



Evaluating the Pilot Implementation of Payment for Forest Environmental Services in Lam Dong, Vietnam

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WorldFish

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EVALUATING THE PILOT IMPLEMENTATION OF PAYMENT FOR FOREST ENVIRONMENTAL SERVICES IN LAM DONG, VIETNAM

Nguyen Thi Y Li

EXECUTIVE SUMMARY

This study aims to assess the performance and the short-term impacts of the payment for forest environmental services (PFES) policy in Lam Dong Province, Vietnam. After a two-year pilot implementation (2009-2010), the Vietnam government plans to establish a national legal PFES framework. The paper describes the PFES pilot policy and how this pilot project is being implemented. The study focuses on the economic and environmental impacts of the pilot PFES.

Economic effectiveness is estimated in terms of household annual income contribution, improved access to financial resources, and employment improvement. The environmental impact is assessed by proxy variables such as time spent conducting forest protection and conservation, amount of illegal logging, forest removed or burned, and farmers' and local authorities' awareness of environmental improvement.

By applying the propensity score matching and difference in difference methods, the research found that PFES has contributed to increasing annual household income by about VND 3.9 million/household per year. It has also generated positive effects on forest environmental services as well as improved the awareness of local farmers and authorities of the value of forests and the need for their protection. However, some problems remain and are associated with the following: forest environmental services have not been fully defined; participation is not completely voluntary; payment relies on a top-down mechanism; and the sustainability of the system is not assured.

1.0 INTRODUCTION

1.1 Statement of Problem

The world's forest area is approximately 4 billion ha, accounting for 30.3% of the total land area (FAO 2007). Forest is very important, not only to human life but also to the global economy. However, deforestation is a challenge because each year about 13 million ha of the world's forests are lost due to deforestation (FAO 2005). In an attempt to deal with this issue, several programs and activities related to reforestation, such as establishing forest protection areas, the prohibition of illegal logging and wood trading, and forest certificates, have been implemented. Payment for forest environmental services (PFES) is an innovative approach to the conservation of forests and it is one that has been applied in both developed and developing countries (Wuner et al. 2008). PFES is a highly promising conservation approach that can benefit buyers and sellers as well as improve the resource base (Wunder 2005). Globally, Costa Rica is the pioneer country in this area, applying payment for environmental services (PES) based on market mechanisms. This tool has also been applied in EU countries, the USA, Australia, and Latin America in recent years.

Forests are an important resource that provides products and services for national economic development in Vietnam. Up to 2008 forest cover accounted for 38.27% of the total land area of Vietnam, an area equivalent to 12.9 million ha (Tuan 2009). Besides contributing to the livelihood improvement and poverty alleviation of local people in rural and highland areas, forests play a vital role in environmental protection, watershed regulation, land stabilization, clean water provision, and the prevention of sediment in reservoirs. In recent years forest conservation and development have become priority tasks within national development schemes.

The government has been the lead entity responsible for forest protection and development. Several programs have been applied such as: Program 327 (1992) was aimed at “Re-Greening the Barren Hills”; Program 556 (1995) tried to refocus the activities of Program 327; Program 661 (1998) was called the “Government’s Five Million Hectares Reforestation Program” (The and Ngoc 2006); and various other command and control management programs. However, these programs had not fully utilized payment for forest environmental service principles. Therefore, in April 2008, the Vietnam government issued Decision no. 380/QĐ-TTg to implement payment for forest environmental services nationwide. The policy aims to make PFES compulsory in Vietnam, but it was first piloted for a two-year period in Lam Dong and Son La provinces. Experiences and lessons learned in the Vietnamese context were used to build a national policy (2011 onwards).

So far, this policy has been implemented in Lam Dong Province (Figure 1), facilitated by the Lam Dong Forest Protection and Development Fund (FPDF) under the management of the Lam Dong Department of Agriculture and Rural Development (DARD) and the provincial people’s committee. Payment has been asked for three major services: watershed regulation, sediment reduction, and the preservation of scenic beauty, which is vital to tourism. Consequently, from 2009 to 2010, the local people who were allocated forest land for conservation and protection were compensated by about VND 300,000 per ha. This figure is higher than the VND 100,000 per ha currently paid by government’s 661 Program.



Figure 1. The pilot areas, Lam Dong Province

The program has generated positive effects on the environment and on local life. However, qualitative and quantitative research on the impacts of the pilot program has yet to be conducted to synthesize the lessons learned. This research assesses the following: the implementation of the pilot program; its effects on the economy and on the environment; and the critical conditions for the success of PFES in the study areas as well as in a wider Vietnamese context.

1.2 The Significance of the Study

Generally, the implementation of a pilot project is evaluated in order to distill the lessons learned for the benefit of interested audiences. As PFES is going to be implemented nationally, it was essential to study its results, advantages and weaknesses. These results are also needed to plan for the next stage of implementation. This paper analyzes the implementation of PFES in Lam Dong Province to assess its legal, political, financial, and capital feasibility as a policy. As the first country in Southeast Asia to launch PFES as a national policy, Vietnam’s experiences will be useful to Vietnam and to other countries that are going to apply PFES.

1.3 Research Questions

The paper aims to answer the following questions:

- 1) How was the pilot PFES designed in Vietnam?
- 2) How has it been implemented in Lam Dong Province?
- 3) What are the impacts of PFES on the environment and household incomes?
- 4) How has equity been addressed via implementation? How do different stakeholders behave in this program?
- 5) What needs to be improved when designing and implementing the program at a national level?

1.4 Research Objectives

The general objective of this study is to assess the achievements and identify the lessons learned to improve the PFES policy in Lam Dong. Specifically, the study:

- 1) assesses the components of PFES design in Vietnam and in Lam Dong Province;
- 2) analyzes the implementation of PFES in Lam Dong Province in terms of financial budget, legal feasibility, equity, implementation mechanism, and stakeholders;
- 3) evaluates the short-term impacts of PFES on the economy and on the environment;
- 4) explores and explains how different stakeholders perceive the implementation, monitoring, and management of PFES;
- 5) analyzes the behavior of stakeholders regarding PFES and of equity in the implementation process; and
- 6) draws lessons and figures out recommendations for the improvement of PFES.

1.5 Scope of the Study

The study assesses the performance and evaluates the impacts of the two-year pilot PFES policy in Lam Dong Province. It focuses on the implementation of the policy in four piloted zones: three districts – Lac Duong, Don Duong, Duc Trong – and Da Lat City. The study relied on household surveys, in-depth interviews and focus group discussions (FGD) involving local authorities, experts, farmers, and other stakeholders.

Individuals and companies paying for services were interviewed to evaluate service quality and payment levels as well as to elicit comments and suggestions to improve the program. The lessons learned will help to ensure the program's sustainability in the future. Implementation issues related to payment mechanisms, monitoring systems, finances, human resources, and legal framework were assessed.

Economic and environmental impacts were evaluated by estimating the changes in local income, forest area, amount of illegal logging, and forest density/quality since the program was implemented.

2.0 REVIEW OF LITERATURE

2.1 PES Synopsis

2.1.1 Definition

PES can be broadly understood as economic incentives providing return for environmental services (ES) as a result of beneficial activities such as reforestation, watershed protection, and soil conservation (The and Ngoc 2006). Wunder (2005) described PES as having the following five criteria:

- a voluntary transaction;
- a well-defined environmental service;
- being '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.

2.1.2 Scope of PES

Forests provide not only direct use values but also indirect and non-use values. However, these values are usually underestimated because there is no market for them. The forest environment is protected by certain members of society who depend on the forest to make a living, but they are often uncompensated for their conservation activities. There are no financial or economic incentives for land holders or natural resource managers to conserve their forest if they bear all the costs. The PES mechanism has been established to internalize the cost for ecosystem conservation and to generate economic incentives for landowners managing the ecosystem in a sustainable manner. PES recognizes these indirect values and encourages people conserving ecosystems by providing compensation to overcome the high opportunity costs of conservation (Emerton 2008).

2.1.3 PES Stakeholders

The principle of PES is that those who provide environmental services should be compensated, while those who receive the services should pay for the service providers. The providers and users can negotiate a bilateral agreement that makes both parties better off (The and Ngoc 2006). Therefore, the stakeholders in PES regularly include service sellers, buyers, and intermediaries.

Who are the sellers?

Engaging effectively with the sellers (providers of environmental services) is a critical foundation for PES. This ensures the sustainability of the mechanism, the positive environmental outcomes for the service buyers, and the improvement of the livelihood of the service providers (Zbinden et al. 2005). Generally, potential ES providers are landholders doing ecosystem conservation and development. The property rights of landholders should also be mentioned because in some countries the individual owns the private land property, while land belongs to the state or to local communities in other countries. The PES program can be aimed wholly or partially at public land such as protected areas (Engel et al. 2008).

Who are the buyers?

Buyers are people or entities that benefit from environmental services. These are the actual environmental service users, the government, NGOs, and international organizations. Buyers can also be a mix of local, national, and international beneficiaries.

In a 'user-financed' PES program, the buyers are the actual users of an ES and pay directly to the service providers or through intermediaries. In 'government-financed' PES programs, the buyers are a third

party acting on behalf of services users. This is typically a government agency but it could also be an international financial institution or conservation institution in the case of global externalities (Engel et al. 2008).

Intermediaries

Knowledge of the PES principle is still fairly new for service sellers and buyers. Generally, the implementing institution of the PES can be a multi-actor organization like a watershed authority or a micro-watershed management committee with representatives from the government, private institutions and NGOs, and with procedures that guarantee transparency and impartiality (Maina et al. 2007). The government usually plays a facilitator or moderator role in linking service providers to buyers. It also establishes the policy and institutional framework supporting payment implementation. As the moderator, the government needs to set up the payment level based on seller and buyer capacity. In addition, local and regional governments are required to collaborate with and encourage help from consultants from international organizations and NGOs.

2.2 Characteristics of the PES Program

2.2.1 How are PES mechanisms established?

Types of environmental service

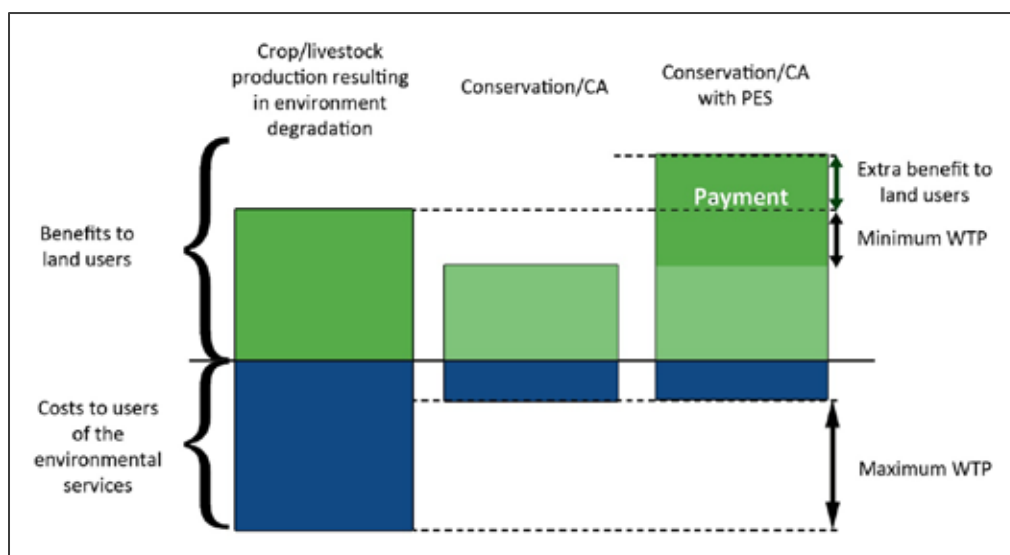
In order to evaluate the feasibility of a payment scheme for environmental services, studies regarding supply and demand for environmental services must be carried out. Generally, the ES can be grouped into four broad categories: watershed protection, carbon sequestration and storage, biodiversity, and natural beauty.

Payment level establishment

Landholders have several ways of generating benefit via their land so the revenues to service providers must be good when compared to other land use alternatives. But while the payment must be more than the land opportunity cost, it must be less than the value of the benefit of services. Hence, the payment levels must be carefully determined by adjusting the supply (willingness to accept) and demand (willingness to pay) of environmental services. Maina et al. (2007) expressed this principle in Figure 2. Landowners are willing to accept the minimum level equal to the lowest opportunity cost. The payment must obviously be more than the additional benefit to land users for the alternative land use (Pagiola et al. 2003).

Not all farmers provide the same level of environmental services when participating in a program, and ideally PES schemes should offer differentiated levels of payment to correspond to these differences (FAO 2007). But it takes time and money to determine payment at an individual level, relying on their service quality and quantity. It is also very difficult when there are several alternative land uses, hence there will be different opportunity costs. Many PES programs pay a fixed level per hectare for given activities to simplify the procedure.

Cash is considered to be the most flexible and preferable mode of payment in PES systems. Cash is most appropriate when ES suppliers forego cash income to comply with a PES contract (Wunder 2005). However, PES schemes can also provide compensation packages mixed with other benefits such as access to credit, capacity building, information, and other collective or individual services (Mayrand and Paquin 2004).



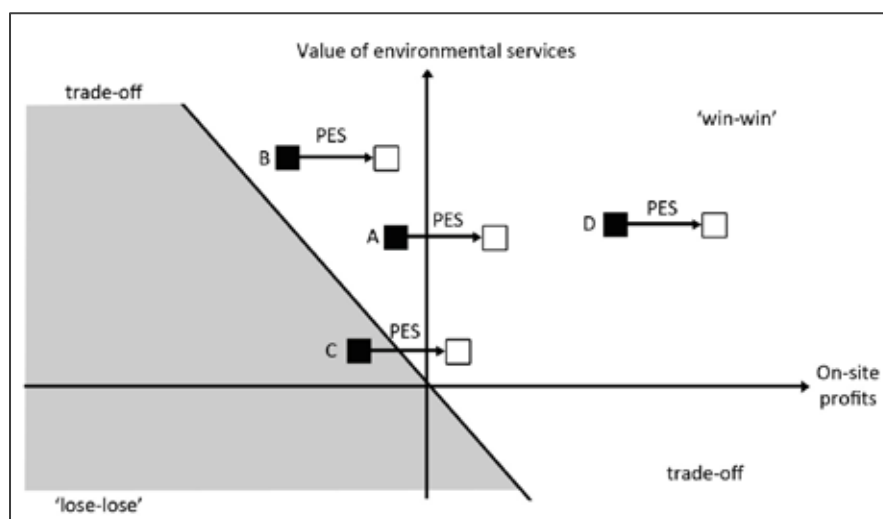
Source: Maina et al. 2007

Figure 2. Conceptual framework of payment for ES under agricultural production

2.2.2 The effectiveness and efficiency of the PES program

Several papers have mentioned the income and non-income effects of PES. As long as participation in PES programs is voluntary, there is a preliminary assumption that they will make participants better off. In addition, PES contributes to social and environmental impacts such as environmental service quality, employment, and social security.

The framework to evaluate the effectiveness of the PES program originated from Pagiola (2005) and is presented in Engel et al. (2008) (Figure 3). The vertical axis denotes the net value of environmental services generating to others and the horizontal axis stands for landholders' net profitability. The win-win quadrant shows the best case, in which PES generates benefits for both landowners and environmental services. The lose-lose quadrant represents implementation of PES that does not bring benefits to land users and generates a negative impact on the environment. Cases that have a negative impact on the environment but gain benefits for landholders are presented in the bottom-right and top-left quadrants, respectively. Normally, the efficiency of the PES program assessed from the social viewpoint is higher than that assessed individually because PES gives benefits to society much higher than social costs. Hence, the 45° diagonal indicates that the implementation of PES brings positive total social value.



Source: Engel et al. 2008

Figure 3. A framework to analyze the efficiency of PES

2.2.3 Challenges and issues in PES design and implementation

In principle, PES is a simple mechanism, but practically, there are several challenges and issues in designing and implementing it. Wunder (2005) identifies two key problems in PES implementation: (1) limited demand, and (2) poor knowledge of the institutional requirements of the program.

Land tenure is another challenge because PES influences the activities of landholders. Service buyers want to be certain that they are entering into a contract with those who are able to determine land use over the long-term. In addition, service sellers are unlikely to participate unless their rights to the land are strong enough to guarantee that their investment will not be lost (United Nations 2009).

One of the most obvious and significant potential hindrances to the participation of poor people in PES is transaction costs. Working with many small dispersed farmers imposes high transaction costs, and special efforts are needed to ensure that the poor have access to the new opportunities created by PES programs (Pagiola et al. 2003).

Another significant challenge is overcoming existing inevitable inequalities in the design process (United Nations 2009). Service providers are usually poor, uneducated, and lack information. It is not easy for them to understand what environmental services are, and they usually make mistakes in making commitments.

Finally, the implementation of PES is a process that involves the collaboration of different organizations so the success of PES programs depends on successfully coordinating the policies and efforts of relevant authorities (United Nations 2009). The management mechanism of most developing countries is organized as a system from the top to the bottom, and from the national to the regional then to local levels. Ensuring coordination between these levels presents another challenge.

2.3 Selected Experiences of PES

PES has been employed in some high income countries such as the USA and in European countries. The US Conservation Reserve Program spends about USD 1.5 billion annually to contract for 12-15 million ha. In Europe, 14 nations spent an estimated USD 11 billion between 1993 and 1997 to divert over 20 million ha into long-term set-aside and forest contracts (The and Ngoc 2006).

Costa Rica

Costa Rica pioneered the first formally-labeled PES program in 1996-1997 and since then there have been more than 280 PES programs documented worldwide (United Nations 2009).

PES started in Costa Rica in 1997 (Pfaff et al. 2008) as an alternative approach to halting environmental degradation as a result of deforestation (Russol and Candela 2006). The National Fund for Forest Financing (FONAFIFO) was established to collect money from beneficiaries then to distribute this income among service providers.

The environmental services defined include carbon sequestration and storage, watershed protection, biodiversity protection, and landscape beauty (Pagiola 2008). Service providers are individual farmers contracted to conserve, reforest, or manage forest sustainably throughout the life of individual contracts (Russol and Candela 2006). Service buyers are fuel consumers, hydro-electricity companies, countries that need green house gas emission permits, and international donations.

The payment mechanism is based on the opportunity cost of land (OCL), in which the payment level must be greater or at least equal to the OCL. Compensation to landholders is set for a five-year period and varies in payment level according to the type of activity undertaken: reforestation (USD 450 per ha), forest preservation (USD 200 per ha) and agroforestry systems (USD 0.75 per tree). The payment fund comes from fuel companies, the World Bank, the Global Environment Facility, and the Ecomarkets Project.

Mexico

In Mexico, the PES program for hydrological services began in 2003 (the project focused only on water services). Payments are made to individuals and communities as incentives to preserve existing forests (Alix-Garcia et al. 2005).

The design of Mexico's PES program was strongly influenced by its political and lobbying processes. The payment was considered a subsidy program because the payment mechanism was not based on the competitive market. In addition, the government was involved as the only buyer in choosing which forest plots would be eligible for payment (Pina et al. 2007), and the federal government decided on almost everything. The payment level was chosen based on the land opportunity cost as a fixed-price, with USD 27.3/ha per year for cloud forest and USD 18.2/ha per year for normal forests.

Consequently, several issues were generated in the implementation process, and the program's objective was not achieved. For instance, the government gave priority to the poor and to high-risk deforestation. The results showed that 50%-70% of the forests were at a low risk of deforestation, the poorest people did not participate, and most of the participants were not located in areas given high priority according to water scarcity criteria (Pina et al. 2007). Many implementation tasks were rushed and there was no standard procedure, hence there were misinterpretations and the program was delayed (Alix-Garcia et al. 2005).

The Philippines

In the Philippines, PFES has not been established to rely on comparative markets. Here, PFES could be considered an environmental service subsidy or compensation because the payment level does not depend on market mechanisms. Francisco (2003) presented four case studies of forest environmental service payments in the Philippines that all originated from the idea that "upland communities collaborating in the implementation of forest/watershed management projects could be paid or compensated in terms of wages for services rendered, provision of free planting materials, conduct of skills-training, technical assistance, and tenure security, among others. Hence, the payment now takes the meaning of rewards."

In the cases presented, service sellers are upland farmers using agriculture land sustainably, doing reforestation, and watershed rehabilitation. Service buyers are water users, hydroelectric consumers, hydropower companies, bio-prospecting firms, generators of carbon gases, and society. Funding is contributed not only by private beneficiaries but also by government, NGOs, and other international organizations.

3.0 RESEARCH METHOD

3.1 Methods to Assess the Implementation of the PES Pilot Program in Lam Dong Province

3.1.1 Stakeholder analysis

The research applies a review of the literature, a survey-based approach, and direct observations to analyze the performance of the pilot policy. The performance of the PES policy is evaluated for legal/institutional and political feasibility, financial and human resources for implementation, and for the impacts of the PFES project on service buyers, sellers, and on the environment.

Stakeholder analysis aims to review and discuss the problems of the project from different perspectives, understanding how different stakeholders are affected in different ways, and what kinds of solutions are presented and by whom.

3.1.2 Payment rate identification analysis

The research investigates the basis for the payment level in Lam Dong Province and also estimates the appropriate payment rate, relying on forgone opportunity costs and providers' statements. In addition, to assess the appropriate payment rate, we compare the actual compensation with the costs of inputs used to provide services. Through the household survey, we identify the total cost for forest conservation and protection including labor costs and equipment.

3.1.3 Analysis of the behavior of service providers

In Vietnam all land is owned by the government and landholders only have a right to use land for a limited period; therefore, participation cannot be fully decided by farmers. Like most PES in developing countries, the selection is based mainly on geographic criteria (a selected participant must live within the forest area or in the buffer zone) and meeting of the minimal criteria: having enough labor for forest conservation, participation is voluntary, and the first priority is given to ethnic minorities and poor households. Hence, the local inhabitant's behavior in this program is the condition for sustainability. The decision of farmers to participate in providing forest ES can be analyzed by FGDs, surveys, and depth interviews to answer the key questions: are they willing to participate? Why do they participate or not? Will they participate when PFES is applied nationally? And what do they expect to gain by participating in PFES?

3.1.4 Analysis of the behavior of service payers

The study used a semi-structured questionnaire to interview representatives of service users including the Dai Ninh Hydropower plant in Binh Thuan Province, the Da Nhim Hydropower plant in Ninh Thuan Province, the Water Supply Company of Ho Chi Minh City, the Dong Nai Water Supply Company, and organizations and individuals conducting ecotourism businesses in the pilot areas. Their opinions on payment responsibility, assessment of environment service, and payment level were collected in order to understand the payer's behavior.

3.1.5 Analysis of the equity in PFES' pilot implementation

Equity is a key component of sustainable development and a key criterion to take into account in the development and implementation of PES (Corbera et al. 2006). Equity analysis is necessary to test the first criterion of real PES (voluntary transaction). This research limits the equity in PES design and implementation to three elements: equity in access, equity in decision making, and equity in PES outcome. Equity in access concerns the mechanism by which individuals or organizations are legal, able, and willing to participate in the PES scheme. This is evaluated by information access, land and forest resource access, knowledge, and networks. Equity in decision making indicates whether all stakeholders participate in designing, adjusting, and meeting the PES. The research focus is on whether the poor, limited knowledge, limited resources, and women are considered when designing PES schemes. Equity in PES outcome refers to the distribution of PES benefits to different program participants, specifically the net benefit from PES and perceived fairness from landholders. In this research, the net benefit is assumed as payment. Ideally, schemes should offer differentiated levels of payment to correspond with the actual outcome level of providing for ES. The reward for ES providers could be equitable if benefit is varied, relying on their service quality, quantity, and opportunity cost. In this part, we also assess the benefit distribution among the poor, non-poor, ethnic, indigenous and non-indigenous peoples by considering the payment distribution across all participants.

3.2 Method of PFES Impacts Evaluation

3.2.1 Time dimension and baseline for evaluation

The choice of baseline to compare the differences between with the PFES project and without the PFES project is important to determine PES efficiency. An environmental service baseline must be constructed to see whether the project generated effects or differences. To avoid inconsistencies in the baseline, the research will compare the current situation with the baseline situation that occurred without PFES to evaluate the impacts of the pilot policy. In addition, the livelihoods of households before and after the program will be compared to see the contribution of the PES program. It means that the baseline for comparison is dynamic by time.

3.2.2 Theoretical base

Internationally, several studies have been conducted to evaluate the impacts of PES programs on economics, society, and the environment. However, this paper emphasizes the methods used to evaluate the PES programs in Costa Rica, Mexico and Vietnam.

In Costa Rica, Locatelli et al. (2007) evaluated the impacts of reforestation under the PES program on local development in the north of Costa Rica. They applied a fuzzy, multi-criteria analysis including socioeconomic, institutional, and cultural dimensions and it was based on the individual perceptions of landowners. The impacts of PES on local development were broken down into 12 criteria and 27 indicators to compare the situation with and without PES. The data were collected by interviewing 37,132 landowners receiving PES for reforestation in the area. In addition, fieldwork was conducted and experts met with national and local governments to figure out and weigh the impact criteria and indicators. The results showed that the impact of PES on local development depended on the composition of the beneficiaries; the PES applied to reforestation had a globally positive effect; and the negative economic impacts were balanced by the positive institutional and cultural impacts.

"Paying for Environmental Services: An Analysis of Participation in Costa Rica's PES Program" (Zbinden and Lee 2005) analyzed the factors that influence both PES participants and non-participants. The binary logistic model was used to analyze the decision of a landowner to participate in the reforestation program. A multinomial logistic regression analysis was used for the decision of a forest owner to participate in forest protection, sustainable management, or in both aspects of the program. The research was done by the data collected in mid-2002 by conducting a survey of 246 land and forest owners in the northern lowlands of Costa Rica. The study showed that farm size, human capital and household economic factors, and access to information were significant variables that affected participation in PES.

Pfaff et al. (2008) evaluated the impact of PES on Costa Rica's deforestation rate by applying the matching method. They employed the matching estimation method to compare the complete lack of deforestation on PES land with the deforestation on untreated land with similar demographic features to the PES land. Data were collected from primary data and household surveys (participants and non-participants in the PES program from 1997-1999). They found that PES had a very small impact on deforestation. In particular, a five-year forest protection contract was signed in 1997, 1998, and 1999, which prevented deforestation in the first contract year, but only 0.21% of the total land enrolled. The covariate matching standard errors suggest no significant impact from PES.

In Vietnam, some of the first pioneer research on PES was "Payment for Environmental Services in Vietnam: Assessing an Economic Approach to Sustainable Forest Management" (The and Ngoc 2006). This research was done when PES had not yet been applied in Vietnam. An experimental PES scheme on sustainable forest management was conducted for a 26-month period in Thua Thien Hue Province. Cash payment was used to compensate forest owners who adopted a sustainable forest management program. The payment level was determined based on the farmer's willingness to accept VND 140,000/ha per year (USD 7.4) and VND 156,000/ha per year (USD 8.2). As a result, payment from the PES program had a limited effect on household income (only 2% of adapting household income), indicating that the PES program had no significant impact on poverty reduction. Nevertheless, the PES program did have positive social and environmental effects.

From this overview, to evaluate the impacts of PES, three main cluster effects should be identified: effects on sellers, on environmental services, and on intermediaries. Other papers have mentioned that the effects could be evaluated as income, non-income, and in-direct benefits. Some impacts are visible and quantifiable and some are invisible or unquantifiable so choosing criteria or indicators for evaluation depends on the available data.

3.2.3 Measuring the economic and environmental impacts of the PES scheme in Lam Dong

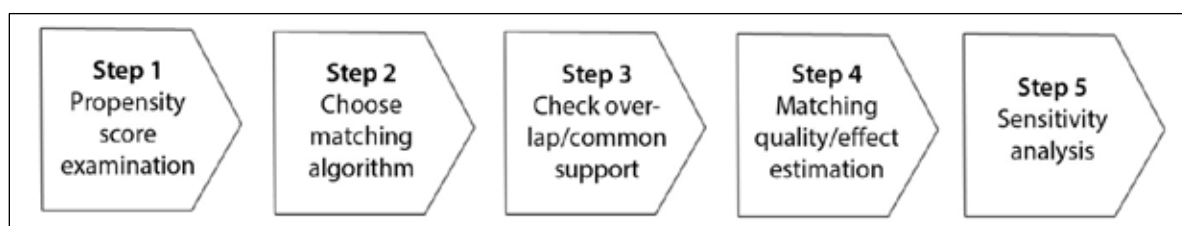
The preliminary economic impacts of the pilot policy on stakeholders and its impact on the targeted environmental services was evaluated through quantitative and qualitative data. The paper focuses on economic and environmental influences by using the following indicators.

Economic impact

The most obvious impact of a PES program on participants is the additional income it provides (Pagiola et al. 2005). The impact of PFES on annual household income is estimated by the average difference between participants and non-participants as well as before and after participation by applying the propensity score matching and difference in differences (DID) methods.

Propensity score matching

This method is used to compare the outcomes of program participants with those of matched non-participants, where matches are chosen on the basis of similarity in observed characteristics (Todd 2006) (Figure 4). The paper applies matching estimators to compare the difference in annual household income between participants and non-participants.



Source: Caliendo and Kopeinig 2006

Figure 4. Necessary steps when implementing PSM

Assuming that there are two potential outcomes, denoted $Y_i(0)$, $Y_i(1)$ represents the annual income for farmer i with treatment and without treatment, respectively. X_i is a $(k \times 1)$ vector of covariates affecting outcome along with the treatment including variables capturing the socioeconomic characteristics and input usage of the sample farms. Given the vector of these variables, the net income of farmer i will vary depending on the participation on PFES.

$$Y_i = Y_i(T_i|X_i) = \begin{cases} Y_i(1|X_i) & \text{if } T_i = 1 \\ Y_i(0|X_i) & \text{if } T_i = 0 \end{cases} \quad (\text{Equation 1})$$

With the outcome $Y_i(1|X_i)$ and $Y_i(0|X_i)$, the impact on household annual income, as a result of participating, can be calculated as:

$$\Delta Y_i = [Y_i(1|X_i) - Y_i(0|X_i)] \quad (\text{Equation 2})$$

Step 1: Propensity score (PS) estimation

PS is actually the probability that a person is assigned to a particular treatment group given a set of known covariates. PS seeks to create comparison groups that are similar on all covariates but different in treatment levels. Two choices have to be made when estimating the PS, including the model to be used for the estimation, and the variables to be included in this model. In this research, the model i relied on the logit model with impact of related variables on the probability of farmers' decision to participate.

Step 2: Choose a matching algorithm

There are different matching algorithm choices when matching (Figure 5). The nearest matching estimator is the most straightforward matching when the individual from the comparison group is chosen as a matching partner for a treated individual that is closest in terms of the PS. Caliper and radius matching imposes a tolerance level on the maximum propensity score distance (caliper). Stratification and interval matching partitions the common support of the propensity score into a set of intervals and to calculate the impact within each interval by taking the mean difference in outcomes between treated and control observations. Kernel and local linear matching are non-parametric matching estimators that use weighted averages of all depending on the choice of the kernel function – individuals in the control group to construct the counterfactual outcome.

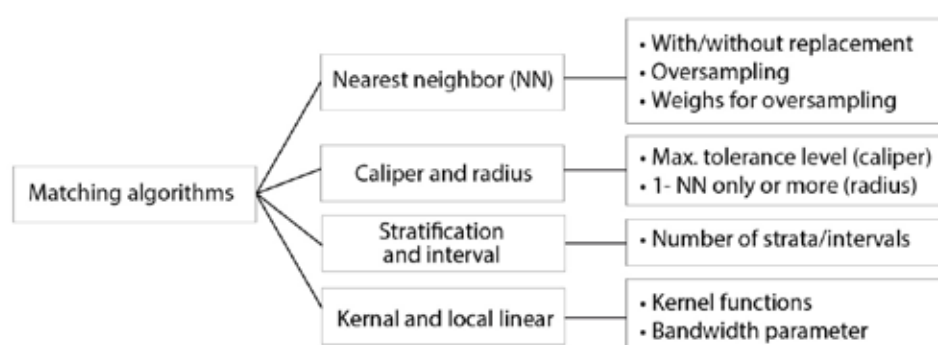


Figure 5. Choosing a matching algorithm

Step 3: Check overlap/common support

ATT are only defined in the region of common support. Hence, only the subset of the comparison group comparable to the treatment group should be used in the analysis (Caliendo 2008).

Step 4: Assessing the matching quality

This involves checking if the matching procedure is able to balance the distribution of the relevant variables in both the control and treatment group.

Step 5: Sensitivity analysis

Sensitivity analysis is done by testing the statistical significance of treatment effects and computing their standard errors.

Difference in difference (DID)

If one just observes the outcome difference between treatment and control in areas with performance payments, one cannot discern the PES impact separately from omitted variables such as the recipient's location, schooling, conservation attitudes, etc. (Wunder 2005).

Hence, with this basic 2x2 design (before-after and control-treatment), program impacts are estimated by calculating the difference in annual income between treatment and control groups after program implementation minus the difference in annual income between treatment and control groups prior to the implementation (Figure 6).

$$Y_{it}^j = \alpha + \alpha_j D_t + \alpha^j D^j + \varepsilon_{it}^j \quad (\text{Equation 3})$$

$$\text{Where } D_t = \begin{cases} = 1 \text{ for after} \\ = 0 \text{ for before} \end{cases}$$

$$D^j = \begin{cases} = 1 \text{ for treated} \\ = 0 \text{ for control} \end{cases}$$

$$D_t^j = 1 \text{ for both } j \text{ and } t = 1$$

* Group treated:

$$\text{- Before: } Y_{i0}^1 = \alpha + \alpha^1 D^1 + \epsilon$$

$$\text{- After: } Y_{i1}^1 = \alpha + \alpha_1 + \alpha^1 D^1 + \beta + \epsilon$$

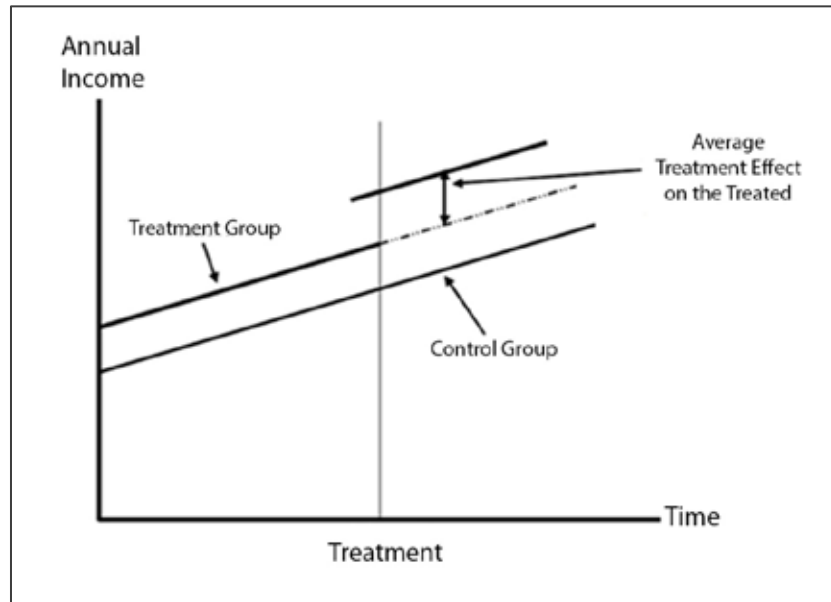
* Group control:

$$\text{- } Y_{i0}^0 = \alpha + \epsilon$$

$$\text{- } Y_{i1}^0 = \alpha + \alpha_1 \epsilon$$

$$\text{DID} = (Y_{i1}^1 - Y_{i0}^1) - (Y_{i1}^0 - Y_{i0}^0) = \beta + [\epsilon^1]$$

(Equation 4)



Source: Pattanayak, 2009, p 25

Figure 6. Difference in differences estimator

Environmental effects

So far, PES schemes have been proved to have had effects on watersheds, carbon sequestration, biodiversity conservation, landscape beauty and bundled services (Mayrand and Paquin 2004). However, for the pilot period, these effects were not clearly recognized or measureable so the paper used the following proxy variables.

- Total number of days per month a household spent protecting the forest before and after PFES implementation. Information collected by household survey. The more days a household spends on forest protection, the better the forest quality.
- Amount of decrease in illegal logging per year after applying PFES. The current forest area could be conserved if illegal logging is prevented. Amount of illegal logging was measured based on secondary data and interviews with local forest managers.
- Forest removed or burned: forest burning is the critical challenge in Vietnam so far, especially when the drought season is longer as a result of global climate change. This research measures the forest burning area before and after PFES policy. It is expected that if forest holders are more responsible for preventing forest burning, then forest burning will decrease.
- Deforestation rate: this is a direct criterion to assess the impact of the PES scheme on forest resources. This information was collected through interviewing households and meeting local forest managers. Deforestation will be compared before and after participation in the PES scheme.
- In addition, the paper also evaluates the pilot policy through some qualitative indicators such as knowledge of PFES amongst farmers and in local authorities; forest protection training for farmers; and increased awareness of farmers' responsibility for sustainable forest management and conservation.

3.3 Data Collection

The paper relies on several data resources such as literature reviews, internet research, statistical data, household surveys, and in-depth interviews with PFES stakeholders and experts. The research engaged the following surveys in order to obtain the above-needed information.

1. Two focus group discussions held with Dasar and Da Nhim forest management boards, belonging to Lam Vien and Da Nhim forest owners.
2. In-depth interviews with local authorities, from provincial to commune levels, consultants, Vietnam MARD, and PFES experts in Vietnam (Winrock International).
3. Some 13 personal interviews with payers, using a semi-structured questionnaire.
4. Meetings and discussions with all forest owners in the pilot area.
5. Four sets of questionnaires, designed for household participants and non-participants, service users, and local authorities.

This data were gathered by a questionnaire conducted randomly and through interviews with PFES participants and non-participants. The number of households is determined by the following formula:

$$n = \frac{N}{1 + Ne^2} \quad (\text{Equation 5})$$

Where: n = sample size;
 N = total number of households in the area; and
 e = desired margin of error

A total of 3,594 households participated in the PES program in Lam Dong up to December 2010 (Table 1). Of this figure, 749 households were interviewed, broken down into 366 participants and 383 non-participants. The 366 participant households were from Da Lat City (46) and the districts of Don Duong (56), Lac Duong (129), and Duc Trong (123).

Table 1. Allocated sample size of household survey among research areas

Location	Participating households	Participant	Non-participant
1. Da Lat City	458	46	46
1.1 Tay Nguyen Forest Seed Joint-stock Company	192	19	19
1.2 Lam Vien Forest Management Department	230	23	23
1.3 Tuyen Lam Tourist Management Department	36	4	4
2. Don Duong District	686	69	69
2.1 Don Duong Agri-forest Company	262	26	26
2.2 Dran Forest Management Department	424	43	43
3. Lac Duong District	1,288	129	129
3.1 Da Nhim Forest Management Department	843	84	84
3.2 Bidoup-Nui Ba National Park	439	44	44
3.3 Dankia Forest Management Department	6	1	0
4. Duc Trong District	1,144	122	139
4.1 Ninh Gia Forest Management Department	185	18	18
4.2 Dai Ninh Forest Management Department	145	15	15
4.3 Ta Nang Forest Management Department	832	89	106
Total	3,594	366	383

4.0 PILOT POLICY FOR PFES IN LAM DONG PROVINCE

4.1 General Information on Research Area

4.1.1 Forest resources in Lam Dong Province

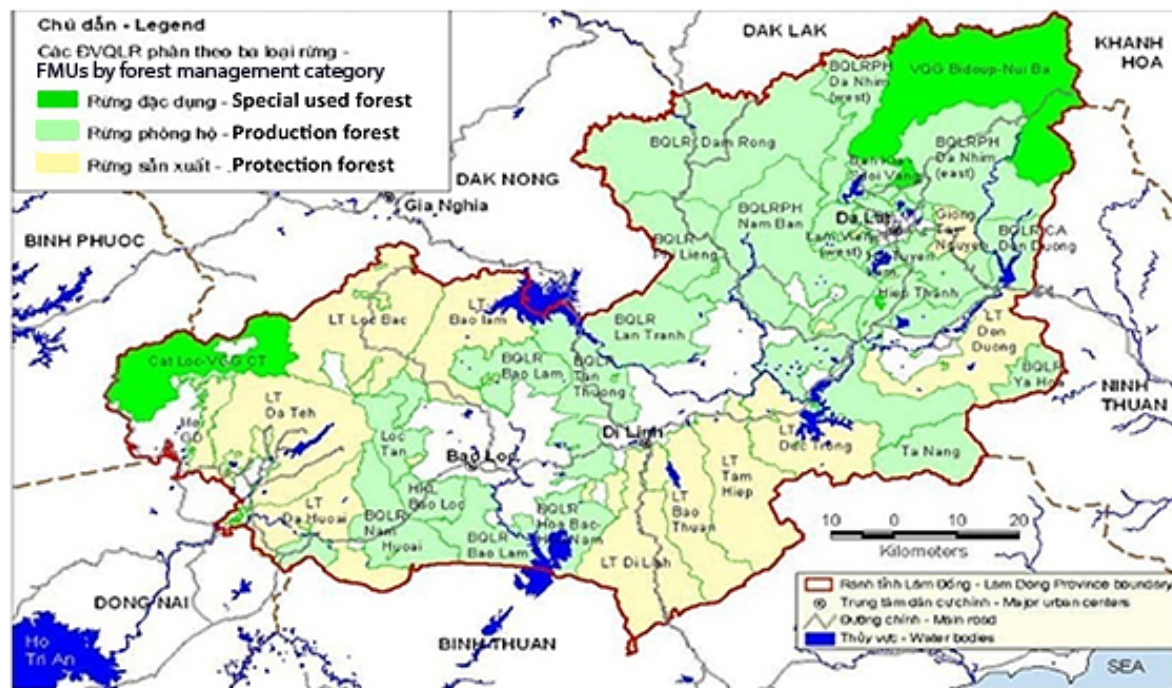
Lam Dong Province has a total natural area of 977,220 ha, including 602,041 ha of forest or 61% of the total natural area. It is the fifth-largest province in terms of total forest area after Dak Lak, Kon Tum, Gia Lai, and Nghe An. It is also the fourth largest province in terms of forest coverage after Tuyen Quang, Quang Binh, and Kon Tum. The biodiversity of Lam Dong forest is very high and includes several kinds of plants and fauna that are threatened species and are listed in Vietnam's *Red Data Book* as well as in the IUCN Red List (Lam Dong Forest Ranger Department 2010).

There are three typical types of forest in the province: special-use forest, protected forest, and commercial forest. Currently, commercial forest is dominant, accounting for 57.4% of the total forest area, 28.7% of the protected forest area, and 13.9% of special-use forest (Figure 7). Lam Dong is upstream of four important river systems in South Vietnam: the Dong Nai River, Serepok River, Luy River, and Cai River. These rivers can be developed to supply hydropower as well as to supply water to downstream areas.

4.1.2 Structure of forest management system in Lam Dong Province

In Lam Dong Province, as in other provinces of Vietnam, the forest is managed at three levels: province level, district level, and commune level. The Provincial Forest Ranger Department is directly under the Department of Agriculture and Rural Development (Figure 8). This department manages the forest ranger sections at the district level for certain forest fields. Simultaneously, the district people's committee manages the district forest ranger sections in terms of state administration. In each district, there are forest management departments and agro-forest companies named as forest owners. Households receive forest areas to protect directly from forest owners and they are supervised by forest owners, forest ranger agents, and forest sub-regional agents.

On the other hand, in Da Lat City, there is an agro-forest department that implements forest and agriculture management and development. In addition, there are forest management departments and agro-forest companies under the Da Lat City people's committee. These departments and companies have forest protection and plantation contracts similar to the forest management departments and agro-forest companies in each district.



Source: Lam Dong Department of Agriculture and Rural Development

Figure 7. Lam Dong forest management units (FMUs) by forest management categories

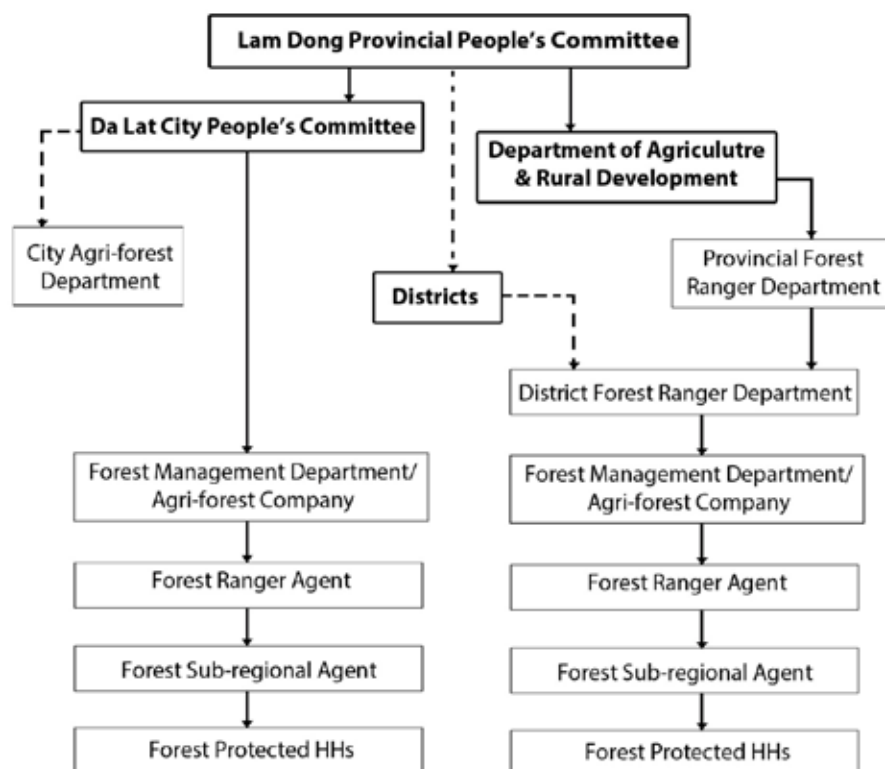


Figure 8. Forest management system in Lam Dong Province

4.1.3 Forest management programs in Lam Dong Province

Currently, there are five main forest protection, conservation, and plantation programs in Lam Dong Province: Program 661, the Provincial Budget Program, Program 304, the PFES Pilot Program, and the Forest for Livelihood Improvement in the Central Highlands (FLITCH) Program (Table 2). Program 661 has been active in Lam Dong Province since 1998. During the first stage, farmers involved in forest protection and conservation are paid 50,000 VND/ha per year. This increased to 100,000 VND/ha per year from 2008 onwards.

Table 2. Forest management programs in Lam Dong Province

No.	Programs	Year established	Payment (VND/ha/year)
1	Program 661. The Vietnam government's Five Million Hectares Reforestation Program	1999	100.000
2	Provincial Budget Program	1995	100.000
3	Program 304	2006	200.000 + 30 kg rice/ household per year
4	Pilot Program	2009	350.000
5	FLITCH Program	2010	247.000

Source: Collected data, 2010

Lam Dong set up a fund for forest protection and conservation in 1995. The payment level for households participating in this program is similar to national Program 661. In 2005, the government issued Program 304 and this has been implemented in Lam Dong since 2006 to improve the lives of the local ethnic people in the highland provinces. Most of the farmers who participate in this program are ethnic and hold certificates as poor households.

The payment given through this program is 200.000 VND/ha per year with 30 kg of rice/person per year. In 2009, the PFES pilot program was officially implemented in Lam Dong province with an average payment level of 350.000 VND/ha per year. In 2010 the FLITCH Program started in six provinces – Lam Dong, Kon Tum, Gia Lai, Dak Lak, Dak Nong, and Phu Yen – with the goal of improving the lives of people relying on forest. The average payment for local residents joining this program is 247.000 VND/ha per year. If we consider the payment level for forest conservation and protection, the payment for the PFES pilot program is the highest, and the money comes from forest service users. The effects of this program on the economic conditions of local people and on environmental protection are discussed in the following sections.

4.2 PFES Implementation in Lam Dong Province

4.2.1 Basics for PFES in Vietnam

In Vietnam the forest-rich provinces are usually the poorest provinces, and the farmers planting in these forests and protecting them are amongst the poorest people in the country.

Whenever a hydropower plant is going to be built, local authorities make plans to facilitate the hydropower plant. The local farmers must move to another area and are prohibited from accessing the forest for their living, making them poorer. In a workshop on forest management policy and strategy (2005-2006) the following question was raised: “why don’t we compensate farmers planting in and protecting the forest?” However, some workshop participants responded by saying “the government has been doing this” by paying the farmers approximately 100,000 VND/ha per year.

In 2006, with US support (USAID), Winrock International started to implement the Biodiversity Conservation in Dong Nai River Basin project. After successfully finishing the 2006-2008 phrase, the second phase of the project focused on forest values and services. Winrock International sat down and agreed with

the Ministry of Environment and Natural Resources and with the Ministry of Agriculture and Rural Development to make payment for forest environmental services a major part of this project.

The PFES drafting committee included legal board and Ministry of Agriculture and Rural Development (MARD) representatives for the Vietnam government and Winrock International. The result of this consultation was a draft framework and application process for PFES in Vietnam. On 4 April 2008, the Prime Minister issued 380/QĐ-TTg for the pilot program in Lam Dong and Son La. PFES was piloted from 2008 to 2010 and was officially implemented in 2011.

4.2.2 PFES in Lam Dong Province

The program's objectives

In April 2008 the Prime Minister issued Decision 380, which was related to PFES implementation in Lam Dong Province. First, this Decision formed the basis for the establishment of a legal framework on national policy on PFES. Second, the Decision clearly defined the responsibilities and benefits of the payers and payees of forest environmental services and encouraged the public to participate in forest management. Finally, the Decision gradually established a sustainable economic fund to protect the environment and ecosystems as well as to improve forest services.

Time frame and location

The PFES policy was piloted in Lam Dong for two years, beginning in November 2008 when the Decision came into force. It was applied in the provinces of Lam Dong, Dong Nai, Binh Thuan, Ninh Thuan, and Ho Chi Minh City (Figure 9) for individuals, organizations, and companies using the environmental services of Lam Dong forest.

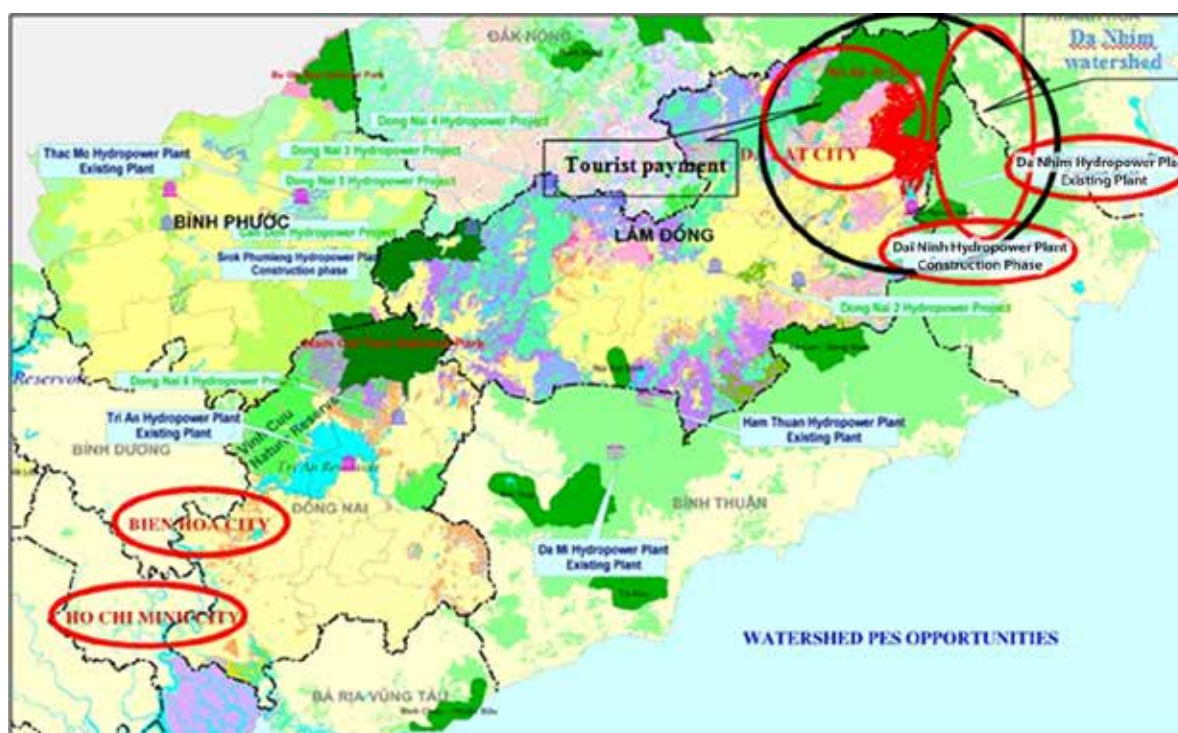


Figure 9. Pilot locations of PES in Lam Dong and other provinces

Stakeholders

The stakeholders in the piloted PFES in Lam Dong were service suppliers, service users, and intermediaries. These service payers included the Dai Ninh hydropower plant in Binh Thuan Province, the Da Nhim hydropower plant in Ninh Thuan Province, the Sai Gon Water Supply Company in Ho Chi Minh City (SAWACO), the Dong Nai Water Supply Company in Dong Nai Province, and nine companies conducting ecotourism business in the Lam Dong forest area.

The service providers included all forest holders in the headwater areas of the Dong Nai River watersheds within the administrative boundaries of Lam Dong. The service providers were organizations and individuals directly protecting the forest.

The intermediaries included the Ministry of Agriculture and Rural Development (MARD), Vietnam's Forest Protection and Development Fund (FPDF), Lam Dong Department of Agriculture and Rural Development (DARD), Lam Dong FPDF, and other forest management agents. The Lam Dong FPDF collected money from provincial payers then allocated the payment to service providers. Vietnam's FPDF collected money from multi-provincial payers then allocated the payment to different provinces.

Types of forest environmental services

Forest environmental services were mentioned in the pilot policy. They were: water regulation and provision, soil erosion reduction and watershed protection, and ecotourism services.

Forms of payment and payment rate to service providers

During the pilot period, indirect cash payment was used. Users paid cash indirectly to service providers through the Vietnam National FPDF and the Lam Dong FPDF (Figure 10). In case service buyers used services from forests located in more than one province, the money was transferred to the Vietnam FPDF. From the collected fund, the service distribution for each province was estimated and allocated. In case users used services from a forest located in only one province, the Lam Dong FPDF collected money directly from service users, then distributed it to forest owners. Forest holders were also given support such as workshops that gave training in forest protection techniques and social communication.

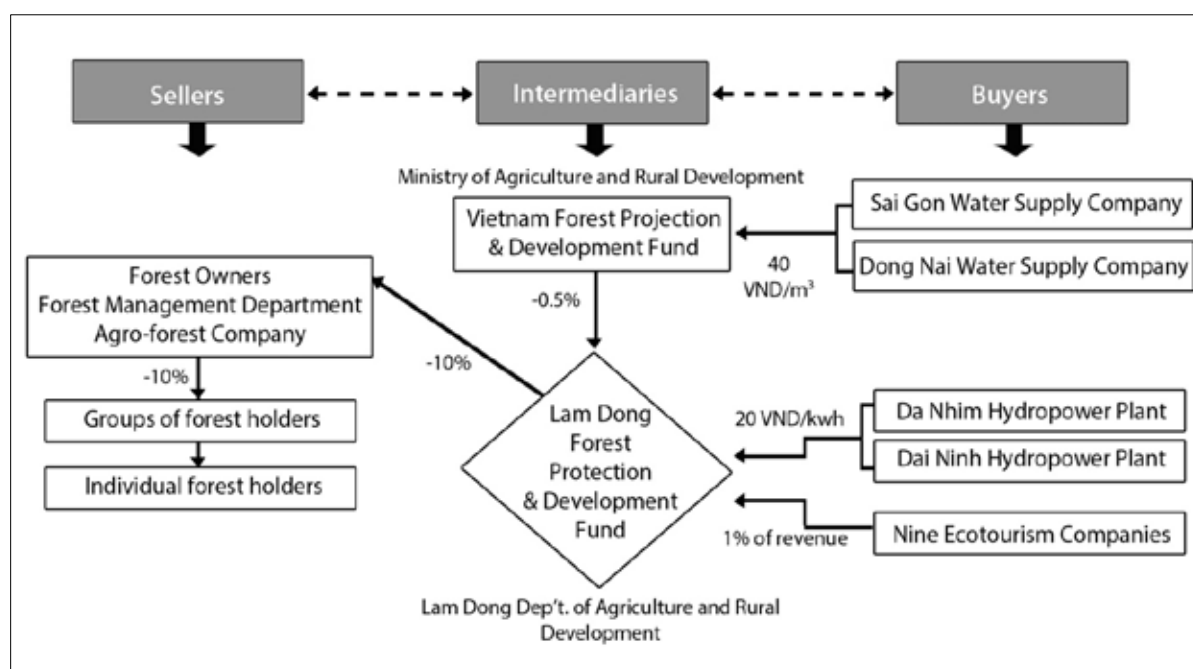


Figure 10. PFES stakeholders, pilot scheme, Lam Dong Province

At first, the payment was determined by:

$$\begin{array}{ccccccc} \text{The amount} & & & & & & \\ \text{of payment} & & & & & & \\ \text{to the payee} & = & \text{Norm of payment} & \times & \text{Area of Forest} & \times & \text{Coefficient k} \\ \text{of FES in a year} & & \text{for 1 ha of forest} & & \text{managed and} & & \\ \text{(VND)} & & \text{(VND/ha)} & & \text{used by payee of} & & \\ & & & & \text{FES (ha)} & & \end{array}$$

Where norm of payment for 1 ha of forest = total collected money/total forest area (VND per ha), coefficient K depends on the forest type (protection, special use, production); status of forest (rich, average, poor, regenerating forest); and origin of forest (natural, planted).

However, in the pilot stage, to make it simple (as there is not any research determining the K coefficient), Lam Dong Province decided to apply K = 1 for every forest type and quality with the following formulation:

$$\text{Payment/ha/year (VND/ha)} = (\text{SRevenue} - \text{Management cost}) / \text{Total forest area (ha)}$$

Fundamentals to determine the payment rate of service users

Winrock International played a vital role in establishing the payment level for service users. Winrock's specialists worked with Lam Dong DARD, Vietnam Electric Authority, and Chiang Mai University (Thailand) to conduct a watershed valuation study in Da Nhim's watershed. Results showed that the forest value in watershed protection and sediment reduction for a hydropower company was approximately 69.07 USD/ha per year. Relying on this study, the Vietnam Legal Board imposed on the hydropower company an environmental service charge of 20 VND per kwh (USD 0.00096). The forest service value of the water supply was evaluated by D.T. Ha and team members in 2007. The team's research showed that the majority (93%) of Ho Chi Minh City residents were willing to pay an average of 5% more in their water bills if the additional funds would go directly to poor communities living in the Dong Nai watershed. Relying on this research, the Vietnam Legal Board imposed an environmental service charge on the water supply company of VND 40 per m³ (USD 0.00192) for using water from the Da Nhim watershed. Finally, for the ecosystem service used by the tourist company, the Vietnam Legal Board estimated 0.5-2% of total annual revenue. After several discussions, however, Lam Dong Province settled for 1% of the total revenue from annual entrance tickets.

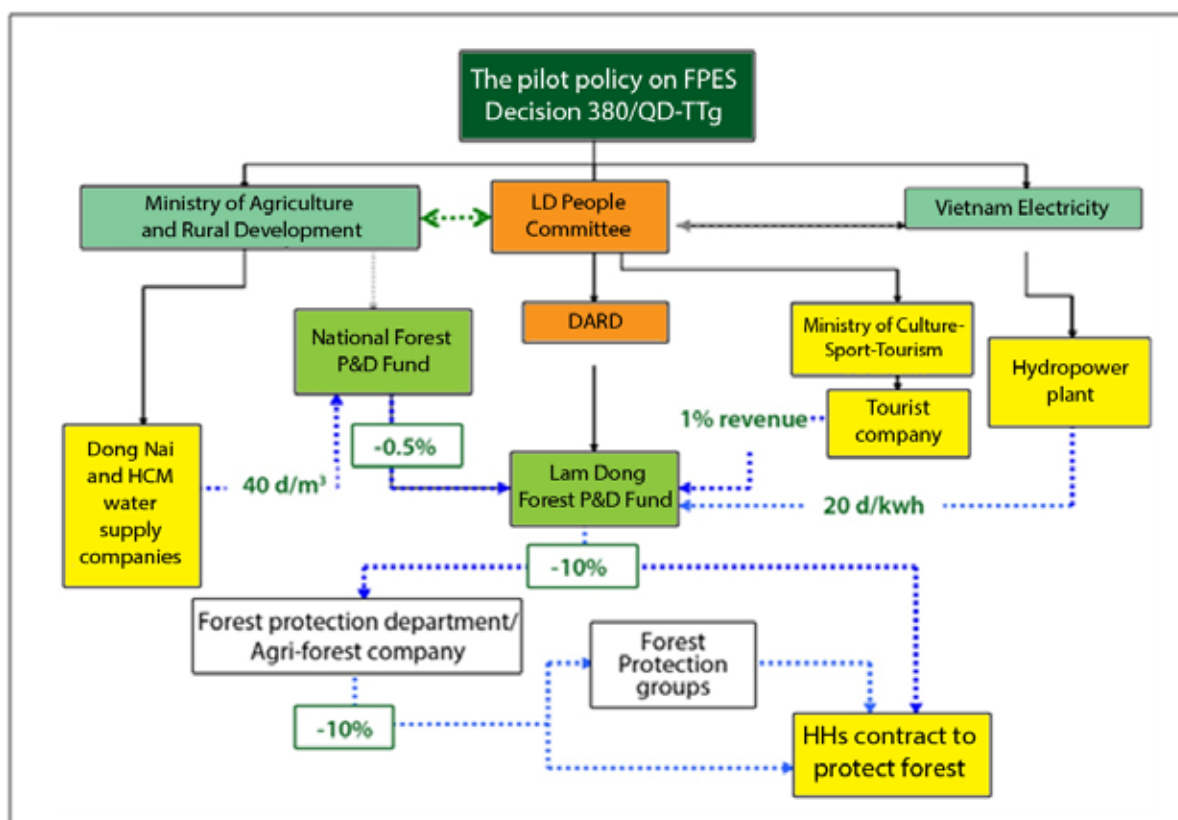
Management and use of money collected from forest environmental services

The forest protection and development fund, controlled by the Department of Agriculture and Rural Development, administers the operation of PFES. Every quarter, the payers report their produced output to the FPDF in order to calculate the payment. Some 20 days after the quarter ends, the payers must transfer the money, based on their output, to the FPDF's account. In case of late payment, the FPDF sends reminder letters. As with the national fund, 5% of the money collected is used for management costs, and the remaining 95% is allocated among the provinces. For the Lam Dong FPDF, 10% of the total collection is used for management and the remaining 90% is paid to forest owners. The forest owners take 10% off to cover their management costs before distributing the remaining amount to forest protection groups and individuals. Consequently, the service providers receive less than 80% of the money collected from the service users (Figure 11).

Responsibilities and rights of payers and payees

There is no agreement or contract signed between service users and forest holders. The agreement is signed between service users and the director of the Lam Dong FPDF indicating only the payment level and time without stipulating any forest service quality or quantity. Service users are not guaranteed any forest quantity and quality for their payment. In addition, the forest holders sign a contract with the Lam Dong FPDF mentioning the rights and responsibilities of each party to conserve and protect the forest. In the first year (2009), the terms focused on payment and on the tasks of forest holders – sanctions for not

following these terms were not mentioned. In 2010 several rights and responsibilities, including reward and punishment, were stated in the contract.

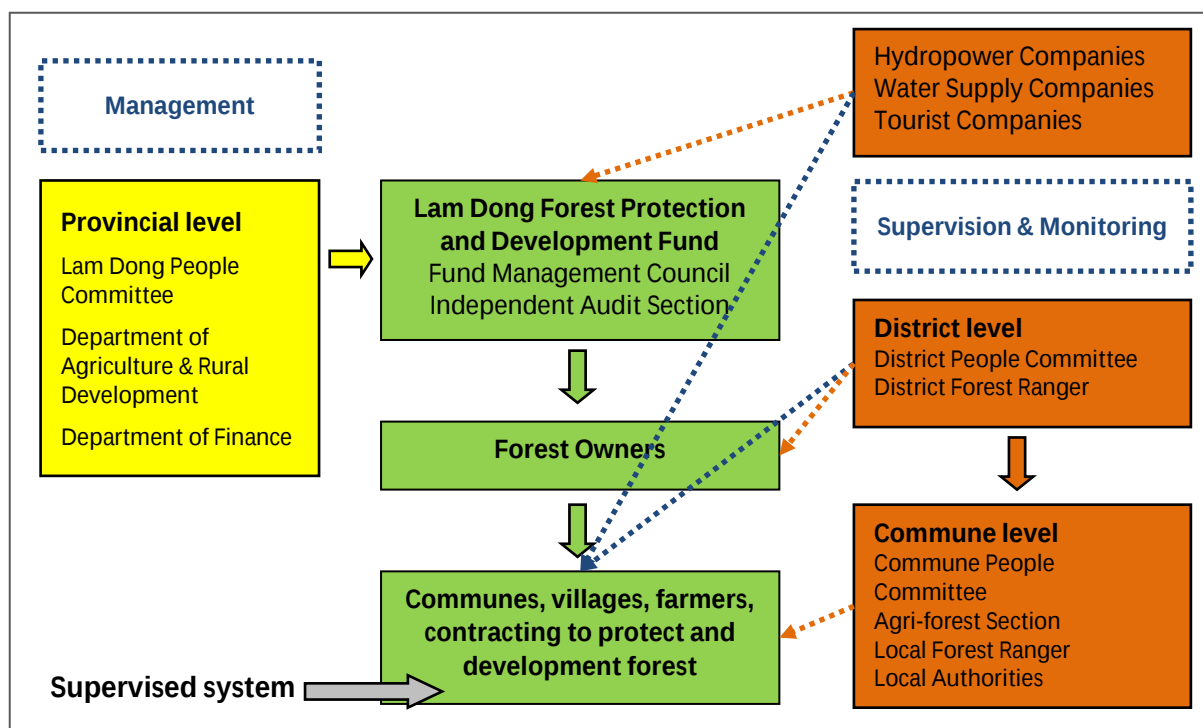


Source: Lam Dong Forest Protection and Development Fund

Figure 11. Allocation mechanism, forest fund, Lam Dong Province

Supervision and monitoring mechanism

As with the payment system, the supervision and monitoring system has been set up at provincial, district, and commune levels (Figure 12). The Lam Dong FPDF is monitored by the Lam Dong People's Committee, DARD, and the Department of Finance. The payers have a right to monitor the operation of the Lam Dong FPDF as well as forest holders. In addition, at district level, district forest rangers, together with the district people's committee, also participate in supervising and monitoring the operations of forest owners, commune/village authorities, and farmers protecting and developing the forest. Moreover, the forest holders are monitored and controlled directly by forest owners and the Lam Dong FPDF. In theory, the supervision and monitoring mechanism has been designed for accuracy. However, no regulation has been issued regarding the rights and responsibilities of the participants being monitored.



Source: Lam Dong FPDP

Figure 12. The management and monitoring of PFES in Lam Dong Province

5.0 GENERAL RESULTS OF THE HOUSEHOLD SURVEY

5.1 General Characteristics of Households Surveyed

5.1.1 Individual features

Ethnic distribution of respondents

Lam Dong is one of the highland provinces of Vietnam and has many different ethnic minority groups. The policy gives priority to ethnic households (Table 3). Of the 366 participating households, 67.49% belong to ethnic minorities. The Cil account for the highest proportion (47.54%), followed by the K'ho (14.75%), and others including the Churu, Tay, Nung, and M'nong (5.2%). This allocation is representative of the population because ethnic minorities account for 69.956% of the 3,594 households participating in the PFES pilot project in Lam Dong Province. Ethnic minorities account for 49.09% of the non-participants and for 20% of the total population of Lam Dong.

Table 3. Ethnic households in Lam Dong

PFES participants			PFES non-participants		
Ethnic	No. of HHs	Percentage (%)	Ethnic	No. of HHs	Percentage (%)
Kinh	119	32.51	Kinh	195	50.91
Cil	174	47.54	Cil	107	27.94
Churu	14	3.83	Churu	5	1.31
K'ho	54	14.75	K'ho	65	16.97
Tay	3	0.82	Tay	3	0.78
Nung	1	0.27	Nung	5	1.31
M'nong	1	0.27	Thai	3	0.78
Total	366	100	Total	383	100

Education

Most PFES participants are poor ethnic farmers so levels of illiteracy are relatively high. The average education level is 5.18, with the highest being grade 12. Almost a quarter of participants (24.32%) are illiterate. Participants who reached high school account for 13.93%, and the remaining 61.75% attended primary and secondary schools. This low level of education influences farmers' awareness of and knowledge about the implementation of PFES.

On the other hand, the average educational level of non-PFES household heads is relatively higher (6.93) than that of PFES household heads (5.18). At the highest level, 2.07% of household heads graduated, and illiteracy is lower, at 9.47%. Other respondents finished secondary school (39.64%), primary school (25.74%), and high school (23.08%) (Table 4).

Table 4. Education of households participating and not participating in PFES

	Mean	Max	Min	Illiterate	Primary school	Secondary school	High school	Graduated	Total
Non-participants	6.93	14	0	46	98	143	88	8	383
	Percentage (%)			9.47	25.74	12.01	25.59	37.34	22.98
Participants	5.18	12	0	89	97	129	51	0	366
	Percentage (%)			24.32	26.50	35.25	13.93	0	100

Household size and labor force

The number of people in the PFES households in this area is relatively high and most of them are ethnic and have low levels of education. This is a potential labor resource for participating in PFES. On average, the number of people in a participating household is 5.38. There are two households of the largest size, of 13 people, and two households of the lowest size, with one person. The remaining households have between four and six members.

There are no differences in the size of households participating or not participating in PFES. The average size of non-PFES households is 5.3, with a range of between three and six people. The largest household has 14 people and the smallest household has only one person (Figure 13).

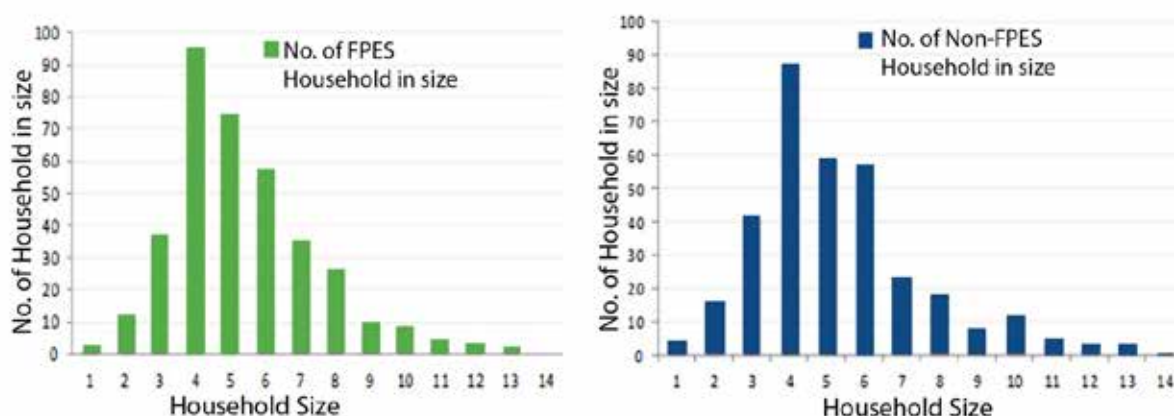


Figure 13. Size of participating and non-participating PFES households

It is an advantage for PFES implementation when most participants are farmers. Farmers can apply their agricultural experience to forest conservation and protection. The survey showed that 99% of total participants are farmers and the remaining 1% are government personnel, workers, or motorbike drivers whose relatives use the forest. The non-participating households comprise 78% farmers, mainly cultivating

coffee, tea, vegetables, and persimmon, and the remaining 22% are micro-traders, local government staff, and workers (Figure 14).

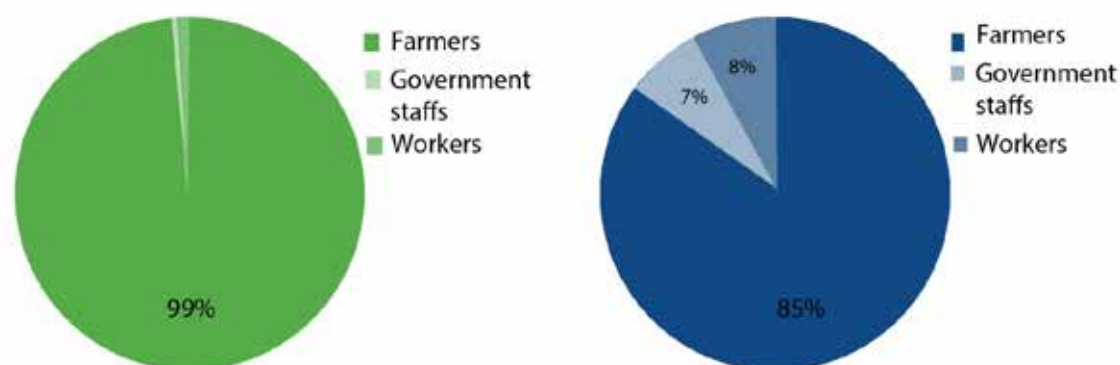


Figure 14. Labor force distribution among participating and non-participating households

Annual household income

On average, the annual income of participating households is lower (VND 40.44 million per year) than that of non-participating households (VND 55.78 million per year). Income from the PFES program was collected in 2010 and this has contributed to the annual income of participating households. However, the lowest average income of participating households (VND 5 million per year) is relatively higher than that of non-participating households (VND 1.5 million per year). The highest level of average annual income was earned by non-participating households (Table 5).

Table 5. Average annual income of participating and non-participating households in 2010

	Mean	Max	Min	Standard deviation
Participant	40.44	274.00	5.00	37.37
Non-participant	55.78	350.00	1.50	54.69

Conversely, non-participating households can conduct their own businesses, such as flower and vegetable cultivation, which bring in higher incomes. Although the annual income of participating households is relatively high, this is offset by the high number of members (5.3) in each household. Hence, the average annual income for each member is not very high. However their income is varied and not stable, as illustrated by the large standard deviation.

Therefore, 29.23% of the 366 participating households are poor whereas only 8.87% of the non-participating households are poor (Table 6) relative to the new Vietnam poverty standard of an income of less than VND 4,200,000 per person per year. Although this status illustrates well the PFES target of tending to give priority to poor and low-income households, some poor households are still non-participants.

Table 6. Number of households living in poverty, 2010

	Participants	Non-participants
Poor household recorded	107	34
Percentage (%)	29.23	8.87
Total	366	383

5.1.2 Features of agricultural production

Agriculture land resources

Total agriculture land affects a farmer's decision to participate in PFES. The PFES policy gives priority to households with less land, meaning the average amount of agricultural land held by participants is normally less than that of non-participants (Table 7). In participating households, the average amount of agricultural land is 0.98 ha, the smallest average amount of agricultural land is 0.05 ha, the largest average amount of agricultural land is 7.5 ha, and 10 households are landless. Currently, most landless households are very poor; they work for other households during harvesting or drive motorbikes. Participating in PFES gives these households employment and improves their annual incomes.

For non-participating households, the average amount of agricultural land is 1.25 ha, the largest average amount of agricultural land is 9 ha, the smallest average amount of agricultural land is 0.05 ha, and 12 households are landless. The landless households are engaged as the staff of local government organizations or in micro-businesses at home. Coffee is the main crop in this area. In addition, maize, persimmon, rice, bananas, cassava, chestnuts, flowers, and vegetables are also cultivated on different farms.

Table 7. Agricultural land, PFES and non-PFES participants (ha)

	Average	Max	Min	Standard Error
PFES households	0.98	5	0	0.07
Non-PFES households	1.25	9	0	0.08

Most of the agricultural land in the study area is derived from self-reclaimed forest land, both with and without permission. Among the PFES households, 48% of their agricultural land area came from self-reclaimed forest land – most of them came without any property from North Vietnam around 1975-1980. At that time, forest land in Lam Dong was plentiful so newcomers could reclaim forest freely for agriculture. Some households (25%) obtained their agricultural land through inheritance after getting married; 14% of households received their agricultural land officially from the government, and 13% of households bought their land (Figure 15).

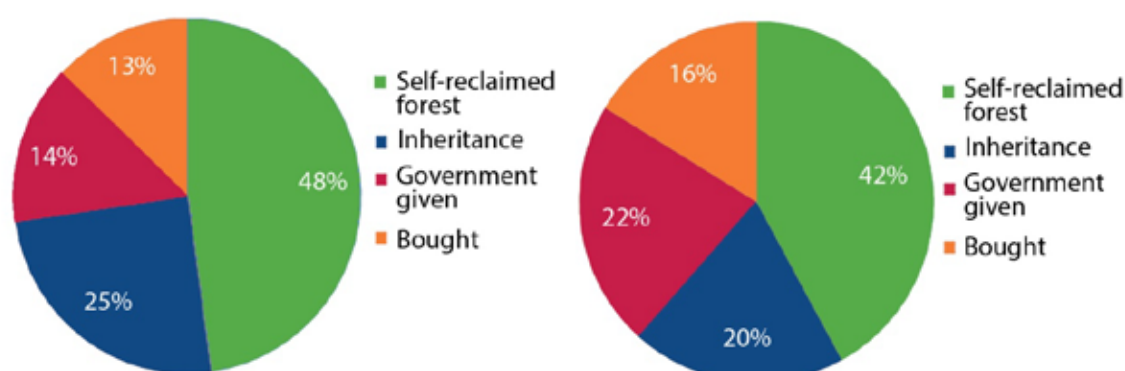


Figure 15. Land resources of participating households (left) and non-participating households (right)

Many non-PFES households (22%) received their agricultural land from the government, although most households (42%) got their agricultural land from self-reclaimed forests. The remaining households obtained their agricultural land through inheritance and by buying it. These results indicate that forest land in this area has been significantly affected by agricultural production by local residents (Figure 15).

Crops

Agriculture is the strength of Lam Dong Province, especially the cultivation of coffee, vegetables, and flowers (Table 8). In Da Lat City, vegetables and flowers are the dominant crops, while coffee, maize, vegetables, flowers, beans, rice, and potatoes are available in several gardens in the research area. Of the 366 participants, 242 have coffee gardens with an average area of 0.98 ha, and 61 cultivate vegetables across an average area of 0.71 ha. Only three participants grow flowers but they cultivate an average area as wide as 2 ha. Participants grow other crops such as rice, potatoes, and tea in an average area of 2.9 ha. Moreover, persimmon is one of the typical crops of this area, and it is intercropped in most gardens.

Table 8. Crops cultivated by household farms, 2010

Crops	Coffee	Maize	Vegetables	Flowers	Beans	Others
No. of participants	242	24	61	3	6	14
Average area (ha)	0.98	0.72	0.71	2.00	0.36	2.90
No. of non-participants	201	2	51	5	13	40
Average area (ha)	1.46	0.10	0.92	1.27	1.49	1.30

Non-participants grow coffee in their gardens. Generally, coffee is their main source of income. In addition, maize, vegetables, flowers, beans, rice, potatoes, tea, strawberries, and persimmon are cultivated in these gardens. The recent high price of coffee helps to improve farmers' standard of living. The farmers spend more time on their coffee farms and this affects the amount of time they spend on forest protection and conservation.

Agricultural production as a part of total household income

As most participants and non-participants are farmers, agricultural production contributes to the household income (Figure 16). For participating households, the average income per household is VND 40.44 million per year. With an average household size of 5.18, the average income per capita would be 7.18 million per capita every year. This average income is lower than the average overall income of households living in the countryside of Lam Dong Province (9.74 million/capita per year, 2009). The income is composed of agricultural production, forest protection, and other elements such as wages, interest earned, etc. Their annual income comes from agriculture (39.4%), forest protection (31.28%), other resources (28.94%), and non-timber products like mushrooms and bamboo shoots (0.38%).

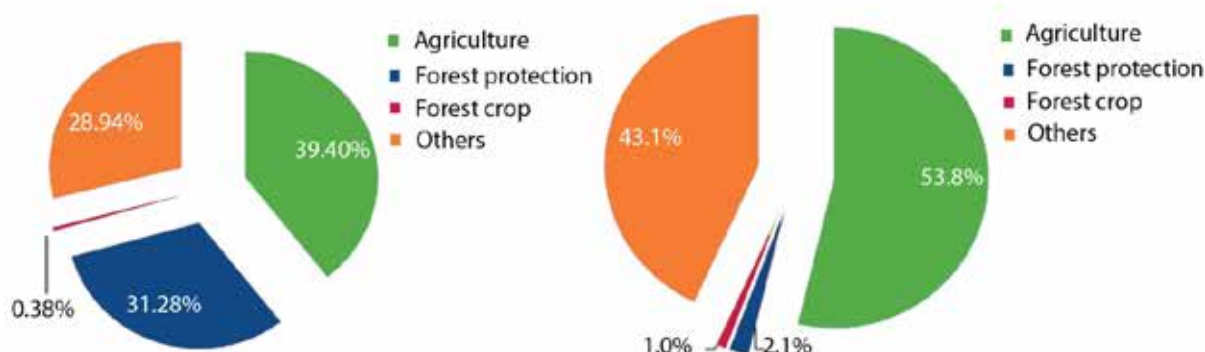


Figure 16. Income distribution of PFES and non-PFES households

Similarly, for the PFES non-participants, the average annual income per capita is VND 8.28 million, with an average household size of 6.93. Their major income comes from agriculture (54%) and from other sources (43%). Income from forest protection accounts for 2% of their total income because they are participating in other forest protection programs such as Program 661, FLITCH, the Lam Dong provincial fund program, Program 304, and Program 30A.

5.2 Household Participation in the PFES Pilot Program

Based on the data collected up to the last quarter of the pilot period (4th quarter, 2010) (Table 9), a total of 3,587 households have participated in PFES. The majority of these households (76.13%) are ethnic, the smallest group being the Kinh people. All these people protect the forest located in two watersheds (Da Nhim and Dai Ninh).

Table 9. Information on PFES participants up to the 4th quarter, 2010

Location	No. of participants	Kinh	Ethnic	Average forest area (ha)	Watershed payment
1. Da Lat City	458	420	38		
Tay Nguyen Forest Seed Joint-stock Company	192	154	38	20.524	Da Nhim + Dai Ninh
Lam Vien Forest Management Department	230	230	0	30.591	Da Nhim + Dai Ninh
Tuyen Lam Tourist Management Department	36	36	0	29.616	Dai Ninh
2. Don Duong District	686	284	402		
Don Duong Agri-forest Company	262	61	201	24.018	Dai Ninh
Dran Forest Management Department	424	223	201	27.954	Da Nhim + Dai Ninh
3. Lac Duong District	1,291	39	1,252		
Da Nhim Forest Management Department	848	35	813	27.491	Da Nhim
Bidoup-Nui Ba National Park	443	4	439	37.056	Da Nhim
Dankia Forest Management Department	6	0	6	30.216	Da Nhim
4. Duc Trong District	1,152	113	1,039		
Ninh Gia Forest Management Department	185	70	115	23.167	Dai Ninh
Dai Ninh Forest Management Department	145	26	119	20.344	Dai Ninh
Ta Nang Forest Management Department	822	17	805	17.497	Dai Ninh
Total	3,587	856	2,731		

The forest area allocated to each farmer depends on the total forest area in their living location so people in different locations receive different areas of forest land (Table 10). Those who participated in protecting the forest in Bidoup-Nui Ba National Park received 37.056 ha per household, which was the highest average forest area. The park is located along the Da Nhim watershed with a payment of VND 350,000/ha per year. Hence, in 2010, the highest total money that a farmer received was VND 12.96 million per year.

Table 10. Forest area allocation of surveyed participants, 2010

Average forest area/HH (ha)	Max	Min	Standard error
24.05	66.93	13.30	0.14

Meanwhile, the lowest average forest area of 20.524 ha per household was allocated to participants in the Tay Nguyen Forest Seed Joint-stock Company. This company belongs to the Da Nhim watershed. The average payment to these households was VND 7.183 million per year. Annual income from forest protection is significantly different among farmers because it depends on the total allocated forest area and

watershed location. This allocation has generated resentment among households in different watersheds because the time spent on forest protection was relatively similar. However, the policy stipulated the allocation of forests only to local residents in each location, or as regulated by a biological corridor. Therefore, farmers with less forest allocation do not have the right to participate in forests with higher forest allocation or watershed.

On average, the forest area allocated for each household is 24.05 ha. Some households received the largest forest area of 66.93 ha, while some received an area of 3.30 ha. If we take the average payment in 2010 to be 350,000 VND/ha per year, the highest payment that households could earn is VND 23.42 million per year, while some receive VND 1.15 million per year.

5.3 PFES Pilot Policy: The Views of Local Farmers

5.3.1 Farmers' attitudes to the PFES policy

Generally, participants and non-participants have a good attitude towards the PFES pilot program; they think it is a good program that should be continued. Specifically, 91% of participants say that PFES is a good or a very good program with several benefits. For example, PFES has contributed to reducing forest fires, illegal logging, and forest encroachment. PFES has also improved income, forest quality and environment, responsibility for forest protection, and has generated employment for local residents.

Among non-participants, more than 70% said that PFES is a good or very good policy. Around 14% of non-participants had no idea about the program because of limit access to information (Table 11).

Table 11. Farmers' assessment of the PFES pilot program

Evaluation level	PFES participants		PFES non-participants	
	No. of participants	Percentage (%)	No. of participants	Percentage (%)
Very good	154	42.08	87	22.72
Good	182	49.73	198	51.70
Normal	26	7.10	39	10.18
Not good	1	0.27	7	1.83
Completely not good	0	0.00	0	0.00
No idea	3	0.82	52	13.58
	366	100	383	100

Additionally, farmers' awareness of the forest impacts on their attitudes towards, and decision to participate in, PFES. Most participants and non-participants think that the forest has generated benefits for local people and the environment (99%). To these people forest conservation and plantations are essential because the forest can contribute to water generation and regulation, climate control, soil erosion control, flood prevention, landscape preservation, employment, and livelihood improvement.

Of the 366 participants, 318 (25.06%) participated in PFES because it helps them to increase their income. Others wanted to improve forest quality (15.60%) or believe that it's their responsibility (15.29%). In addition, the program gives them employment (10.09%) because they do not have agricultural land. Many of them (9.85%) also want to improve the quality of their soil (9.85%) and to have technical support for forest protection. Farmers decided to participate in PFES not only because of potential income but also because of environmental and forest protection. Farmers are aware of the value of the forest as well as their responsibility to conserve and protect it (Table 12).

Table 12. Reasons for joining the pilot PFES

No.	Reasons	No. of respondents	Percentage
1	Increased income	318	25.06
2	Technical support for forest protection	86	6.78
3	Improved forest quality	198	15.60
4	Improved soil quality	125	9.85
5	Increased land tenure	76	5.99
6	Provision of employment	128	10.09
7	Local authority requested	68	5.36
8	Relationship with local authority	37	2.92
9	General responsibility	194	15.29
10	Others	39	3.07
Total		1,269	100

5.3.2 Households' evaluation of the participating mechanisms of the pilot PFES

Participation procedure

Most local farmers are relatively uneducated so a simple implementation procedure is essential if PFES is to be a success (Table 13). Many of the respondents thought that signing the PFES contract and participating in the scheme was normal (51.09%) and simple (36.89%). However, at least 4.1% found the process complicated because they are illiterate and could not understand the content of the contract regarding their rights and responsibilities. Consequently, 19.40% of the farmers did not read the contract before signing it and 39.62% of them could not remember the major rights and responsibilities mentioned in the contract. In addition, the contract lasted for only for one year and this had a negative effect on the farmers' decision to participate.

Table 13. Evaluation of the PFES implementation procedure

Evaluation	No. of households	Percentage (%)
Complicated	15	4.10
Normal	187	51.09
Simple	135	36.89
Very simple	29	7.92
Total	366	100

In Vietnam, individuals do not own the forest because the land is owned by the state. Unlike other countries, farmers are not totally free to decide whether to participate or not participate. To participate in the pilot policy, households need to meet at least one of the criteria listed below.

- 1) Be indigenous to the pilot PFES areas (according to watershed).
- 2) Have enough labor to take care of the forest.
- 3) Cooperate voluntarily with forest owners to preserve and protect the forest.
- 4) Do not have any agricultural land and belong to a poor or ethnic household.

In each district, the eligibility of the participants is reviewed by local authorities and the names of those qualified are displayed publicly at the commune office. As the expected allocation per household was at least 20 ha, the number of households that could participate was limited. However, every qualified household was free to decide whether or not to participate.

Pressure to sign the contract

All (100%) of the households said that they signed the contract freely and that there was no external pressure on them to make a decision. However, after signing the contract, they must strictly follow the regulations or their names will be removed from the list of qualified participants. One of the advantages of PFES in Lam Dong is that it was signed by a group, instead of individuals, thereby reducing the number of contracts. A leader represents a group of between 6 and 15 people in signing the contract with the forest owner/s.

Payment level

The payment level is different between the two pilot years and between watersheds (Table 14). The payment to farmers mainly depends on the amount of money collected from the service users. In the first pilot year, relying on a preliminary assessment of forest service values and an estimation of collected money, the highest payment was 290.000 VND/ha per year in Dai Ninh watershed and the lowest payment was 10.000 VND/ha per year in Dong Nai watershed. However, after the first year, the collected money was much higher than the payment to service providers. Hence, payment increased significantly in 2010, up to 400.000 VND/ha per year at the highest level and 50.000 VND/ha per year at the lowest rate.

Table 14. Payment level, VND/hectare per year, 2009 and 2010

Year	Da Nhim watershed	Dai Ninh watershed	Dong Nai watershed
2009	270.000	290.000	10.000
2010	350.000	400.000	50.000

Accordingly, the payment level per ha of forest is relatively higher than for previous government programs (100.000 VND/ha per year). However, most of the households indicated that this payment level is medium (47.27%) or relatively low (43.72%) compared to the responsibilities of the program and the spent time protecting forest. Only 6.28% of respondents said that the payment is relatively high or very high. The final 2.73% of respondents think the payment level is very low and needs to be improved (Table 15). Participants' expected payment ranged from 300.000 VND/ha per year to 1.000.000 VND/ha per year. On average, they expected the payment level to increase to 525.000 VND/ha per year, given their labor costs and opportunity costs.

Table 15. Farmers' evaluation of the payment level

Payment evaluation	No. of households	Percentage
Very high	1	0.27
Relative high	22	6.01
Medium	173	47.27
Relatively low	160	43.72
Very low	10	2.73
Total	366	100

5.3.3 Behavior of participants to the compulsory implementation of the PFES policy

In 2011 the PFES policy was applied compulsorily in Vietnam, and therefore Lam Dong, and this is the reason for the increase in the number of participants as well as for the expansion of the total forest area. It is important to evaluate the participants' behavior in the implementation of the pilot program in order to ascertain the feasibility of applying the policy at the next stage.

The participants were asked whether they would participate in the next stage of PFES and almost all, or approximately 90%, of them said that they will participate. Participants said that the payment is acceptable, that they want to protect the forest, and, for some, alternative jobs are not available to them. However, more than 10% of participants do not want to join PFES in its next stage because they are not satisfied with the current payment (Table 16). Overall, most of the farmers support the PFES pilot program and are willing to participate in the next period if the payment is higher. This indicates the feasibility of PFES implementation in 2012.

Table 16. Household statements regarding participation in the next stage of PFES

	Surely yes	Yes	Depends	No	Definitely not
No. of respondents	262	65	39	12	9
Percentage	68.85	18.58	6.83	3.28	2.64

5.4 Cost Estimation for Supplying Forest Environmental Services

Estimating the cost of supplying forest environmental services is one of the important indicators for revealing whether the current payment level can compensate for the total costs spent by farmers, including labor costs (Table 17). The PFES policy asks for only one person per household to participate in forest protection and patrolling. On average, each farmer must patrol the forest for between six and seven days per month, meaning that their labor total for a year is VND 10,203 thousand (average labor cost: VND 82,000 per day).

Table 17. Cost estimation of environmental services by farmers (thousand VND)

	Mean	Standard deviation	Maximum	Minimum
Labor cost	10,203	3,885	37,440	2,400
Equipment	376	83	1,120	0
Other costs (gasoline)	974	423	1,372	300
Total costs	11,553	27,981	39,160	2,400

In addition, each time a farmer patrols the forest, he must buy a knife, shoes, boots, a raincoat, a flashlight, anti-malarial drugs, and other items, totaling an average of VND 376 thousand per year. Moreover, in order to patrol a forest area a significant distance from home, some farmers must travel by motorbike. Each trip costs VND 10-20 thousand for gasoline. On average, the total cost of gasoline is VND 974 thousand per year. Therefore, the total cost of protecting a hectare of forest is VND 11.553 thousand a year.

5.5 Payment Received by Service Suppliers

With the annual contract, payment is made quarterly and forest owners give money directly to the farmers. Each participant has a payment book that gives information on the date of payment, the amount of payment, and contains the signatures of the payers and receivers.

In total, each farmer is compensated (Table 18) with an average of VND 10,108 thousand every year. The highest payment is VND 24,850 thousand and the lowest is VND 2,400 thousand, depending on the total allocated forest area. This payment covers the labor cost but does not compensate for the total cost spent by farmers so, although the PFES policy is supposed to provide payment for forest service values, the service fees do not cover the total cost of forest protection. An explanation for this is that the forest services have not been correctly estimated. Instead, the pilot PFES focused on the services of water regulation and adjustment, sediment reduction, and safeguarding the beauty of the landscape. Hence, this payment has not been attractive to some forest holders.

Table 18. Average payment to farmers from the pilot PFES

Items	Thousand VND/year/HH
Mean annual payment	10,108
Standard error	201
Standard deviation	3,860
Minimum	2,400
Maximum	24,850
Confidence level (95.0%)	396

6.0 EVALUATION OF PFES IMPACTS

6.1 Evaluating the Impact of the PFES Pilot Policy on Household Annual Income

6.1.1 Impact of PFES on household annual income by Propensity Score

Propensity Score (PS) estimation

The first step was to determine the propensity score and satisfy the balancing propensity. This was based on the household survey data and Stata software with the program participation variable “y” (y=1: participant, y=0: non-participant). The propensity score represented the probability of getting each household to participate in PFES, as explained by the 10 variables presented in Table 19. The probability of participation depends on the education of the household head, the total agricultural area per household, household income before and after participating in PFES, opportunity cost, access to information, opportunity income, distance from the household to the forest, alternative job/s, and debt.

The output shows that the identified region of common support of the propensity score is [0.03092642, .09870177], the final number of blocks is 6, and the balancing property is not satisfied. The annual income after participating in PFES is not balanced in block 6. We dropped the “HHICOMEA” variable then re-estimated the propensity score. The balancing propensity was satisfied, so the output of the households’ annual income between the treatment group and the matched control group is now comparable. These conditions are better to assess whether the pilot program affected annual household income or not.

Relying on this model, the propensity score presented for the probability of each household participating in the program was calculated. The propensity scores of participants range from 0.3 to 95%, while the non-participants’ scores range from 0.014 to 98.7% (Table 20 and Figure 17).

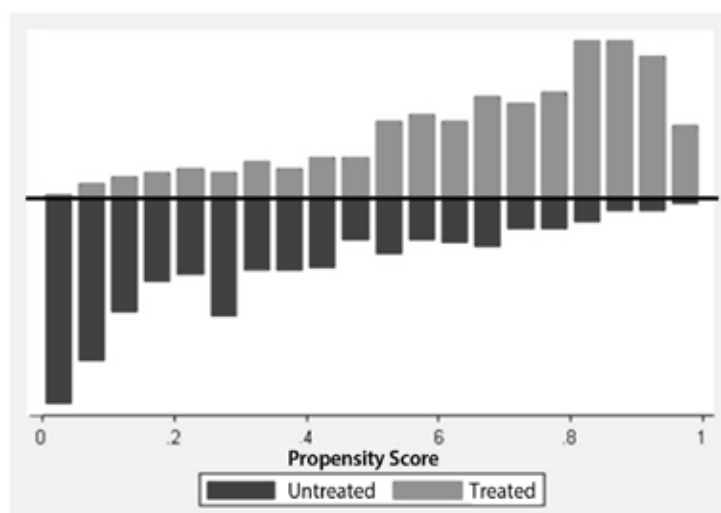
Table 19. Binomial logit regression estimates for the PFES participation model

Dependent variable	Y			
Log likelihood function	-350.42			
Percentage of right predictions	0.87104			
McFadden R-Square	0.42479			
Variable	Coefficient	Standard error	T- ratio	Marginal effect
EDU	-0.12482 (**)	0.27216E-01	-2.1832	-0.17433E-01
AREA	-0.15841 (*)	0.11046	-1.7031	-0.39280E-01
HHICOMEA	0.19866E-01(***)	0.42733E-02	4.6488	0.49260E-02
OPPCOST	-0.48341E-03 (***)	0.79268E-04	-6.0984	-0.11987E-03
INFOR	2.0252(***)	0.19827	10.214	0.50218
OFINCOME	-0.67601E-02(**)	0.27997E-02	-2.0146	-0.16763E-02
DISTANCE	-0.30697E-01 (**)	0.10518E-02	-1.9636	-0.17370E-04
OPJOB	-0.83407(***)	0.20437	-4.0812	-0.20682
DEBT	-1.0929 (***)	0.19729	-5.5393	-0.27100
HHICOMEB	-0.27810E-01(***)	0.62211E-02	-4.4704	-0.68961E-02
CONSTANT	1.6889	0.30834	5.4773	

Note: *, **, *** ==> Significance at 10%, 5%, 1% level

Table 20. Household allocation by the propensity score based on the logit model

Predicted participation probability	Number of participants	Number of non-participants
<5%	1	59
5-10%	4	47
10-20%	13	57
20-30%	15	56
30-40%	18	42
40-50%	22	32
50-60%	44	28
60-70%	49	27
70-80%	55	18
80-90%	86	11
90-100%	59	6

**Figure 17.** Histogram of propensity score

Estimate the average treatment effect for the treated (ATT)

The effect of participating in the PFES pilot was estimated using different matching techniques such as nearest-neighbor matching, stratification matching, radius matching, and kernel matching (Table 21).

The results show that the average treatment effect is positive, with the lowest at VND 1.951 million per year by applying kernel matching, and the highest at VND 6.208 million per year by applying radius matching. However, the "T" value in the last column indicates that pilot participation does not have a significant impact on household annual income at 10% significance in all matching techniques.

Table 21. Average treatment effect using different matching techniques

Matching technique	No. treat.	No. contr.	ATT	Std. Err.	T-value
Nearest-neighbor matching	366	136	3.926	5.776	0.680
Stratification matching	366	345	3.283	3.866	0.849
Radius matching	138	128	6.208	5.846	1.062
Kernel matching	366	345	1.951	3.318	0.588

We have checked the robustness of the effect of the above average treatments by applying direct nearest-neighbor matching (Table 22). Findings show a VND 3.95 million positive impact of program participation on annual household income. Although the T-value has increased to 1.34, the result is not significant at the 10% level of significance. This means that PFES participation did not have a significant impact on annual household income during the pilot period if we consider the difference in annual income between participants and non-participants.

Table 22. Average treatment effect for the treated by direct nearest-neighbor matching

Weighting matrix: inverse variance Number of obs = 749 Number of matches (m) = 1					
hhcomea	Coef.	Std. Err.	Z	P> z	[95% Conf. Interval]
SATT	3.954503	2.951965	1.34	0.180	-1.831243 9.740248

6.1.2 Impact of PFES on household annual income by DID Method

Simplest implementation

The simplest way of calculating the difference in difference (DID) is to manually take the difference in household annual income between treatment and control and the difference before and after participating in PFES (Table 23). This data is collected via a questionnaire. The panel data for 2008 (before PFES) and 2010 (after PFES) is used for this purpose. The different variables of annual household income were created and compared for participants and non-participants. The impact of the program on annual household income changed from insignificant to significant ($t = -1.9648$) at the 5% level. In other words, PFES pilot policy participation increased household income by VND 3.915 million per year and this impact is significant at 5%.

Regression implementation

Instead of manually taking the difference of the household annual income, DID can be implemented using regression analysis. The results do not show a significant effect for participating on annual household income at a 10% level of significance, similar to the PS matching results.

Table 23. Results of simple comparison with DID method

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]
Control	383	12.02475	1.736292	33.97991	8.61086 15.43863
Treatment	366	15.94014	.9650771	18.46301	14.04233 17.83795
Combined	749	13.93801	1.007211	27.56523	11.96071 15.91531
Diff.		3.915393	2.011195		-7.863659 .0328732
diff = mean(0) - mean(1) t = -.9648 Ho: diff = 0 dgr. of freedom= 747			Ha: diff < 0 Pr (T < t)=0.0260	Ha: diff = 0 Pr(T > t)=0.0479	Ha: diff > 0 Pr (T > t) = 0.9740

6.1.3 Checking the robustness of DID with fixed-effects regression

Another way to measure the DID estimation is to use a fixed-effects regression instead of ordinary least squares (OLS) (Table 24). Fixed-effects regression controls for households' unobserved and time-invariant characteristics may influence the household annual income variable. The result shows that PFES participation has a positive impact of VND 3.85 million on annual household income and the impact is significant at the 5% level.

Table 24. Result of fixed-effects (within) regression

Number of obs = 1498 Group variable (i): nh Number of groups = 749 Prob > F = 0.0000					
hhicomea	Coef.	Std. Err.	T	P> t	[95% Conf. Interval]
Year	12.08495	1.417432	8.53	0.000	9.302322 14.86757
ya	(dropped)				
ydd	3.855193	2.026792	1.97	0.048	-.1236941 7.83408
cons	31.47463	.7162493	43.94	0.000	30.06853 32.88073

In conclusion, after iterations for PS matching techniques and the DID method, the results show that participation in the PFES program during the pilot period has approximately a positive impact of VND 3.9 million on household annual income, and this impact is significant at the 5% level.

6.2 Evaluating the Environmental Impact of PFES

6.2.1 Environmental impact evaluated by farmers

Environmental effects after two years of pilot implementation were assessed using six qualitative indicators covered in the household survey: total forest area, annual illegal logging, forest soil quality, forest fires, forest cover, and number of tourists (Table 25). The results show that most respondents understand these indicators and recognize the positive impact of this program on the environment.

Most of the participants and non-participants assessed the total forest area as having remained constant since the application of the pilot program. In addition, 38.52% of participants and 24.57% of non-participants indicated that the total forest area had increased since the application of PFES. However, the target of the program is to conserve and protect the current forest area, not to plant additional forest. The increase in forest area could have been brought about by the reduction in illegal logging, giving the impression that the forest area has increased.

With regard to annual illegal logging, 87.16% of participants and 71.33% of non-participants said that the amount of illegal logging has decreased since the policy was implemented. Since applying PFES, the regulation of forest patrols and protection is stricter and the number of days spent on forest protection has increased. The participants spent more time patrolling the forest and preventing illegal logging. In addition,

the payment level was higher and there were more participants than in previous policies so illegal logging was reduced in terms of quantity and volume.

Table 25. Farmers' assessment of the impacts of the pilot PFES on the environment (%)

		Increase	Decrease	Constant	Un-known	Total
Forest area	Participants	38.52	3.01	48.91	9.56	100
	Non-participants	24.57	15.02	38.57	21.84	100
Illegal logging	Participants	0.27	87.16	8.47	4.10	100
	Non-participants	4.78	71.33	5.12	18.77	100
Forest soil quality	Participants	50.49	0.82	13.39	35.30	100
	Non-participants	34.37	6.83	15.36	43.45	100
Forest fires	Participants	0.82	83.61	10.66	4.92	100
	Non-participants	3.41	74.74	6.48	15.36	100
Forest cover	Participants	86.34	1.37	4.92	7.38	100
	Non-participants	65.87	6.83	9.22	18.09	100
No. of tourists	Participants	13.11	1.09	31.69	54.10	100
	Non-participants	19.80	3.41	20.82	55.97	100

The results show that most farmers (35.5% of participants and 43.45% of non-participants) do not know how soil quality has been affected after two years of PFES implementation, although 50.49% of participants said that soil quality has got better. Also, 83.61% of participants and 74.74% of non-participants thought that the number of forest fires per year had been reduced and that the affect of each fire had also decreased; the number of forest fires has decreased because more people are patrolling the forest and preventing fires. During the sunny season, participants are asked to regularly practice fire prevention activities and individuals are responsible for the forest area they take care of. Consequently, any forest fire can be detected and dealt with promptly.

Forest cover is one of the indicators used to assess forest quality (forest canopy and the quality and density of forest layers). Most farmers say that the forest cover has improved. As for tourism, most of the farmers do not know if the number of tourists has changed. This is an understandable response for farmers in areas that are unfamiliar with ecotourism. Some 13.11% of participants and 19.8% of non-participants don't know if the number of visitors to the local forest area has increased after the implementation of PFES. On the other hand, 1.09% of participants and 3.41% of non-participants say that the number of visitors has decreased without any explanation.

In addition, information from the household survey, including the number of days each household spent on forest protection, the number of times the household detected illegal logging, the number of people participating in forest protection, the number of times forest-related meetings were held, and the amount of training in forest protection and development before and after PFES, are also major indicators for assessing the impact of PFES (Table 26). The results showed positive effects in all these areas. Each household spent 2.93 days a month on patrolling the forest before PFES, and this number increased significantly, to 6.29 days per month, during PFES. The amount of training for PFES participants increased from less than one training session a year to around three sessions per year. Similarly, the number of meetings held related to forest topics was more than three times that compared to before PFES implementation. Also, the average number of people per household that participated (labored) in forest protection increased with the application of PFES. Finally, the number of illegal loggings detected by forest holders decreased from 4.67 to 2.27 times per year.

Table 26. Quality indicators for environmental change with PFES

	No. of forest training	No. of forest meeting	No. people working on forest	No. of day/month for forest protection	Illegal logging
Before	0.89	4.73	0.77	2.93	4.67
After	2.75	13.84	1.00	6.29	2.27
D	1.66	9.09	0.23	3.37	-2.37

6.2.2 Environmental impact evaluated by statistical data

To complement the above result and to assess the positive environmental impact of the PFES policy, the research considered the statistical data on the number of illegal loggings collected from 14 key ranger points in Lam Dong Province (Table 27).

Table 27. Illegal logging in Lam Dong Province, 2005-2010

14 Key ranger points	2005	2006	2007	2008	2009	2010
Bao Lam	310	315	468	360	293	305
Bao Loc	112	112	103	89	72	66
Co Dong 2			51	93	118	66
Cat Tien	67	103	84	99	23	64
Co Dong 1	30	67	68	83	103	103
Don Duong	192	138	166	100	196	111
Da Hoai	990	820	85	95	135	169
Da Lat	332	303	301	128	222	189
Di Linh	235	304	396	318	402	419
Dam Rong	64	72	98	70	112	95
Da Ter	276	190	230	247	215	148
Duc Trong	262	410	383	309	378	129
Lac Duong	134	196	172	183	242	169
Lam Ha	179	215	214	165	210	170
Total	3.183	3.245	2.819	2.339	2.721	2.203

Source: Lam Dong Department of Forest Rangers, 2011

From 2005 to 2010, the number of illegal loggings decreased over time. The highest number of loggings occurred in 2005 and the lowest in 2010. However, in 2009 logging increased significantly in all PFES-implemented areas, including Co Dong 2, Don Duong, Da Lat, Duc Trong, and Lac Duong. As this was the first year of implementation and there were more farmers participating in forest patrols and protection, more illegal logging was detected. This contributed to the significant reduction in illegal logging in 2010.

In addition, the impact of illegal logging has been reduced. Several farmers explained that they detected illegal logging or fires earlier, hence the level of damage declined. Moreover, all the ten forest owners said that the actual number of loggings may have increased but the effect of each illegal logging decreased significantly. As they explained, the more time they spent patrolling the forest, the more illegal loggings they detected and put a stop to, so the effect of the logging decreased.

7.0 PAYERS' ASSESSMENT OF PFES PILOT IN LAM DONG PROVINCE

7.1 Revenue and Expenditure of the PFES Fund, 2009-2010

In 2009, the total revenue collected from the three categories of targeted service users, including two hydropower companies, two water supply companies, and nine tourist companies, was VND 55.327 billion. The hydropower companies contributed VND 50.1 billion, accounting for 90% of total PFES revenue. The two water companies paid approximately VND 5 billion, accounting for 9% of total revenue. The last 1% was contributed by the nine tourist companies (Figure 18).

Regarding collected money, the Lam Dong FPDF expended VND 23.93 billion, including VND 19.375 billion to forest holders and VND 4.555 billion for the system management fee. The management cost accounted for approximately 20% of total expenditure. At the end of 2009, the remaining fund was VND 31.397 billion, which was kept by the Lam Dong FPDF. Because the amount remaining in the fund after the first year was relatively high, the managers decided to increase the payment rate to farmers in 2010 to around 30% compared to that of 2009.

In 2010, the total money collected was VND 52.483 billion (Figure 18). The two hydropower companies paid VND 46.14 billion; Sai Gon and Dong Nai water supply companies paid VND 6 billion; and seven tourist companies paid VND 0.3 million. Two tourist companies declined to pay because they were not convinced by PFES and the payment level.

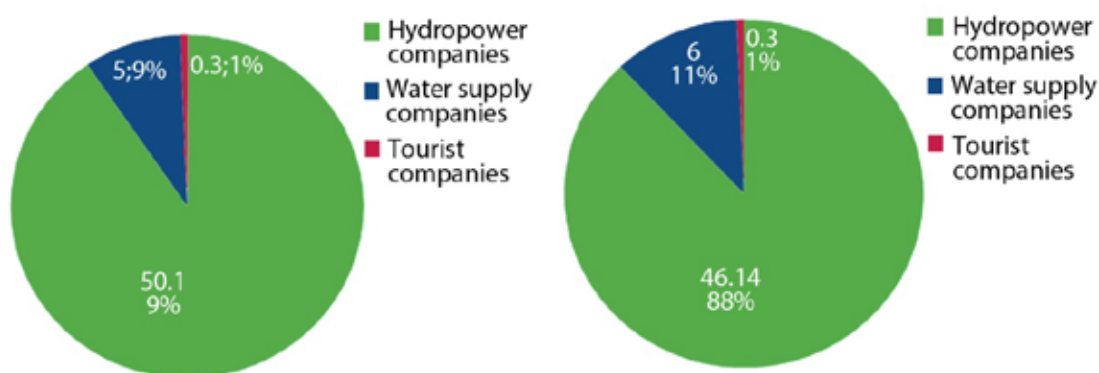


Figure 18. Payment distribution in 2009 (left) and 2010 (right)

In 2010 VND 45.431 billion was paid to farmers and VND 9.791 billion was paid in management fees to forest owners and Lam Dong FPDF. The total expenditure in 2010 was VND 55.222 billion from total collected money of around VND 2.739 billion that was taken from the remaining fund in 2009. Consequently, after two years, the total collected money was VND 107.81 billion (approximately USD 5,185,193), and the total expenditure was VND 79.152 billion (approximately USD 3,805,400) including the system management cost. The management costs of operating the system accounted for 18.12% of total expenditure. The last of the money, a total of VND 28.658 billion, has been kept by Lam Dong FPDF (USD 1,379,793) (details in Appendix 1).

With the above collected and allocated money, the total protected forest area given to farmers up to the end of 2010 was 209,705 ha, located in Da Nhim watershed, Dai Ninh watershed and Dong Nai river basin. However, this area will be expanded in the future based on the total amount of money collected.

In addition, the number of participants has increased over time in terms of the estimated forest area and the number of registered volunteers. Most participants are from local ethnic groups and this fits with one of the program's criteria, which is to give priority to the poor and to ethnic people. Up to the end of 2009 there were 3,162 participants, 82% of which were from ethnic groups. This number increased significantly at the end of 2010 to 9,870 households, 70% of which were of ethnic origin.

The cost of implementing PFES in Lam Dong throughout 2009 and 2010 was VND 99.086 billion, and this consisted of administration costs and the cost of preparing, designing and implementing PFES. In the first stage, USAID sponsored Winrock International to collaborate with the Vietnamese government to prepare and pilot the PFES in Lam Dong and Son La provinces (sponsorship totaled VND 84.74 billion). During the two years of the pilot implementation the cost of managing the system, which was VND 14.346 billion, was taken from payments collected. After two years, payments collected from forest users totaled VND 107.81 billion, and this was assumed to be the program's revenue. This money was spent on administration costs and payments to farmers. Hence, the total cost of PFES implementation accounted for 92% of the total money collected (Table 28).

Table 28. Total expenditure and collected payments for PFES in Lam Dong, 2009-2010

FPES total collected payments	Implementation cost (thousand VND)		Total payments to farmers	Collected payment/cost	Payment/cost
107,810 thousand VND	Administration cost	14,346	64,806 thousand VND	1.09	0.65
	Sponsored by USAID	84,740			
	Total	99,086			

Source: Dissemination workshop in Lam Dong Province, August 2011

7.2 Impact of Payment for Forest Environmental Services on Service Users' Expenditure

During the in-depth interviews, all the service users, such as the state companies, said that they were willing to pay for service values on a quarterly basis because they could account for these fees in their operation costs and attribute it to their final product price. The payment accounted for around 6-9% of the total annual costs of the hydropower companies and approximately 1% of total annual costs for the water supply companies. Private enterprise service users, such as ecotourism, were a bit confused about estimating the payment rate and the mechanism for distributing the fund. Although they accounted for this cost in their operating costs, they did not increase the price of entrance tickets because of competition, so the payment accounted for just 0.5-1% of their annual revenue.

For the hydropower companies, payment for forest environmental services started in January 2009. Directors from the two companies said that the payment rate was relatively high, accounting for 7-10% of the production cost per kwh (VND 250 per kwh) and 4% of the production cost (VND 550 per kwh) in Da Nhim and Dai Ninh, respectively. This payment rate is higher than the natural resource tax, accounting for 2% of the commercial electricity price. This cost would normally be passed on to users. Actually, the companies did not increase the selling price of electricity during the pilot period because the price of electricity is controlled by central government. It has to be understood, however, that the electric companies have a monopoly.

The two companies said that this cost must be added on to the electricity price and that users must pay for it in the future. It should be noted that the hydro-electric companies have been paying the natural resource tax, and now they must pay environmental services costs as well. Whether the payments are similar or different has not been explained to them by government representatives and they suggested that the government should explain these payments to them.

Since 2009, the two water supply companies have been paying VND 40 per cubic meter of commercial water sold to the national FPDF. There is confusion in both companies over how payment is allocated to service providers, whether their payment goes directly to the local residents protecting the forest or not, how much has been paid, how much is remaining, how is the payment level established, and other issues. However, as their representatives said, they are government companies and if the government asks them to pay for environmental services, then they will pay. The cost will be included in the production cost and reflected in the final service price. In addition, the Dong Nai Water Supply Company and the Sai Gon Water Supply Company use water from two provinces, including Lam Dong and Dong Nai, and they wanted to know who identifies the distribution role between the two provinces and how payment is allocated. Neither company has received an annual financial report from Lam Dong FPDF or related organizations.

For the payers by themselves, it is very difficult to assess the impact of the payment on their water collection in 2009 and 2010. To date, they have not seen any improvements in their water supply system. There is no technology that illustrates the connection between payments and improvements in water supply. Also, the quantity of water resources in Dong Nai river basin may decrease because of frequent droughts.

Regarding services connected to water generation and adjustment, the National FPDF has collaborated with other organizations to determine the contribution of Lam Dong forest to the Dong Nai water basin. In Lam Dong forested area accounts for 52% of the Dong Nai watershed. The two water supply companies paid VND 9.42 billion in 2009 and VND 11.62 billion in 2010, and this money was distributed to the Lam Dong FDP fund. These payments account for 2-3% of each company's annual operation costs.

The ecotourism companies have been paying 1% of their revenue to Lam Dong FPDF on a quarterly basis since 2009. This revenue has come from money received from entrance tickets. All of the ecotourism companies understand the reasons why they must contribute to Lam Dong FPDF and they appreciate the fact that the low payment rate does not really impact on their service costs. The ticket sales were low while they supplied several value-added services and, as most of the tourist companies are privately-owned, they can keep their entrance tickets reasonably priced. Nevertheless, five of the nine ecotourism companies said that they benefitted from advertising the fact that they are paying for forest environmental services, and that this, in turn, compelled good behavior from tourists. Hence, no company increased their entrance ticket prices after paying for forest environmental services.

Most of the ecotourism companies are a bit confused about the payment rate of 1% of annual entrance ticket revenues. They want to know how the fund works, what they are paying for, whom they are paying, how much they are paying them, and how their payment is allocated. Therefore, in the long-term period, the government has to give this information to the ecotourism companies to encourage them to pay the service fees.

7.3 Advantages of PFES Implementation According to Service Users

All of the companies understand the reasons for PFES and agree to their obligation to pay for forest values. Most of them say that this payment can contribute to the improvement of the environment and to the livelihoods of local residents. They have indicated that they think it is a good policy and that it needs to be compulsory. Currently, the payment rate is relatively high but it is acceptable because the forest is in desperate need of protection. They are hoping that if the forest cover area is improved, the many factors threatening their water supply can be gradually eliminated.

The hydropower companies understand that their payments will help to reduce soil erosion, decrease reservoir sedimentation, prevent flooding, and increase the base flow. The ecotourism companies do not yet understand the role of forest services in their business but they believe that the better the forest is protected, the higher the income they could make.

7.4 Shortcomings of PFES Implementation According to Service Users

Although most service users understand their obligations, they are a bit confused about the implementation mechanisms and they suggest the following improvements.

- There is no economic contract or agreement between forest holders and service users regarding service quality, money allocation, rights and obligations. At the beginning, service users participated in some meetings on PFES obligations organized by the Lam Dong people's committee, Lam Dong FPDF, and Winrock International. Then, every quarter, an accountant from the Lam Dong FPDF issued a note regarding the payment time and amount of payment to service users. These companies say that if the government asks them to pay, they will pay but they wonder if their money will really be allocated to the farmers who are protecting and developing the forest. There is no commitment to responsibilities regarding service quality between them and forest holders. Service payers wonder what will happen if their payment is

increased and deforestation increases. Also, there is no system to illustrate the relationship between payment and the quality of forest services.

- Information access and the dissemination of information to service users about the PFES program are inadequate. There are no official explanations about how the payment rates are determined and there are no annual reports on financial revenue and expenditure. Also, there is no research or scientific reporting on the total forest cover in Lam Dong Province before and after PFES. All of the companies suggest increasing the number of staff involved in disseminating and promoting PFES. Whomever acts as the proponent of PFES must clearly present the following to service users: the approach used to determine the payment rate; annual reports that detail revenue and expenditure; share research reports or information related to changes in forest area due to illegal logging or forest fires; and information on environmental quality to service users.
- At the beginning, the PFES policy was designed without the participation of other stakeholders such as Vietnam Electricity (EVN), the water supply sector, and the Vietnam National Administration of Tourism so the policy did not receive guidance and encouragement from general administrators in how to allocate funds for this payment. If PFES is applied compulsorily, related sectors must participate in its preparation and implementation. Additionally, all of the companies would like to know how their money will be used and they want to participate in the council that controls the fund. Moreover, the service users hope to form an independent organization to evaluate and monitor the quality of environmental services and the fund distribution.
- All of the service users feel that it is unfair to use the same payment rate for every user in a sector. According to them, in each location, the contribution of forest services upstream and downstream is very different. Hence, it is necessary to determine the payment rate depending on the forest contribution in each location.
- Based on these suggestions, the companies suggest enhancing the monitoring system as well as setting up a reward mechanism for individuals or organizations who pay well and on time, in order to encourage good implementers. On the other hand, it is necessary to set up regulations that punish those who do not pay or who pay late.

8.0 EQUITY IN PFES PILOT IMPLEMENTATION

Equity in the pilot implementation of the PFES is a key indicator of the success of the policy. In this research, equity is identified in terms of access to information, equity in decision-making, and benefit allocation.

8.1 Equity in Information Access

If farmers receive policy-related information on time and if it is fair, then they can participate in PFES more responsibly and proactively. In 2009 and 2010, with the support of Winrock International, the Lam Dong People's committee and the Lam Dong FPDF, several public information campaigns were launched. For instance, in the pilot areas, 24 poster panels and 41 large roadside billboards were installed, around 200 small billboards were displayed, and 14,200 brochures were delivered to farmers via PFES-related meetings and workshops.

However, because most farmers are from ethnic groups with a low level of education and limited access to information, several respondents (99 participants or 27.05% of the total) were unaware of the government's forest planting, protection and conservation programs. Consequently, although they are members of the PFES pilot program, they do not know about the PFES pilot program and its implementation. The matters they are most concerned about are what do they have to do and how much are they going to be paid. A total of 72.95% of participants said that they knew about the program but they

were unaware that it is just a pilot program. In summary, because of the low level of education of farmers and poor information sharing, many of them do not fully understand the program yet (Table 29).

Table 29. Household awareness of the PFES pilot program

	Aware	Unaware	Total
No. of respondents	267	99	366
Percentage (%)	72.95	27.05	100

Information about the pilot program needs to be communicated at three different levels:

- at a national level – the Ministry of Agriculture and Rural Development should take responsibility for this;
- at provincial level; and
- at commune/district level.

Most of the respondents said that they learned about the program from the forest owners (63%), while the rest accessed the information from friends and relatives, from media such as TV and newspapers, and from public meetings, seminars, and workshops (Table 30).

Table 30. Sources of information on the PFES pilot program for farmers

	Forest owners	TV/newspapers	Friends/relatives	Others	Total
No. of respondents	322	98	46	47	513
Percentage (%)	62.77	19.10	8.97	9.16	100

The regression model shows that the more farmers access information on PFES, the higher the probability that they will participate. By looking at the marginal effect, the variable of information access strongly affects participating probability in PFES. In addition, approximately 50% of the non-participants said that they did not know about the program. Several farmers still do not know whether they are eligible to participate in the program and what criteria are considered.

Currently, forest owners collaborate with the commune forestry committee to figure out a list of illegal farmers. This list is announced and stuck on the commune news table. The final illegal list is approved by the commune people's committee and the district people's committee. However, some farmers from the survey said that they do not agree with the list sometimes because the local implementer usually gives priority and related information to their relatives or neighbors.

8.2 Equity in Decision-making

In Vietnam, the process of PFES implementation has not followed market mechanisms between buyers and sellers, although qualified farmers are free to make a decision regarding their participation. The government still acts as the main coordinator of the PFES pilot program because the government owns the forests. Consequently, any contract related to forest protection was signed by the forest owner on behalf of local authorities and representatives of forest holders on behalf of all the forest protection teams. Then, the forest owner representative for the forest holders signed the contract directly with the Lam Dong FPDF. The content of the PFES contract is based on the previous program's contract (Program 661) and no suggestions or comments from the forest service suppliers and users were incorporated. Normally, forest owners sign the contract with a group leader of 7 to 22 people, but each farmer does not sign the contract directly with the forest owner, they just sign an authorization document for a group leader.

Therefore, several farmers do not remember or clearly understand the items mentioned in the contract or their rights and responsibilities. A total of 45 respondents out of 366 respondents (12%) said they cannot remember the content of the contract because they were called to sign it only after the forest owner

read all the items in the contract at the forest owner's office. They did not have time to read the contract carefully or to take it back to their home. A total of 30% of participants said that they did not read the contract before signing it.

In 2009 the contract mentioned the area, location, payment level, and general requirements regarding responsibility. In 2010, the Lam Dong FDPF inserted detailed penalties in the contract. However, most participants were not aware of the conditions mentioned in the contract due to their low level of education and limited reading ability. Therefore, from 2009 to 2010, more than 50 households lost their contracts because of violations such as illegal logging, not patrolling on time, etc. As a result of violating their contracts, their allocated forest area was taken away from them and given to the next farmer with the highest priority.

One of the five criteria of the PES is the freedom to participate (voluntary transaction) (Table 31). Many households indicated that they were free (54% for participants and non-participants) or completely free (41% for participants and 24% for non-participants) to decide to participate in PES after they were qualified for the program. They considered their participation to be voluntary because most of them did not have any forest land but they were given land by the government based on the priority criteria. However, five households said that voluntary participation was relatively low because the contract was signed by groups, instead of by individuals, and some group leaders gave priority to their relatives or neighbors.

Table 31. Household assessment of the amount of freedom to decide to participate in PFES

Participating decision	Participants		Non-participants	
	No. of respondents	Percentage (%)	No. of respondents	Percentage (%)
Completely free	151	41.26	87	24.30
Free	199	54.37	194	54.19
Normal	9	2.46	40	11.17
Low	2	0.55	5	1.40
Completely not	5	1.37	1	0.28
Do not know	0	0.00	31	8.66
Total	366	100.00	358	100.00

8.3 Equity in Benefit Allocation

The vital outcome of the PFES pilot implementation is the amount of money or compensation that can be used to take care of the forest. This payment depends on the allocated forest area. During the pilot phase, Lam Dong Province chose the coefficient $K = 1$. This means that every participant in the same watershed is paid the same rate, although the time spent on forest protection and conservation is different between different forest owners. Some of the participants suggest identifying the payment rate based on the forest quality and the degree of threat to the forest. Two options have been put forward:

- 1) Retain the same payment rate because most forest holders are from the K'ho ethnic group. Benefits from the forest must be equally distributed. If the K coefficient is identified, the difference in payment rate may be a potential source of social discontent; and
- 2) The determination of the K coefficient would encourage forest holders to take care of the forest well and in a sustainable manner. The program can achieve efficiency if the benefits are distributed and not just skewed to the K'ho communities.

On the other hand, there are large differences in payment between the three watersheds. The payment in the Dong Nai watershed is the lowest (VND 50.000/ha per year) and the payment in the Dai Ninh watershed is the highest (VND 400.000/ha per year).

Moreover, during the pilot stage, the precise allocation of forest parcels to households was not archived. For instance, in the Da Nhim watershed, some households received 30 to 40 ha; while in Da Lat

City, which is evaluated for its importance to tourism, some farmers received only 12 to 15 ha. Accordingly, the total payment ranged from VND 2.4 million to 37 million/household per year. Consequently, there have been several complaints and protests from farmers receiving lower payments. Some of these issues have been raised with local authorities. Mr. Minh, of Lam Dong DARD, says he knows about these issues but, at this early stage, there has not been any research on how to determine the K coefficient. Computing the K coefficient must be based on forest quality and quantity as well as on fair and accurate forest demarcation. It takes time and money to do these tasks, therefore the inequity has to be accepted for a while.

There is no contract between service users and service suppliers. The payment by service users is flexible and depends on the users' annual operating outcome. In other words, the money collected from service users depends on the annual operating results of hydropower companies, water supply companies, and ecotourism companies. Therefore sustaining this payment mechanism is a challenge. Although there is no difference in payment level between ethnic groups, women, female-headed households, the poor, and uneducated households, the payment level has been determined based on total revenue instead of service quality or opportunity costs.

The situation can be likened to two neighborhood farmers, one of whom receives forest land located in the watershed with PFES, so s/he is paid 300% more than another farmer who protects forest land belonging to Program 661 or to a program run from the provincial budget. Both of the farmers must spend the same amount of time engaged in forest protection and patrolling. This situation makes the lower-paid farmer feel discriminated against.

9.0 ACCOMPLISHMENTS, ISSUES AND LESSONS LEARNED

9.1 Accomplishments

Vietnam is the first country in Southeast Asia to launch a national PFES policy. The policy has been a success, as the preliminary accomplishments in Lam Dong Province demonstrate.

- Implementation of the PFES policy in Lam Dong Province has increased environmental awareness and has educated local authorities, farmers, and service users about their responsibilities regarding forest protection and conservation. Previously, when talking about forests, most local residents instantly thought about the value of timber or non-timber products such as mushrooms, herbs, honey, and animals. They also believed that forest protection and development was the responsibility of the government. After several public campaigns by the PFES policy regarding forest values and the rights and responsibilities of forest protection and development, farmers' awareness of forest values has improved. Most farmers have learned about the other important values of forests and that forest service users must pay for these values instead of the government. In addition, as the implementers of the program (rather than local authorities), farmers now have a better understanding of forest values and of their responsibility to promote and implement PFES. Moreover, the payers now understand that payment for forest services is their responsibility if water resources and the beauty of the landscape are to be safeguarded – and if these values are enhanced, their outputs will certainly improve.
- Economically, PFES has helped to improve the lives of local residents through increased annual household income. The estimated data show the positive impacts of PFES policy on the annual income of participants to be VND 3.9 million. Although this contribution is not really significant compared to annual average household income, it is a positive effect after two pilot years. This increase in income could contribute to the reduction of poverty and the eradication of hunger among communities living near forests and could, in turn, support the stability of local politics. In the first stage of PFES, the allocation of compensation between the participants has been relatively fair.
- Environmentally, after two years, the PFES pilot has had a positive impact on forest quality and quantity. Farmers are now better trained in forest protection and conservation and this helps

them to protect the forest more efficiently. They must spend more time patrolling the forest, and attending public meetings about the forest. Consequently, some illegal logging and forest land encroachment has been prevented on time. Also, the total forest area has improved. More importantly, this is the first time that the value of the forest in terms of water regulation, the reduction of sedimentation in reservoirs, and the preservation of the beauty of the landscape have been quantified. Any decision by the government relying on these values can now be more accurate. The results also provide a baseline to encourage different stakeholders to plant and to take care of the forest. Forest improvement also contributes to the stable and sustainable development of hydropower plants, water supply companies, and ecotourism enterprises, and to a reduction in the climate changes that cause environmental disasters such as drought, flooding, and disease.

- PFES implementation has created a general framework of forest management, which relies on an incentive-based mechanism. Stakeholders' rights and responsibilities have been discussed. There is closer coordination between forest owners, local authorities, and farmers relating to forest protection and management. The local government at village and commune levels has become involved and has paid more attention to and provided more support for forest protection including tree cutting, fire control, and the pursuit of violations of Forest Protection Law. In addition, PFES is a bridge that can connect local farmers and state or private companies in terms of responsibility and compensation, with the government acting as moderator. Therefore, forest protection and development have become tasks undertaken by different stakeholders in society and are no longer just the government's responsibility.
- Some social issues in local communities have been resolved. With respect to employment, more than 40% of forest holders participated in the PFES compared to participation in previous programs. This source of employment is helping to solve labor problems in rural areas. In addition, the PFES contracts were signed by groups, creating solidarity within communities because members must collaborate closely to sustain the group.
- The PFES pays the local staff of 22 forest management boards and forestry businesses. A total of 10% of the money collected for management is used for wages. This money has improved the income of local staff and has encouraged them to spend more time and effort administering the operation of PFES. The technical capacity of the local technical personnel regarding the management and application of new technologies and equipment for environmental monitoring, e.g. GIS tools and gauging stations, has also improved.
- Through public information and actual operation, PFES has attracted the attention of individuals and organizations from other provinces as well as from other countries. The director of Lam Dong FPDF said that in 2009 and 2010 more than 100 participants from ASEAN member countries and China attended the Southeast Asia Regional PES Policy Enabling Conditions Workshop in Da Lat City. The participants also made site visits showcasing the lessons learned from Lam Dong Province's pilot PFES. Delegations from other Vietnamese provinces, as well as from the governments of Lao PDR and Cambodia, have made study tours to Lam Dong Province to learn about the implementation of PES.
- Following the principles of pilot implementation, Lam Dong Province regularly conducted seminars, workshops, and meetings to evaluate the achievements of the program and to address any issues that arose. These events were supported by Winrock International and several issues were resolved promptly. At the commune level meetings were held twice a month; at the district and forest owners level one meeting was held every month; and at provincial and national level, more than 10 workshops were held. However, these meetings only focused on evaluating PFES implementation. The Lam Dong people's committee and Winrock International held three major workshops: a mid-term evaluation, an annual report meeting, and a final review workshop. Several issues were brought up, and these constitute essential lessons for the next stage of PFES implementation.
- After the pilot period, the national legal framework for PFES in Vietnam was established. At the first stage PFES was established by the government in the form of Decision 380. The program's two pilot years in Lam Dong Province were a success. Because of this, by the end of 2010, the

Prime Minister of Vietnam signed the National PFES Decree into Law (Decree 99), and it has been applied nationwide since January 2011.

9.2 Issues and Lessons Learned

Although PFES has been evaluated as an effective policy in Lam Dong, Vietnam has faced several challenges in its implementation. This section presents these challenges and the lessons learned from the two-year pilot period.

- 1) The “voluntary transaction” aspect of the PFES policy was not fully implemented. Unlike other countries, all land and forest land is owned by the government of Vietnam, so it was hard to use this criterion to implement PFES. Adhering to Vietnam's land laws, farmers are given a forest area to protect and conserve for a limited period. The contract for PFES participants is set up annually. This set-up has two effects. On the positive side, some forest holders have worked hard in order to be given a forest area the following year – otherwise, the forest area will be taken from them and given to the next priority farmer. On the negative side, because forest tenure is not secure, some participants try to make additional income from the forest. Consequently, around 50 contracts were terminated because farmers ventured into illegal logging. In addition, because the forest is state-owned, the PFES policy prioritizes local, poor, and ethnic farmers. This means that even if other farmers want to participate in the program, their names are not put on the legal list. Therefore, the “voluntary transaction” criterion was only applied after satisfying the criteria of the conditional list.
- 2) The PFES pilot policy did not fully identify all forest values. The payment was implemented with only three services in mind: water regulation, soil sediment prevention, and the preservation of the beauty of the landscape. The value of landscape beauty was not estimated scientifically. Hence, the payment established for ecotourism companies was 1% of the total revenue from ticket sales and this payment did not convince service users – possibly because limited services were implemented to reduce the risk of failure. Other important forest values were not estimated for payment implementation such as carbon sequestration and biodiversity. In the pilot stage only large service users were identified, while small hydropower companies, water supply companies, and other potential users were not considered. Consequently, the payment to forest holders did not cover the opportunity cost and has not significantly impacted on annual household income. In the long-term, if all the service users and service values are not included, there will be discrimination between users.
- 3) Because the coefficient $K=1$ was fixed for every forest, the farmers were not encouraged to improve the forest quality. In the pilot phase, the constant payment rate was simple and easier to implement. However, from the participants' perspective, this payment rate was unfair to participants given poor quality forest and those whose houses are located far away from the forest they have to care for.

At the end of 2010, using additional funding given by USAID (Winrock International), experts collaborated with the Lam Dong Department of Technology and Science to set up four gauging stations in the Da Nhim watershed. These stations were established to monitor the quality of forest environmental services to determine the K coefficient. The monitoring focused on water level, flow velocity, sediment deposition, and turbidity. However, it takes time and labor to operate and maintain these stations. In addition, with the current erratic state of climate change, the monitoring did not give stable results. Relying on this inaccurate result to set up the K coefficient could be a potential source of social discontent. On the other hand, the PFES policy not only focuses on forest protection and conservation but also aims to improve local living conditions. Therefore, the final payment rate must consider both the K coefficient and the socio-economic and socio-political factors of local communities.

- 4) Although the forest simultaneously supplies different services, PFES applied the payment for only one service in each watershed, which caused inequalities in payments to households in different watersheds. Total payments between the hydropower, water supply, and ecotourism companies were significantly different.

For instance, the forest value in the Da Nhim and Dai Ninh watershed was estimated for water regulation and sediment prevention for hydropower companies. The money collected from these companies was used to compensate the forest holders in these areas. The forest in Da Lat City, on the other hand, was valued for the beauty of its landscape so forest holders were paid out of the money collected from ecotourism companies. The forest in Dong Nai watershed was valued for water generation so the forest holders were compensated by the money collected from water supply companies. Overall, the payment rate among forest holders varied considerably, even though all the forest holders spent the same amount of time and expended the same effort to protect the forest contracted to them.

- 5) The legal framework for the implementation of PFES has not yet been completely established. There were no regulations for disciplining farmers contracted to perform forest protection who then allowed deforestation, agricultural encroachment and illegal logging to take place. Also, there were no formal guidelines for dealing with service users who do not pay the right amount of money and/or pay on time. During the pilot period two tourist companies did not pay on time, but the Lam Dong FPDF was at a loss to know how to deal with them. Furthermore, the core relationship between service users and forest holders did not guarantee rights and responsibilities. As a consequence, the users did not trust that their payments would be used to improve the living standards of local residents and forest holders and they also distrusted the fact that forest holders would indeed strive to improve forest quality. Alternatively, some farmers thought that they were being paid by the government instead of service users.

The financial mechanism and general discipline for the operation of the Lam Dong FPD fund has not been clearly enunciated. The procedure for money collection and distribution is problematic so the users worry about how their payments are being used and how accurately they are being allocated to forest holders. Currently, there is no mechanism that monitors the money received from payers going into the fund and being paid out to forest owners and contracted households. Another area that still requires clarification is how the fund is disbursed and approved, including the allocation of the 10% spent on general management costs and the further 10% towards the management costs of the forest owners. Finally, the procedure for implementing the fund's collection and distribution between the national FPDF and the provincial FPDF has not been clearly determined.

- 6) There has not been any scientific data to illustrate the relationship between the users' payments and improvements in forest services. Although it is really quite difficult for the users to recognize improvements in forest services, local authorities have not given them any concrete information. As a result, service users are worried that their payments cannot prevent illegal logging. Although some gauging stations have been set up, the data collected from these stations has not been reported publicly. Also, with recent extreme changes in climate and weather, the quantity and quality of the water supply from these areas may have already deteriorated – but the payment is constant.
- 7) Although Winrock International has collaborated with local authorities to conduct several campaigns to raise public awareness of the value of forests and of PFES implementation, stakeholder recognition of this policy is limited. Surveys show that more than 30% of participants could not state clearly the name of the PFES policy and could not remember the content of their contracts. Most of the service users do not understand how PFES is implemented, especially how it operates the funds. Challenges to this situation include the low levels of education and limited access to information of rural residents as well as an inadequate and ineffective information delivery system.
- 8) Winrock International was the proponent of the PFES policy in Vietnam through the Asia Regional Biodiversity Conservation Program. Winrock International finished the PFES project in 2010 and the project now has to find additional funds for implementation and to pay professional experts. Winrock International, on behalf of USAID, paid for all the costs of preparing and designing PFES as well as inviting experts to help implement the program in Lam Dong. Financial and technical support for PFES in Lam Dong and in other provinces in Vietnam will be limited in the next stages of implementation if funding is not found.

- 9) The challenge is to apply the experiences of Lam Dong to other provinces in Vietnam. Lam Dong has different natural characteristics, living standards, and social features to other potential implementation areas in Vietnam. The financial frameworks and technical resources needed in other provinces have not yet been considered and, even though the forest service values in Lam Dong have not been fully estimated, managers have not presented a proposal to adjust these values in other provinces.
- 10) There is no scheme to maintain users' payments in the next few years. During the pilot scheme forest holders were paid mainly from the money collected from service users. PFES policy stipulates that forest service users pay forest holders to compensate for forest use through the Lam Dong FPDP. If the users decline to pay for the service values, the sustainability of the policy will be affected. However, issues have already surfaced during the pilot period, meaning that supplemental regulation is needed to ask the service users to keep up their payments. As of now, there is no solution for this issue.

Lessons learned during the PFES implementation will form the foundation upon which the Vietnam government can apply the policy more effectively and efficiently at national level. The research has identified the following lessons that need to be learned from the pilot project.

- Carefully design and prepare PFES to make it appropriate to different contexts even though this takes time and capital.
- The support and collaboration of external individuals or organizations is important for the design and application of PFES.
- Clearly identify the payment services, payment rate, and payment mechanisms. The government must explain the basics of these processes to all stakeholders.
- Establish the legal framework needed to operate this program and set up a scheme to frequently monitor and evaluate the implementation process.
- Prepare data to illustrate the relationship between service users' payments and service quality in order to convince buyers. The payment scheme for service providers should also be systematized.
- To attract the participation of forest holders, the compensation level must at least equal their opportunity costs. In order to do this all forest services must be identified and paid for.
- Information related to PFES must reach all the stakeholders and it should come from local authorities via different communication techniques and strategies.
- Consider equitable distribution when determining the payment. To avoid potential social dissatisfaction, adjust the payment according to the political and social factors present in each commune.
- Seriously consider all feedback from all stakeholders and adjust the policies accordingly.
- Establish effective collaboration between all the authorities that are involved, from the center to local levels, in order to implement PFES successfully. PFES cannot be applied without the support and collaboration of local farmers.

10.0 CONCLUSION AND RECOMMENDATIONS

10.1 Conclusion

Lam Dong started implementing the PFES pilot policy at the end of 2008. It started paying households early in 2009, following Decision 380/QĐ-TTg. After two years of pilot implementation, a survey of local residents, authorities, government, and visitors from other countries, considered the PFES in Lam Dong to have been a success.

The most important achievements of the project were improved environmental awareness and changes in the behavior of stakeholders regarding forest service values as well as changes in their attitudes

towards their responsibility for forest protection and conservation. Stakeholders include local farmers, authorities, forest users, and others.

Generally, the PFES policy received a high level of consensus among agencies at various levels. Ethnic minority and poor households were happy to receive payments that contributed to their annual income. PFES had a positive impact on preventing illegal logging and forest fires and it also promoted an increase in the time spent protecting the forest, farmers being trained in forest protection skills, and greater knowledge about the forest. Most importantly, most service users complied with the payment in accordance with the regulations that were set.

PFES is a good policy, appropriate to the context of Vietnam. It generated an economic link between the users and the providers of forest values, in which the users pay the providers based on a user-paid mechanism. The policy has created a new financial mechanism for forest management and protection so that more investment in development and an enhancement of forest quality can be achieved. The pilot PFES in Lam Dong Province has drawn the attention and support of national and international communities. There are, however, issues that need to be addressed.

- The mechanism for entrusting, managing, and using the PFES fund needs to be developed and publicly reported in order to convince payers and users to comply with the system.
- A mechanism for checking, monitoring, and evaluating the quality of the forest and other forest services must be set up to determine the appropriate payment scheme. A mechanism to check and monitor the payment process and to sanction contract violations must also be established.
- To convince ecotourism companies to pay for forest value, the value of the beauty of the landscape must be evaluated scientifically.
- Procedures for spending money collected from service users must be established and independent auditing must be conducted annually.
- A database, forms, contract templates for entrusting, dossiers for acquittal, rights, and for the obligations of each type of payer and payee should be developed.
- Other forest service values, such as capacity to absorb CO₂ and contribution to biodiversity, must be determined. The potential service users of Lam Dong forest services must also be identified.

10.2 Recommendations

10.2.1 Auctions for conservation contracts

Auctions, or tender-based approach, is a new way to deliver funding to community groups and individuals for conservation work and biodiversity protection. This approach has been implemented in the US, Australia, several European countries, and the UK. Using this method, landholders are asked to propose a conservation proposal and a bid to carry out resource conservation.

The environmental benefit index (EBI) or biodiversity benefit index (BBI) is used to evaluate and rank the conservation proposals and bids. Scores are based on the expected environmental benefits for soil erosion control, water improvement, air quality, wildlife habitat enhancement, and cost. In the US, for instance, EBI is composed of benefits to wildlife, water quality, erosion control, and air quality (Table 32). Bids that exceed a minimum overall score are accepted.

Similar programs, called BushTender Trial, Eco Tender, and Auction for Landscape Recover, have been applied in Australia. Landholders are asked to propose a bid to carry out resource conservation and also to detail the cost of this task. The bids are ranked according to the best value for money, and the successful landholders are offered the best value for resource protection.

Table 32. Score scale of environmental benefit index by US conservation auction program

Conservation benefits	Weight score
1. Wildlife habitat	0-100
2. Water quality, benefits from reduced erosion, runoff and leaching	0-100
3. On-farm benefits from reduced erosion	0-100
4. Benefits that will likely endure beyond the contract period	0-50
5. Air quality benefits from reduced wind erosion	0-45
6. Cost	0-25
Total	0-420

Source: US Conservation Auction Program, 2009

These solutions are seen as ways of generating equity among farmers in charge of various forest types and forest quality. These solutions are also more cost-effective than the traditional fixed price scheme. Auctions for conservation contracts could fix the K discrimination issue assuming that the number of days asked to protect the forest is fixed for every participant in each region. Hence, the payment offered could be ranked from the lowest to the highest. The survey showed that the lowest expected payment was VND 300,000/ha a year and the highest was a million VND/ha a year. However, most people expect to be offered payment ranging from VND 400 to 700,000 per ha a year. The participants expected to pay, on average, VND 525,000/ha per year (Table 33). Based on these results, if an auction scheme was applied in Lam Dong, forest owners could give priority from the lowest to the highest level until the requested number of participants was achieved.

Table 33. Expected payment of PFES participants to conserve the forest

Expected payment (thousand VND/ha per year)	300	350	400	450	500	550	600-700	750-1,000
No. of respondents	5	9	78	19	146	10	70	29
Percentage of respondents	1.37	2.46	21.31	5.19	39.89	2.73	19.13	7.92

Consequently, applying the auction scheme to 366 respondents, based on the required payment with 366 household participants and an average area of 26 ha per household, the total payment would be approximately VND 5.03 billion per year. This amount is higher than the total payment of VND 3.33 billion per year if the current fixed payment scheme is applied. Therefore, the auction scheme increases the total payment from the participants by 50% compared to that of the current top-down system.

10.2.2 Establish CO₂ emissions permit trading

Carbon sequestration is one of the main services provided by Lam Dong forest (Table 34). However, the pilot PFES did not mention this value. The value of carbon sequestration must be estimated to generate additional payments for service providers. Based on the research done by the Lam Dong Forestry Department, the carbon absorption capacity of forest types in Lam Dong is shown in Table 35.

Table 34. Carbon sequestration of forest in Lam Dong Province

No.	Forest types	Absorbed carbon amount (t/ha)
1	Standard evergreen forest	150-220
2	Young evergreen forest	60
3	Timber – bamboo mixed forest	35
4	Broad-leaved forest	220-300
5	Coniferous forest	150-180

Source: Lam Dong Forestry Department, 2011

Table 35. Total amount of carbon that can be absorbed by the forest in Lam Dong

Forest type	Total area (ha)	Amount of absorbed carbon (t)	Amount of absorbed CO ₂ equivalent (t)
Standard evergreen forest	19,894	2,984,100	10,951,647
Young evergreen forest	25,919	1,555,140	5,707,364
Timber-bamboo mixed forest	161,062	5,637,170	20,688,414
Broad-leaved forest	196,409	43,209,980	158,580,627
Coniferous forest	128,299	19,244,850	70,628,600
Total	531,583	72,631,240	266,556,651

Forest with wide-leaved trees can absorb the greatest amount of carbon – approximately 220-300 t per ha. The lowest amount of carbon (35 t per ha) is absorbed by timber-bamboo mixed forest. Relying on the data from the Lam Dong forest area for each type of forest, it is estimated that the total amount of carbon that Lam Dong forest could absorb is approximately 72 million tonnes, equivalent to 266 tons of CO₂. Therefore, Lam Dong could be encouraged to participate in greenhouse emissions reduction via the trade in global permits, with an average price of USD 13 for a tonne of CO₂ in the European market. The total value that Lam Dong's forest could generate if these credits are sold in the global marketplace is USD 3.5 million a year. This amount of money would increase compensation for participants and improve management systems.

10.2.3 Applying the travel cost method (TCM) and CVM

TCM and CVM should be applied to estimate the value of Lam Dong forest ecotourism in order to generate the landscape beauty value of forest services and convince ecotourism companies to pay for this landscape value.

10.2.4 Determine potential users

In the pilot stage, several service users were not determined such as farmers engaged in agriculture and aquaculture along the Dong Nai river basin, small-scale hydropower companies, the Lam Dong water supply company, and factories and enterprises emitting sewage in the watershed.

10.2.5 Establish the legal framework

The Lam Dong FPDF and each party in the forest conservation contract need to have an established legal framework in order to facilitate the management and control of stakeholders as well as to sustain their responsibilities and rights.

10.2.6 Continuously estimate forest service values

Forest service values need to be continually estimated and these values need to be adjusted in other provinces to establish the level of payment in different locations. Pilot schemes need to be conducted to establish payments in other provinces before moving to nationwide compulsory implementation.

10.2.7 Public awareness campaigns

Continuously carry out public campaigns to increase awareness of PFES policy and to deliver the required information to stakeholders.

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Appendix 1. Financial Report by the Lam Dong Forest Protection and Development Fund, 2009-2010

Payer	Revenue (VND billion)			Expense (VND billion)				Total area (ha)	No. of Households	
	Total revenue 2009-2000	2009	2010	Description of expenses	Total expenditure 2009-2000	2009	2010		2009	2010
				Forest Protection Contract	64,806	19,375	45,431			
Da Nhim watershed	48.48	24.32	24.16		29,939	10,714	19,225	57,157	3,162	3,617
Dai Ninh watershed	47.78	25.80	21.98		24,677	8,524	16,153	40,847		
Dong Nai river basin	10.94	4.90	6.04		10.19	0.137	10,053	111,701		6,253
Seven tourist companies	0.61	0.31	0.30							
				Management (FPD Fund + Forest owners)	14,346	4,555	9,791			
Total	107.81 (\$5,183,173)	55.327	52.483		79.152 (\$3,805,400)	23.93	55.222	209,705	3,162 households (ethnic HHs: 2,600 accounting 82%)	9,870 households (ethnic HHs: 6,858 accounting 70%)

Source: Lam Dong Forest Protection and Development Fund, 2010 (Lam Dong FPD Fund)

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