules, and arenas that provide the opportunities for “top-down” and “bottom-up” approaches. In this sense, given the centralized nature of PSAH, it only offers a

standardized set of rules for participation in the program that are not flexible enough to account for local, context-based dynamics⁶.

Innovative Environmental Policy Instruments

Over the last 30 years, Mexico's environmental policy has departed from traditional command and control toward market-based environmental policy instruments. First generation environmental policy instruments are referred to as norms, standards and government-based environmental policy regulation. These kinds of instruments have been extensively studied throughout the second half of the 21st century at the international level. For the Mexican case, forest management and natural protected areas policies took shape during the eighties and nineties. At a more recent stage, second generation reforms rely on basic market-based fundamentals that aim to allocate resources efficiently at the environmental sector where incomplete markets or market failures are abundant.

Historically, the context in which Mexican Payment for Environmental Services programs emerged occurred exactly in the middle of the transition of first and second generation reforms. In Mexico, like in many other Latin American countries, one can distinguish between first and second generation reforms. First generation reforms pertain to the command and control realm mainly focused on top-down policies and regulatory policies. In contrast, second generation reforms have been traditionally associated with market mechanisms, deregulation, or decentralization. The main goal of these set of policies is to incentivize economic agents to attain some plausible outcomes through more

⁶ However, in the last three years, a decentralized "branch" of PSAH has been developed as a pilot project called *Fondos Concurrentes* which stands for PES concurrent funds in which basically, federal government provides only part of the PES payment amount, while the environmental service-user (could be a municipality, a state, or an NGO could provide the other part of the subsidy). Under this scheme, local rules have a better chance to be included in the form of Best Management Practices. The current state of affairs of the *Fondos Concurrentes* initiatives as well as the Best Management Practices implications will be thoroughly analyzed in the next chapter.

active participatory mechanisms of policy subsystem stakeholders for the creation or modification of new institutional rules of the game (Samaniego, 2002).

Traditional market approaches involve green taxes and subsidies. In practice, one of the main challenges of these instruments is to accurately define the tax/subsidy amount that addresses the missing or incorrect market price that might be distorted by the presence of an externality (Keohane & Olmstead 2007; Tietenberg, 2000)⁷. PSAH is a kind of green subsidy-based program that requires a clear payment vehicle linked with and funded from environmental service users. In order to address this issue in the Mexican PES program, a fiscal instrument was created in 2003 and called *Fondo Forestal Mexicano* (Mexican Forest Trust). Under this instrument, a higher fee is charged on households which are along the 300 most overexploited aquifers. Revenues from the additional fee are earmarked to *Fondo Forestal Mexicano* to fund PSAH and guarantee and give credibility to the conditionality of payments for hydrological services for five- year contracts. However, this payment vehicle process is still “diffuse” given the fact that all revenues in all geographical revenues are directed to the same “box”, limiting the visibility and direct interaction between environmental service users and providers. Again, this scale constraint is being partially addressed by encouraging PES schemes at the subnational and local level through the *Fondos Concurrentes* subprogram⁸. Until now, these local experiences with clear payment vehicles have had different levels of success and have not been systematized or deeply researched. In sum, Mexican PES programs, including PSAH, have struggled both in

⁷ During the targeting discussion in next chapter, I will analyze the challenges, difficulties and implications in trying to establish the adequate subsidy amount.

⁸ *Fondos Concurrentes* stands for multiple stakeholder funding cooperation that potentially includes a mixture of resources from federal, state and municipal levels of government as well as NGO’s and private firms that function as environmental users. In a way, *Fondos Concurrentes* program works as a Section II of the traditional government-based PES program. *Fondos Concurrentes* ultimate goal is to set up the conditions for market creation and user based local schemes that will eventually work without government intervention.

defining the “optimal” amount for the payment or subsidy of the environmental service, and also in creating local markets with clear payment vehicles between the environmental provider and user.

Closely intertwined with second generation reforms are the public management instruments and organizations that are required to set out innovative policies. For the Mexican case, several public agencies are responsible of running the program The National Forest Commission (CNF) is the main agency responsible for the design and program implementation. National Water Commission (CONAGUA) is also involved in identifying the most overexploited aquifers around the country and collecting water right fees that are earmarked for the program. In this sense, at the beginning of the 21st century, the Environmental and Natural Resources Secretariat (SEMARNAT) agency was created. Two very important agencies were also soon created to accompany Semarnat’s work; one was the National Institute of Ecology, and the other was the National Forestry Commission (CNF). These two decentralized agencies designed and carried out the negotiation process to create the first PES schemes in Mexico, which came to be the single most important set of government-based PES programs in Latin America. Complementary, the National Commission for Biodiversity (CONABIO) was created. This new institutional supply paved the way for PES and second generation environmental policy reforms across the country (Figuerola, 2012). The interaction of these agencies after 14 years of their creation has been “policy fragmentation”. Table 4 illustrates the evolution of environmental policy instruments in Mexico, highlighting PSAH as an emblematic example of this transition

Environmental Policy Instruments and Reforms	Instruments	Issues	Challenges	Stakeholders	Stage/Phase of Implementation in Latin America and Mexico	Actual examples for the Mexican Payment for Environmental Services battery of programs.
Command and Control –First Generation-	Laws, Decrees, Acts, Norms and Standards.	Overregulation	Flexible enough regulatory frameworks	Government	Maturity. Still play a structural role for environmental policy	Natural Protected Areas, Norms with reference prices for land use changes according to different ecosystems
Market-Based traditional instruments -Second Generation- Neoclassical economics. Cap & Trade, Pigouvian Taxes and Subsidies, Coase Theorem	Cost-Benefit. Willingness-to-pay Willingness to Accept Taxes and Subsidies Green Incentives for Renewable Energies, Environmental Compliance, Certifications and Eco-Labeling Environmental Impact Evaluation	Information Asymmetries Optimality level definition with empirical data	Institutional Preconditions to match neoclassical assumptions. i.e. <i>well-defined property rights and low transaction costs for Coasian efficient outcomes.</i> Stated Preference and revealed preference ecosystem valuation limitations	Government and other economic agents A clear supplier and demander of the environmental service that wants to be preserved	Adolescent stage. Mixed and inconclusive results regarding the creation of real markets where market failures previously existed	Pollution Charges for pollutees. “The polluter pays principle” Property Rights Definition in land markets
Market-Based Instruments embedded in a context of New Environmental Governance “Third Generation Instruments”	Payment for Environmental Services Reduction of Emissions for Deforestation and Degradation. REDD+ Strategic environmental Evaluation	Collective Action Issues. Crowding Out Market, Government and Community Failures	Environmental Justice Institutional Design Cooperation	Government, Economic Agents and Communities under intervention	Infant stage. Urgency to identify success stories and scale them up within regions with sound monitoring and verifiable outcomes	PSAH, REDD+; Wildlife Management Units (UMA's); Voluntary Natural Protected Areas at the Communitarian Levels; Public-Private Partnerships

Table 4-3. Environmental Policy Instruments in Mexico: First, Second and third Generation as applied to PSAH in Mexico.

Source: Author Elaboration based on OCDE, 2013. Mexico's Environmental Performance Evaluation. Presented at University of Guadalajara. February, 2013

The Complex Interphase between Second and Third Generation Environmental Policy Reforms in Mexico

As stated in Table 4, PSAH implementation cross-cuts the second and third generation instruments while not totally escaping first generation regulatory policies. On the one hand, neoclassical economics principles were put in place at the design stage of the PSAH program and still continue to be fine-tuned and adjusted in order to improve its performance. On the other hand, different stakeholders, groups, and policymakers have pushed to maintain the vision, scope, and criteria of PSAH embedded with first generation instruments by giving more relative weight to command and control instruments such as natural protected areas at the selection stage⁹.

However, second generation reforms applied to PES programs such as PSAH go beyond the mainstream environmental economic Pigouvian taxes and subsidies. As discussed in the literature review of Chapter 1, the Coasian approach also has a lot to say about the design and implementation of PES schemes in Latin America and Mexico, in particular with our study object: The Payment for Hydrological Services Program (PSAH). Despite having, in principle, Pigouvian elements *ex ante*, the design of the PSAH program opens up the possibility –and in fact encourages- the development of Coasian arrangements any time from receiving the first payment until contract termination at the end of the five year pre-established period.

Originally, the perspective of creating markets as a consequence of PES public intervention came from program designers and international funders (Shapiro, 2012). However, due to implementation and targeting failures in the first years of the program, as

⁹ Both visions will be examined in the next chapter of the dissertation through interviews with policy-makers.

well as the Mexican government's contention that PES programs in Mexico should have dual environmental service and poverty alleviation components, weakened the original market-based philosophy.

Based on a Washington Consensus perspective and according to neoclassical theory, the ultimate goal behind the construction of PES programs in Latin America and Mexico was to create green markets that overcome suboptimal results that are typically associated with PES contexts in Latin America and Mexico. From a political economy perspective, and in an effort to apply a Coase Theorem perspective, market equilibrium might be reached if crucial assumptions are achieved, (mainly, low transaction costs and well defined property rights), there are no significant wealth effects, complete information between the bargainers exists and, finally, that consumers and producers are price-takers¹⁰.

One basic prerequisite for Ejidos to participate in PSAH is verification that they are legal holders of the land that will be used to offer the hydrological environmental service. In general, this basic precondition was instituted for the Mexican PSAH program, especially after the second generation reform that took place in 1992 that allows Ejidos to lease, rent and sell their land.¹¹ As in most government-based programs, demand to participate in PSAH has always surpassed the budgetary supply of the program. Hence, by definition, all selected participants have complied with the well-defined property rights requirement. At the national level, and regardless of the PSAH program, there are still some issues for the appropriate definition of property rights in rural Mexico. In particular, it is difficult to distinguish between *de jure* and *de facto* property rights claimed by different

¹¹ Previously to this reform, it was impossible to make any market transaction and hence no Coasian bargaining could take place.

Ejidos and indigenous communities in the same places, and encroachment and low levels of *rule of law* that lead to property trespassing are still predominant in some geographical regions of the country. From a PSAH perspective, there is not enough information to establish if the environmental quality of the project candidate pool would provide more additionality from *potential* beneficiaries that still lack well-defined property rights definitions, and hence can't be selected by the program.

Overall, only a very small fraction of PSAH selected projects have ended up in the creation of new environmental markets. Why is this percentage so low? According to Shapiro (2012), the original goals of PSAH in terms of creating new markets was very high, especially among program designers from the World Bank that accompanied the configuration of the program, as well as from policy-makers from the national Ecology Institute (INECC), who were mostly economists.

Arguably, one of the main hypotheses about the low level of market creation relies on the declining targeting efficiency of the program that, according to some evaluations, has prevailed in the last years of the program. This issue is the subject of a thorough analysis in the following chapter (Shapiro-Garza, 2013). In any case, having a very low "market creation coefficient" for the PSAH program in the last 10 years does not necessarily imply that the great bulk of approved projects in the last year did not provide any additionality at all to the program and are then just a resource transfer. In Chapter 2, the Ejido analysis showed that *partial* additionality might be achieved if pro-conservation behavioral changes on the part of the population were attained as a consequence of program intervention. These kinds of behavioral changes are mainly referred to in the literature as "pro conservation" or non-economic motivations that may drive or hinder willingness to

participate, comply or learn from the program during its participation, and are determinants for future environmental behavior in the absence of the program (Turiansky, 2010).

Towards Third Generation Reforms

Third generation reforms refer to the moment when market-oriented policies and programs in the environmental realm need to be complemented by institutional, communitarian, and environmental governance variables in order to achieve the original goals towards efficiency. Otherwise, the program in the environmental realm, in this case PSAH, would “crowd out” local communitarian structures and hence the outcomes of the program itself would be jeopardized (Cárdenas, 2000). The set of “rules of the game” of local communities that are intervened by a market-based process is often called environmental governance¹². In the specialized literature Lemos & Agrawal (2006) define environmental governance (EG) as the set of “interventions aiming at changes in environmental-related incentives, knowledge, institutions, decision-making, and behaviors” as well as “the set of regulatory processes , mechanisms and organizations through which political actors influence environmental actions and outcomes” (Lemos & Agrawal; 2006). In this sense, the main issue in the governance concept definition is that government is only one more actor, maybe but not necessarily the main actor, among other sets of stakeholders that include communities, businesses and NGO’s. EG is typically greatly influenced by international and national market-driven policies such as Payment for Environmental Services (PES) and Reduction of Emissions for Deforestation and Degradation (Agrawal, 2010). Cooperation within an environmental governance context for market-driven initiatives such as PSAH is crucial in two ways. First, since PSAH and other PES-like

¹²Although a complete explanation of the environmental governance literature is beyond the scope of this dissertation, it is important to note that an environmental governance structure is a necessary condition towards the success of any PES or PES-like intervention.

initiatives are, at least to some extent, a conditional cash transfer (CCT) and an outcome-based program, they require appraisal by program participants in order to renew the subsidy. Second, in the long term, after five-year PSAH contract termination, those projects that strengthened their own local rules through cooperation and alignment with the program's external rules will have a much higher probability of endurance and environmental service provision even in the absence of the Pigouvian subsidy and even without market creation. Thus, it is the interplay between environmental governance structures before and during program intervention, along with market-based criteria provided by PSAH incentives that determine future outcomes and results of the program in terms of additionality.

In the case of PSAH, the basic outcome that is taken into account to measure program success through the history of the program has been forest coverage¹³. Forest coverage does not reflect the additionality level since we don't know if forest coverage would have taken place anyway in the absence of the program. Nor does it reflect the environmental governance dynamics that underlie the effort to maintain the forest coverage. According to six in-depth interviews in 2012, program beneficiaries, have carried out communitarian conservation activities much more intensively because of their participation in the program.¹⁴ The interviews also showed that there are "failure cases" where those same conservation activities would have taken place even in the absence of the program.

¹³ In order to reduce the transaction costs of the program, it was decided that outcome verification would be done by satellite images and not by direct visit to selected lands, except in extreme cases where direct visits are required due to some preliminary issues identified at the satellite images stage.

¹⁴ Five in-depth interviews were carried out in December 2012 in the municipality of Talpa de Allende, Jalisco, Mexico. This municipality ranks among the top ten locations where Payment for Environmental Services projects have been directed in the last 10 years. It is home of the most threatened and biodiverse watershed of the country. The insights of these beneficiaries will be discussed later on the concurrent trust section of this chapter.

One source of the problem lies in the general nature of the verification variable of forest coverage for PSAH. More comprehensive PES or PES-like programs for carbon sequestration such as REDD+ require more sophisticated indicators at the Ejido-level in order to achieve contract compliance. As mentioned, PSAH is basically based on forest coverage results. The payment is based on yearly outcomes in terms of forest density conservation. Actions to keep the forest are encouraged but not enforced and the contracts are based on results. This design feature has policy consequences.

Results-based schemes may make additionality more difficult to identify and positive results could be achieved even in the absence of sustainable actions. However, and according to program designers, if conditionality were attached to action-based schemes, conservation results would be more difficult to monitor (Munoz et al; 2008). The Mexican PSAH scheme is a results-based scheme with a highly significant component of outreach from CNF. The opportunity cost of labor on high risk forests is also high. This is the main argument for PSAH to be results-based and not action-based. Another possible argument was the high monitoring costs of actions.¹⁵

PES and REDD+ programs in Mexico have been inserted into the international mitigation and adaptation climate change agenda. Specifically, Mexican PES programs have been pooled under the agriculture and forestry set of policy interventions for low carbon development around the country. It is important to note that the forestry sector

¹⁵ A way to bridge potential tradeoffs between outcome vs action-based processes has been to implement a requirement for PSAH participants under the Concurrent Fund modality. Participants need to develop a “Best Management Practices” plan at the end of the year of participation on the program.

where PSAH is included is considered to be one of the main engines to reduce carbon emissions in Mexico¹⁶.

Conceived as a single sector, agriculture and forestry provide the highest primary emissions potential (32%), followed by transport (27%), power (17%) and energy efficiency (16%). Payment for Environmental Services is one out of twelve interventions within the agricultural and forest sector that account for the highest global emission reduction potential in Mexico for the next 35 years¹⁷. Therefore, PSAH evaluation is not only a matter of public budget efficient resource allocation in present time, but also demonstrates the need and advantage of having a solid PES program that stands as a cornerstone of cost-effective policy options for Mexico in decades to come within the international climate change context. Under this scenario, in 2010, the World Bank published a strategy report titled *Low Carbon Development for Mexico* (Johnson et al; 2010). This World Bank document called MEDEC (a Spanish acronym that stands for *Mexico: A Study about Carbon Emissions Reduction*) provides key insights into the steps that need to be followed in order to significantly reduce Carbon Emissions in Mexico for the next forty years. One of these steps is directly related to *LULUCF* interventions (land use, land-use change, and forestry sector).

The document considers PES programs within the broader context of a comprehensive forest sector strategy for Mexico. In fact, they consider PES Mexican

¹⁶ One of the main conclusions of the document is that: “Although energy-related emissions dominate Mexico’s current and projected CO₂e trajectories, the forestry sector provides the single greatest potential for reducing greenhouse gas emissions over the coming decades. Forestry interventions are generally more costly than those in transport or energy efficiency (on a \$/t CO₂e reduced basis), but most interventions that combine the reduction of deforestation and forest degradation benefit with the productive use of biomass, especially for energy purposes, have net benefits”.

¹⁷ This scenario is based upon the construction of an economic and emissions model for Mexico to the year 2030, where the Business as Usual (BAU) trend is consistent with national income, energy estimates and international energy forecasts and markets. It also includes bottom-up analysis of GHG reduction potential to 2030 from major sectors (Johnson et. al., *op. cit.*)

programs, especially PSAH, along with other *LULUCF* interventions as first steps towards a comprehensive forest-sector low carbon strategy in which REDD+ is the main policy intervention (Johnson et. al., *op. cit.*). After PES contract termination, some of the most successful projects will serve as candidates for upgrading for REDD+ projects. The reasons that PES programs in Mexico are suitable for a broader range Climate Change mitigation and adaptation policy intervention in the form of REDD+ and other LULUCF interventions are that the policy process as well as the targeted population overlap. Furthermore, conditionality of PSAH established in user-provider contracts, although being a potential market failure source, represent similar mechanisms for future climate change adaptation initiatives (Angelsen, 2008). As a consequence of all these similarities, it is very likely that many PES projects will eventually become REDD+ projects (Pattanayak, 2010, *op. cit.*). As previously mentioned, one of the shortcomings of PSAH, according to the PES literature, is the relative short-time span (5-years) of the contracts, which compromises additionality attainment after contract termination. This drawback may be partially addressed if we consider that a fraction of successful PES projects will eventually be incorporated into climate change mitigation and adaptation initiatives.¹⁸

Future scenarios pinpoint PES as an important intervention for low carbon development in Mexico. Standard cost-benefit analysis draws negative net costs for the PES intervention. Net costs for the PES intervention and its relatively low mitigation reduction have to be carefully accounted for. While REDD+ interventions explicitly account for economic benefits for the productive use of biomass for the production of biomass and the substitution effect for fossil fuel inputs, positive externalities and indirect

¹⁸ The other way in which it will be addressed is through a potential behavioral change of program beneficiaries during their participation on the program through the application of Best Management Practices (BMP's) and/or the provision of environmental local public goods. This other venue will be discussed later on this chapter.

benefits of PES through forest conservation were not included in the MEDEC study methodology¹⁹. Furthermore, the scenario assumes an extension of five million hectares for PES, and that program effectiveness continues to be stable. However, as it will be discussed in depth in the next chapters. There are ample opportunities for targeting, and hence effectiveness improvement, leading to greater mitigation impacts of PES policy intervention.

Table 5 summarizes the total costs and benefits that each forest sector related intervention will potentially have according to baseline information. PES programs in Mexico are projected to mitigate 4.4 tons of CO₂ annually at a cost of \$18.1 per mitigated ton. Overall, this is a relatively low mitigation impact as compared to other forestry and REDD+ initiatives for energy purposes such as biomass electricity and charcoal production. It is relatively low even for other interventions whose goal is not the productive use of biomass, such as wildlife management, which provides a maximum annual mitigation reduction of 27 tons of CO₂ per year.

¹⁹ Stated- Preferences and Revealed-Preference methods such as Contingent Valuation that account for use value, option value and existence value were not included in the MEDEC estimations since the scale of the study was at the national level. Clean Development Models (CDM's) were also not included. Finally, transaction costs are omitted from the analysis and scenarios given their complex and intangible nature.

				Maximum annual mitigation reduction [MtCO ₂ e/yr]	Net cost or benefit of mitigation [US\$/tCO ₂ e]	
Forestry	REDD	Productive use of biomass	For energy purposes	Biomass electricity	35.1	2 (benefit)
				Fuelwood co-firing	2.4	7 (cost)
				Charcoal production	22.6	20 (benefit)
		For other purposes	Forest management	7.8	13 (benefit)	
		No productive use of biomass	Wildlife management	27.0	18 (cost)	
	Payment for environmental services		4.4	18 (cost)		
	Reforestation / afforestation	Reforestation and restoration		22.4	9 (cost)	
		Afforestation		13.8	8 (cost)	
	Agriculture	Zero tillage maize		2.2	15 (benefit)	
	Liquid biofuels	Sugarcane ethanol		16.8	11 (cost)	
Sorghum ethanol		5.1	5 (cost)			
Palm oil biodiesel		2.4	6 (cost)			

Table 4-4. Mexico’s Low Carbon Development Scenarios for Agriculture and Forestry Interventions for 2030.

Source Johnson, Todd M. MEDEC: Low-carbon development for Mexico

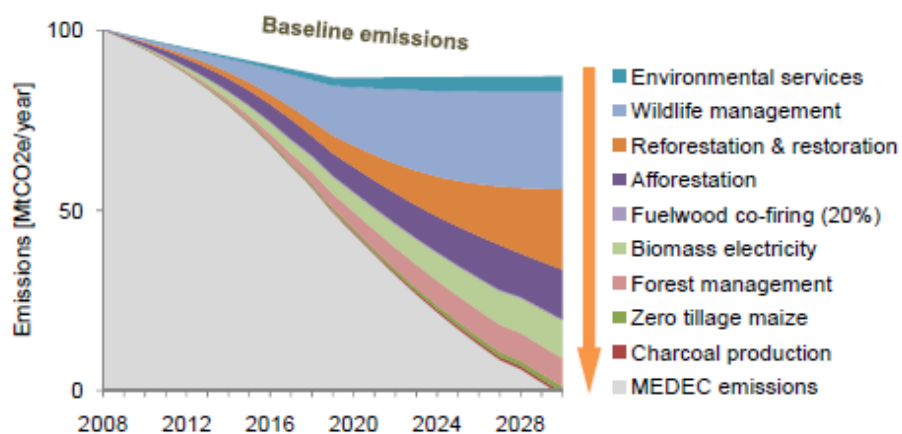


Figure 4-4. Land-Use Emissions wedge graph

Source Johnson, Todd M. MEDEC: Low-Carbon development for Mexico

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