

Article

Impacts of Payment for Forest Environmental Services in Cat Tien National Park

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Abstract: This paper assesses the impacts of Payment for Forest Environmental Services (PFES) in Cat Tien National Park, Vietnam. We analyze the impacts and additionality of PFES on local livelihoods by comparing the socio-economic situations in four pairs of villages before and after its implementation, and between places where PFES is and is not applied. In total, 149 people participated in focus group discussions, while 244 households (123 in areas with PFES and 121 in areas without) took part in household surveys. Our research shows that 92% of the people interviewed are from ethnic minorities participating and benefiting directly from PFES. In villages with PFES, the numbers of participating households ranged from 45% to 88% of all poor households in those villages. Of the poor households participating in PFES in the studied villages, 22% have no source of cash income other than their forest protection contracts, while 81.4% have escaped poverty, based on self-defined poverty criteria, through additional income from forest protection. Since the implementation of PFES, the area of forests allocated for community and household management is estimated to be three to 3.64 times higher than it had been previously. Although the number of communities under PFES contracts has not changed, the number of households participating in forest protection contracts is now much lower than before PFES started. On average, PFES contributes 16% to 74% of total household income in villages with PFES. Incomes in places with PFES are significantly higher than in places without. Although our research demonstrates immediate positive socio-economic impacts on livelihoods, it also highlights weaknesses in the current monitoring and evaluation system and a lack of reliable data for measuring PFES impacts in Cat Tien National Park.

Keywords: Cat Tien National Park; PFES; Vietnam; impacts



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1. Introduction

Payment for Environmental Services (PES) is being implemented throughout the world with the aim of providing financial incentives for forest owners to protect forests more effectively. Multiple countries have adopted national payment programs as part of their efforts to reduce global emissions from land cover change or to protect biodiversity (those operating for at least five years include programs in Mexico, Costa Rica, China, Ecuador, Peru, Brazil, Vietnam, and the United States). However, debates persist over the impacts of these incentives within the global conservation community where some fear that social capital will be heavily undermined [1], while others are concerned about conservation gains [2], or that the issue of weak human capital will be amplified in contexts such as Mozambique [3]. Meanwhile, boosting synergy between conservation and development through PES is challenging, particularly when PES payments cannot compete with the high opportunity costs of other land-use development objectives such as infrastructure development, and when PES payments are often used for reinvesting in things other than forest protection [4].

The Government of Vietnam has issued its own Payment for Forest Environmental Services (PFES) financial mechanism. Its aim is to mobilize resources for the forestry sector to protect existing forest areas, improve forest quality, increase forestry sector contributions to the national economy, and reduce the forestry sector investment burden on the State budget [4,5]. The government considers PFES to be one of its ten greatest achievements in the forestry sector over the period from 2010 to 2020. PFES contributed 28.1% of total forestry sector investment in 2019 and 26.4% up to November 2020 [6] and is implemented in 45 provinces nationwide.

Significant revenues from PFES (over VND 50 billion a year) come mainly from northern mountainous provinces and those provinces with large forest areas located in national parks [7]. At the community level, recent research by [8] shows that PFES plays a role in incentivizing local communities in numerous provinces for better forest management activities such as forest patrolling or fire prevention. In addition, in Bac Kan province, PFES was examined from a stakeholder participation perspective, arguing that inclusive negotiations could induce a platform for locals to contribute their inputs to local PFES schemes [9]. Another study also found that community institutions have strengthened PFES law enforcement, leading to better forest protection [10]. PFES has had mixed results in terms of its impacts on livelihoods and incomes. For example, when examining the impacts of PFES in Son La province, PFES payments were found to have little impact for individual households due to the limited amounts they are paid, but can create strong motivation for communities as PFES payments for community forestry are often significant [11]. In contrast, PFES contributes significantly to household incomes in Lam Dong province due to its large forest area and the high level of payments made to the province [4].

Despite several studies examining PFES impacts in Vietnam, there is a paucity of research evaluating the effectiveness of PFES on communities living in national park buffer zones and core zones. Among these is a study conducted in Bach Ma National Park by [12], who insist the PFES payments to households and communities there cannot compete with other income sources, and this is a potential hinderance to the PFES scheme achieving its objectives. Additionally, the study also suggests that PFES should be available to anyone willing to commit to duties defined in forest protection contracts, regardless of ethnicity or gender [12]. Apart from this study, there are no well-documented studies applying accurate research methods to assess the impacts of PFES on any other national parks in Vietnam.

To address this knowledge gap, this research analyzes the impacts of PFES in Cat Tien National Park (CTNP). CTNP is located across three provinces: Dong Nai, Lam Dong, and Binh Phuoc and is one of the largest national parks in Vietnam (Figure 1). It has received VND 100 billion from PFES since 2010, making it a national park with one of the largest PFES revenue streams in the country.

PFES was first implemented in Lam Dong province, including its part of Cat Tien National Park, in 2010 through Decision No. 99/2010/ND-CP dated 24 September 2010. It was then rolled out in Dong Nai and Binh Phuoc provinces in 2014. The PFES scheme in Vietnam is a mandatory program where the public are obligated to pay PFES fees through their electricity bills (see Figure 2). Hydropower plants collect these fees and then transfer them to provincial Forest Protection Development Funds (FPDFs), which then distribute payments to forest owners, in this case, Cat Tien National Park. The national park then uses these revenues for paying its own staff to protect the forest and to communities and households contracted by the park to patrol designated areas of the forest (Figure 2). Provincial FPDFs essentially work as trust funds with management boards comprising representatives from different provincial government departments.



Figure 1. Location of Cat Tien National Park. Source: compiled by the research team.

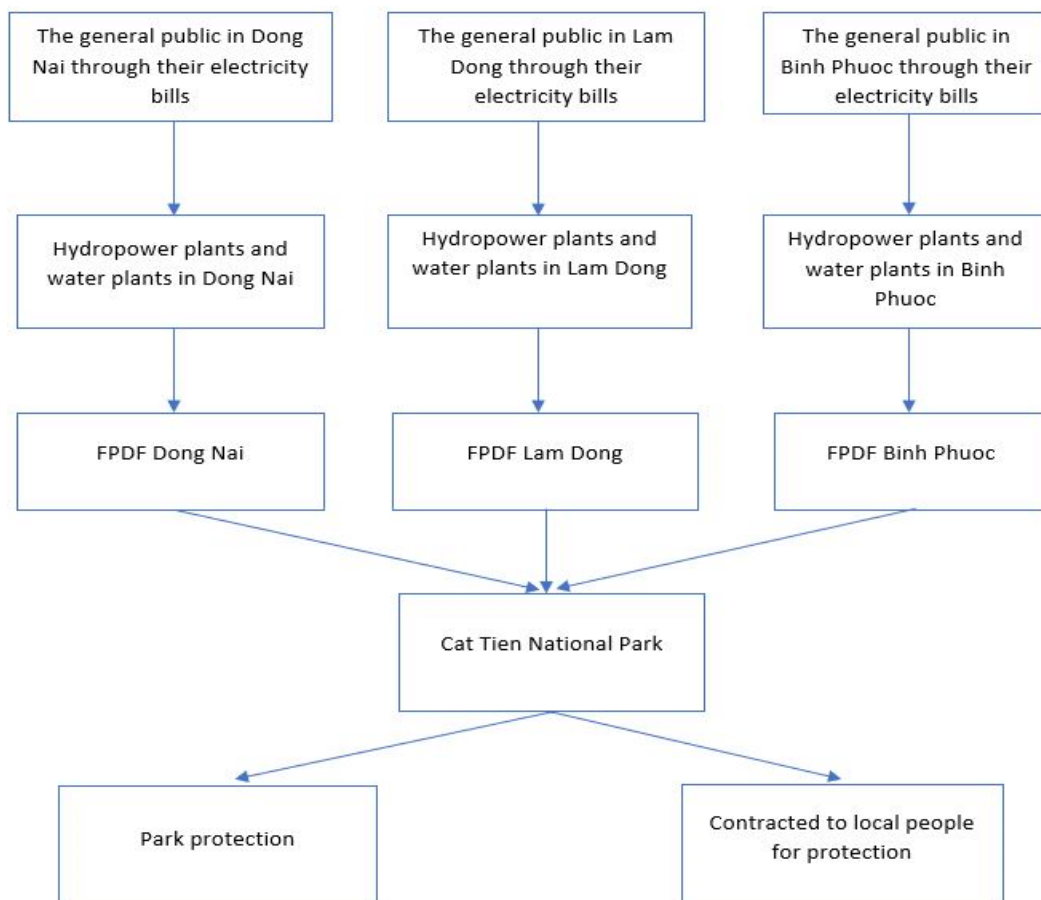


Figure 2. PFES financial flows in Cat Tien National Park. Source: compiled by the research team.

According to CTNP managers, village management boards first compiled lists of households eligible to participate in the PFES program based on selection criteria including health and a history of legal compliance. These lists were then presented in village meetings where villagers voted on their finalization before sending them to national park management boards for final approval. CTNP interviewees admitted that although this should have been a bottom-up approach, CTNP staff did discuss the lists further with village heads to find out which villagers they felt had good performance records, and it was often the CTNP staff's decision that counted. CTNP also developed criteria for selecting PFES communities. These included villages being close to borders with other provinces and having high risks of illegal logging, showing good forest protection performance in the past, and not being involved in other state forest protection programs. CNTP staff also said that in order to ensure equity, they would try to rotate PFES recipient villages every few years. Villages not performing their PFES duties effectively would be removed from the program so other villages could take their place. Both CTNP and the villagers and communities receive PFES payments based on the area of forest they manage.

2. Research Methodology

First, we applied an analytical framework previously used by [13–18] for understanding additionality impacts of policies by comparing pre-and post-PFES situations in places with and without PFES. Second, as PFES is a national program and is assessed by the Government of Vietnam based on its national monitoring evaluation framework, we also used this framework to assess PFES impacts against government expectations. While the monitoring assessment index developed by the Central Forest Development Protection Fund (VNFF) includes 28 institutional, economic, societal and environmental indicators, in the framework of this study and report we only evaluate social and economic evaluation criteria according to guidelines specified by VNFF (see Table 1).

Table 1. Monitoring and evaluation criteria for assessing the socio-economic impacts of PFES.

Social and Economic M&E Criteria	
Social impacts of PFES	<ul style="list-style-type: none"> • PFES amounts and numbers of jobs, equipment and community welfare activities established from PFES funds • Contribution of PFES to total costs of new rural construction • Percentages of ethnic minority households receiving PFES • Percentages of poor households receiving PFES
Economic impacts of PFES	<ul style="list-style-type: none"> • Numbers of contracted households • Percentages of households in areas receiving PFES money patrolling and protecting forests • Average payment amounts received per day from PFES for forest patrolling and protection • Total numbers of households and individuals receiving PFES payments • Numbers of households contracted for forest protection escaping village-defined criteria for poverty every year.

More specifically, the study evaluated changes in these indicators before and after PFES in places with and without PFES.

The research team identified baseline years for comparison in order to assess the impacts of PFES by comparing situations before and after its implementation. Cat Tien National Park is located across the three provinces, and since each province began implementing PFES at different times, the baseline for each one was different. PFES was implemented in Lam Dong in 2010 and Dong Nai and Binh Phuoc in 2014. Therefore, 2010 was chosen as the baseline for Lam Dong, and 2014 as the baseline for the other two

provinces. Table 2 provides an overview of baseline situations across the three provinces prior to PFES implementation in Cat Tien National Park.

Table 2. Baselines for Cat Tien National Park.

Baseline Year	Province	Contracted Forest Area (ha)	Rate of Payment (VND)	Number of Communities Taking Part in Forest Protection Contracts
2010	Lam Dong	5801	50,000–100,000	14
2014	Dong Nai	1900	50,000–100,000	6
2014	Binh Phuoc	1150	50,000–100,000	5

Source: Cat Tien National Park (2019).

Prior to PFES, national reforestation program 661 had been implemented until 2010, though to a much lesser extent than PFES. Through that program, payment rates were also fixed by the central government, initially at VND 50,000 and later rising to VND 100,000 in 2007. These rates were both lower than PFES rates in the three provinces, and were paid to small numbers of villages in national park hotspots with perceived high risks of deforestation.

We then applied the method developed by [19] in selecting four pairs of villages with and without PFES, and determining its impacts by comparing situations before and after its implementation. We first reviewed reports from Cat Tien National Park, forest protection development fund (FPDF) reports from provincial departments, and scientific reports from stakeholders, as well as provincial, district, commune and village socio-economic development plans. We then consulted local authorities on any additional socio-economic conditions in order to finalize a list of 15 possible pairs of villages for this study. These pairs of villages should have similar economic and socio-political conditions, but one village should have and the other not have PFES. There were no perfect pairs, but the team chose study sites with as many similarities as possible. We then conducted field checks where we visited sites to ensure the selected pairs of villages best represented the research criteria. Following consent from villagers and the authorities allowing field studies and reviews, the research team merged pairs of villages and selected four village pairs for primary data collection (see Table 3).

These pairs of villages are not located in the same provinces, but they are all in CTNP buffer zone areas and share similar conditions including ethnicity, livelihood options and land tenure regimes. The research team also carried out field checks to confirm most conditions were the same for these pairs of villages.

The research team also conducted 37 interviews with officials from provincial and district governments, and then with representatives of communes. The aims of these interviews were to ascertain stakeholders' views on the impacts of PFES, as well as on favorable conditions when implementing PFES in their regions.

Focus group discussions (FGDs) were held with male and female participants in each village. Households participating in group discussions represented various age, sex, income, ethnicity, and PFES participation experience criteria. A total of 149 people participated in intensive group discussions (70 men and 79 women). These discussions focused on village history, drivers of deforestation and forest degradation, household economic classification, the strengths, weaknesses, contributions and impacts of PFES or support programs on local people's living standards, and people's desire to implement development assistance programs more effectively. Most of the questions asked during focus group discussions were open-ended, which allowed participants to express their opinions as freely as possible in their own words. The use of open-ended questions also encouraged discussions, so the answers given were to a certain degree the result of consensus between participants.

Table 3. Basic information on villages participating in the study, including participants in focus group discussions and in-depth interviews.

Village	PFES	Non-PFES	Participants in FGDs	Total Number of Households in the Village	Total Number of PFES Households Interviewed in the Village	Total Number of Households Interviewed
Village A, Dac Lua Commune, Tan Phu District, Dong Nai Province	X		20	219	3	30
Village B, Dang Ha Commune, Bu Dang District, Binh Phuoc Province		X	17	189	0	30
Village C, Gia Vien commune, Cat Tien district, Lam Dong Province	X		17	178	12	30
Village D, Ta Lai Commune, Tan Phu District, Dong Nai Province		X	16	393	0	30
Village E, Tien Hoang Commune, Cat Tien District, Lam Dong Province	X		19	189	5	30
Village F, Dac Lua Commune, Tan Phu District, Dong Nai Province		X	22	303	0	30
Village G, Phuoc Cat 2 Commune, Cat Tien District, Lam Dong Province	X		18	35	26	33
Village H, Phuoc Son Commune, Bu Dang District, Binh Phuoc Province		X	20	302	0	31

As required by the project to ensure research ethics, interview team identities and the real names of study villages shall remain anonymous.

In total, 244 households in eight villages (123 households in PFES villages and 121 households in non-PFES villages) took part in our study (see Table 3). Of the 123 households interviewed in PFES villages, 46 households, or 37% were participating in PFES. The aims of the interviews were to understand people's livelihoods and living conditions, people's views on the impacts of PFES and the advantages and disadvantages of participating in PFES, and to explore suggestions for more effective PFES implementation in the future. Compared to the focus group discussions, our in-depth household interview questionnaire included more categorical multiple-choice questions, asking interviewees to choose between options. The interviews aimed to explore changes in household livelihoods and incomes, land-use change patterns, household involvement in PFES and other government programs and projects, households' perceptions on the impacts of these programs on local livelihoods and well-being, as well as opportunities and challenges for these programs. We also used open-ended questions during interviews to encourage participants to express their opinions freely.

Study outcomes were presented in two national consultation workshops involving 120 stakeholder representatives to validate results. During these workshops, we presented our initial findings to representatives of study villages, communes, and district, provincial and local governments, as well as international organizations working in the same areas to seek their comments on the accuracy of these findings. A draft report was sent to these stakeholders prior to the workshops so they could prepare comments and suggest corrections to our findings.

Limitations of Research Methods

Although the study aims to articulate the impacts of PFES on communities, it does have limitations, and further studies could build on its results to supplement the evaluation process. First, a lack of documentation and data relating to PFES has caused many difficulties in assessing its impacts. The analytical framework and assessment methodology applied in this study aimed to demonstrate the effects of PFES by looking at situations before and after its implementation in places with and without PFES. Moreover, although we had wanted to triangulate data with remote sensing data, such datasets were unavailable, which led to difficulties in determining a comprehensive assessment of PFES impacts. Interviews with government agencies and Cat Tien National Park revealed no pre-PFES data had been collected or stored by the park authority. To address this gap, the research team reviewed secondary documents such as commune, district and province socio-economic reports. However, the associated data could only partially answer questions and had often been collected in an inconsistent manner, causing challenges during the assessment process. Currently, only 45 of Vietnam's provinces and cities have PFES, while many provinces are preparing for its implementation. Conducting baseline assessment studies in remaining provinces before they implement PFES and reassessments after its implementation will help Vietnam to determine its effectiveness more accurately. The second limitation was the standard sampling process for determining the accuracy of research results. Choosing pairs of villages that have similar conditions is challenging. In future, when scientists develop studies to evaluate PFES, they might choose other sites with pairs sharing more similarities to assess its impacts more accurately. In addition, due to limited financial and human resources, this study was only able to assess four pairs of villages with and without PFES. The addition of larger numbers of village pairs would help future studies to make more accurate assessments.

3. Findings

3.1. Increase in PFES Area over Time

Although carrying out an analysis to determine the impacts of PFES on area of forest cover was beyond the scope of this study, all available data is consolidated in Figure 3, which shows the area of forest providing forest environmental services fluctuated from year to year but showed a general upward trend from 27,008 ha in 2010 to 78,477 ha in 2019. This is due mainly to increases in forest area under national park management, rather than increases in forest area. From 2008 to 2016, forest area in CTNP increased from 71,187 to 72,606 ha, and from 2017 to 2019, it increased further to more than 80,000 ha. This latter increase was due mainly to a forest area previously under the La Nga Forestry Company being transferred to the national park. From 2010 to 2013, the area managed by Cat Tien National Park for PFES provision accounted for only 38% of the total park area, but this has now increased to 90% as PFES has also been applied in Dong Nai and Binh Phuoc provinces (see Figure 3).

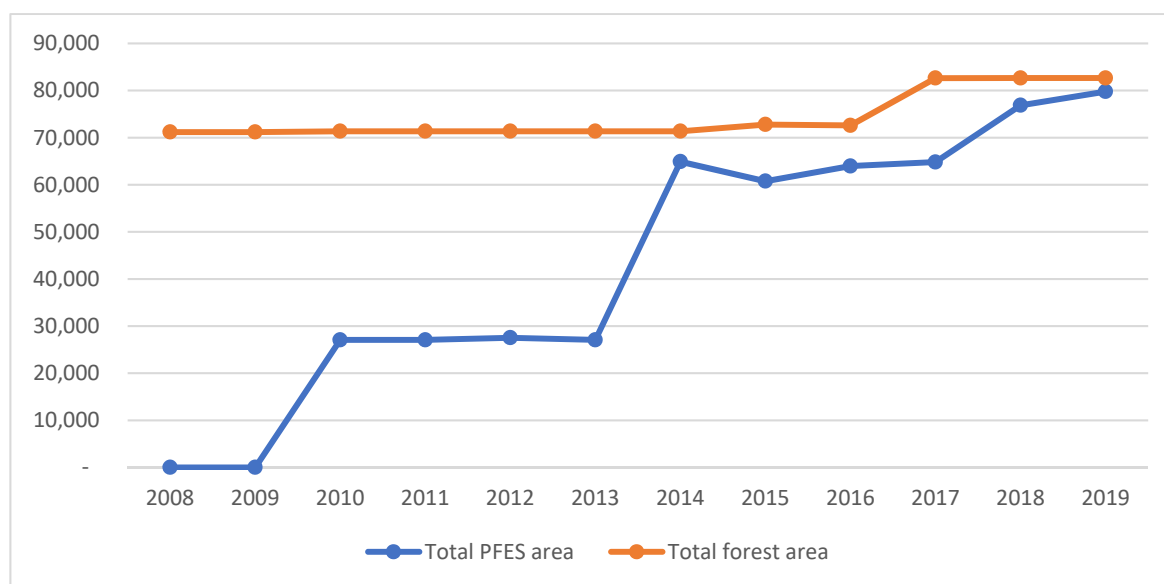


Figure 3. Total forest area in Cat Tien National Park and area allocated for PFES. Source: Cat Tien National Park 2019.

3.2. Social Impacts of PFES in Cat Tien National Park

3.2.1. Impacts on Communities

The Vietnam Forest Protection and Development Fund (VNFF) assesses the impacts of PFES on communities through two criteria: PFES amounts and quantities of infrastructure, and equipment and community facilities built from PFES funds. However, results of interviews with government agencies and focus group discussions showed that despite Cat Tien National Park signing contracts with communities to protect forests, communities pay individual households participating in forest patrols rather than spending money on community infrastructure development. According to focus group discussion participants, infrastructure in five of the eight study villages has been funded by a state program on poverty alleviation or the program under Decision 24, which aimed for investment in and development of special-use forests during the 2011–2020 period. For this program, the state budget supported investment in buffer zone village communities for co-management of special-use forests. The amount of support was VND 40 million per village per year. This funding was spent on the following: investment in improving agricultural and forestry production capacity with seedlings and small-scale processing equipment for agricultural and forestry products, and building materials support for village community public works, such as provision of clean water, lighting, communications, village roads, cultural houses, etc. According to all government officers across the three provinces, as well as participants in FGDs in all the study villages, Decision 24, Program 661 and Program 304 were the major forest protection programs prior to PFES, and provided significant support for communities. In the absence of these programs, village households will have to contribute at least USD 10 a year each to village funds for infrastructure development and events. Per 2019, as communities may now only participate in either the PFES or Decision 24 program, those who previously participated in Decision 24 have expressed disappointment in PFES, as instead of benefitting from both programs they can now only benefit from one. Moreover, interviews with national park staff and village heads revealed that communities could access Decision 24 more easily, and as it was more of a poverty alleviation program, they would still be paid even if they did not protect forests well. In contrast, for communities enrolling in the PFES scheme, any failure to protect forests will result in them not being paid.

3.2.2. Numbers of Ethnic Minority Households Receiving PFES

From interviews with local officials and Cat Tien National Park staff, no reliable statistics are available on the numbers of ethnic minority households receiving forest protection contracts in the study villages before and after PFES implementation, as neither local authorities nor the national parks department have collected and kept such records.

However, a review of secondary documents regarding Decision 661 (in effect from 2004 to 2008) suggested that the main recipients of forest contracts were ethnic minorities living in the core and buffer zones of Cat Tien National Park. Decision 661's purpose was to plant five million hectares of forest and protect existing forest areas, among many other objectives aimed at forest protection. Together with other rural development programs, it aimed to create jobs for vulnerable populations living in forest buffer and core zones.

Program 304 was a policy with a pilot program in Vietnam's Central Highlands provinces, and is relevant to PFES as it addressed one of its key points, which is to allocate and contract forest protection to households and mainly ethnic minority communities. The program region had an overlapping border with Cat Tien National Park, which indicates that although no quantifiable statistics were recorded, ethnic minority communities in the region have had access to forest contract programs prior to PFES. With respect to PFES, in 2019, the numbers of ethnic minority households receiving PFES money accounted for significant percentages of the total numbers of ethnic households in villages (e.g., 66.7% in Village A and 92.1% in Village G (see Table 4). Interviewees from Cat Tien National Park explained that this is because the PFES program prioritizes ethnic minority households.

Table 4. Ethnic minority households receiving PFES funds in 2019.

Villages Implementing PFES	Total Number of Ethnic Households Receiving PFES Funds	Total Number of Ethnic Households in Village	Percentage
Village A	4	6	66.7%
Village C	7	14	50.0%
Village E	8	15	53.0%
Village G	35	38	92.1%

Source: Cat Tien National Park.

3.2.3. Numbers of Poor Households Receiving PFES and Numbers of Households Escaping Poverty Based on Village-Defined Poverty Criteria

The government has an official definition for poor households based primarily on income, educational background, access to clean water and electricity, and access to information. In this study, to identify poor, medium and rich households, we adopted a participatory wealth ranking exercise instead of predetermined standards. In essence, this entailed using focus group discussions in each village where participants were asked to identify the criteria they use to define rich, medium and poor households based on their own standards. Our findings show that local people in each study village have their own definitions of poverty and criteria they use to differentiate between poor, medium and rich households (see Table 5).

Table 5. Local definitions of poor, middle and rich households.

Village Name	Pair 1		Pair 2		Pair 3		Pair 4		
	PFES	Non-PFES	PFES	Non-PFES	PFES	Non-PFES	PFES	Non-PFES	
	A	B	C	D	E	F	G	H	
Rich	Land (ha)	4	2.5	1	1.3	10	1.5	7	3
	Valuable assets	House, cows, machinery	3 motorbikes, type-4 house	House, TV, motorbikes, cows	motorbike, TV, fridge, washing machine, concrete house	Type-4 house, 2 motorbikes, tractor	Type-4 house, 4 pigs, 8 cows, 2 motorbikes	Grocery store, 1–30 cows	House, 6 motorbikes
	Income (millions/year)	150	120	90	500	120	120	70	100
	Education	College, university	College, university	Finished high school	University	College, university	University	College	University
Medium	Land (ha)	2	2	0.5	0.7	3	0.35	2	1
	Valuable assets	6 cows, house	Type-4 house, old motorbikes, 2 cows	House, TV, motorbike	House, 4–5 pigs	Type-4 house, 2 motorbikes, 30 pigs	Type-4 house, motorbikes	20 cattle	Brick house, TV, motorbike
	Income (millions/year)	40	80	90	120	50	80	50	100
	Education	High school, college	University	University	High school, college, university	High school, college	College	High school, college	High school
Poor	Land (ha)	<1	<0.2	<0.2	<0.3	<3	<0.3	<0.3	<0.5
	Valuable assets	Type-4 house	Type-4 house	Temporary housing, 1 motorbike	No house or temporary housing	Wooden type-4 house, 2 motorbikes	Type-4 house	1–2 cattle or none	Bamboo or wooden house, motorbike
	Income (millions/year)	25	Enough for food	<50	<35	<20	<40	25	<15
	Education	Middle or high school graduate	No schooling	Small child	Middle or high school	High school or college	High school or college	Without schooling	Without schooling

Source: Focus group discussion results (2021).

Although the indicators used to assess poverty criteria might differ from one village to the next, most villages define poverty based on four common criteria: land availability allocated to them, the number and value of assets they have, annual income and level of education.

Cat Tien National Park staff indicated that prior to PFES, a national poverty alleviation program titled Program 30A was implemented in a few villages within park boundaries, but no detailed information was available on its effectiveness or how it contributed to poverty alleviation in the area. Government agencies interviewed said they never collected data on how many households had escaped poverty as a result of Program 30A, as their main task was to record how much money was spent under the program, and for whom. However, most households and government agencies interviewed said Program 30A aimed to support communities as a whole, and only provided support for road building and paying a few villagers small amounts for forest patrolling.

Most participants taking part in focus group discussions in the study villages said that larger numbers of poor people have been able to benefit from the state budget since PFES implementation. In villages with PFES, 45%–88% of households defined as poor, using village poverty criteria, participate in the scheme (see Table 6). These households in areas with PFES benefit from this additional income, whereas households in non-PFES villages do not.

Table 6. Village-defined poor households receiving PFES payments.

Villages Implementing PFES	Total Number of Poor Households Receiving PFES Money	Total Number of Poor Households in the Village	Percentage
Village A, Dac Lua Commune, Tan Phu District, Dong Nai Province	10	22	45%
Village C, Gia Vien commune, Cat Tien district, Lam Dong Province	6	12	50%
Village E, Tien Hoang Commune, Cat Tien District, Lam Dong Province	10	15	67%
Village G, Phuoc Cat 2 Commune, Cat Tien District, Lam Dong Province	22	25	88%

Source: Cat Tien National Park (2019).

Villagers across the study sites defined poverty using multidimensional criteria, including both economic and social indicators, in assessing whether or not a household can escape their definition of poverty, arguing that having increased income can help such households to achieve other criteria like buying more land or being able to send their children to school.

We compared incomes of households receiving PFES payments with income levels for households considered “poor” based on village-defined poverty criteria and found that 22% of households participating in PFES have no cash income other than their PFES forest protection contracts. In addition, 81.4% of households participating in PFES in this study now define their status as “not poor”. Therefore, we conclude that these 81.4% of households participating in the scheme have managed to escape village-defined poverty criteria thanks to their increased earnings from PFES forest protection payments.

3.2.4. People’s Participation in Forest Protection and Development Programs

People in both villages with and without PFES are participating in State socio-economic development programs, such as those on seedling support, loans for school children, loans for agriculture production, and hygiene, as well as electricity and clean water, health insurance and vocational training programs. However, people in villages without PFES have been unable to participate in or benefit from any of the forest protection programs people in PFES villages have benefitted from.

On average, 19% of all households in PFES villages receive PFES payments. Although PFES has brought many benefits to the poor and ethnic minorities, some ethnic Kinh people deemed the current PFES program unfair because ethnic Kinh immigrants are not allowed to participate. According to interviews with stakeholders, this is because the government prioritizes allocating forest land and forest-related benefits to indigenous peoples, making it very difficult for ethnic Kinh to participate and benefit from PFES. Kinh households felt they are being discriminated against, saying they are still mobilized to protect the village forest when it burns or is encroached upon by outsiders, but do not benefit from the policy.

According to interview results, 70% of the 123 households in the four villages participating in PFES are implementing it in their villages/hamlets. When participating in PFES, people are trained in many new skills, such as biomass measurement (9% of interviewees) and clarifying forest land boundaries (36% of interviewees). These skills help people monitor and protect forest areas and determine amounts received in remuneration from PFES. However, as forests are fully managed by the park, and villagers are not landowners but only provide labor for forest protection, participants in most FGD meetings said that as forests do not belong to them, they are not strongly committed to their protection. Many participants also admitted that “We only patrol forests on days we are paid for, and it is the park’s responsibility to protect and patrol them on remaining days as these are their forests”.

3.3. Economic Impacts of PFES

3.3.1. Forest Areas Contracted to Local People for Protection

Cat Tien National Park staff stated that prior to PFES, many forest protection and development programs had been carried out in the area, including programs 661, 30A and 304. These programs contracted forest protection and other forest maintenance purposes to local people until the end of their implementation in 2010, when PFES was chosen to replace them and became the main source of finance for forest protection contracts.

The total PFES area in the national park falls under two management regimes: area managed by the national park officers themselves and area allocated to households under forest protection contracts. In Vietnam, forests are State-owned, and households can only have forest use rights certificates. For areas under park management, PFES payments are channeled directly to the national park, while for those managed through forest protection contracts, payments are initially channeled to the national park, which then pays households on a quarterly basis.

Since PFES was launched in Cat Tien National Park, the area of forest allocated to local people has increased significantly, thereby increasing people’s income. Before PFES, only 8851 ha of forest in Cat Tien National Park was contracted for forest protection. This accounted for only 12% of the park’s total forest area (see Figure 4). However, since PFES, the forest area allocated for community and household management is now 3 to 3.64 times higher than it had been previously. The area managed by local people under protection contracts has also increased by 37–39% of the park’s total forest area since PFES. This has created many opportunities for people and communities to benefit economically from forest protection and development programs, including PFES.

However, the increase in forest allocated to households and individuals is not the same across the three studied provinces. From 2010 to 2013, only areas in Lam Dong province were contracted for forest protection, so 100% of the total contracted area during that period was in Lam Dong. From 2014 to 2019, PFES areas in Cat Tien National Park were spread over 3 provinces, with Dong Nai accounting for the majority at 54–61%, followed by Lam Dong at 34–40%, and Binh Phuoc at only 5–7% of the park’s total PFES provision area.

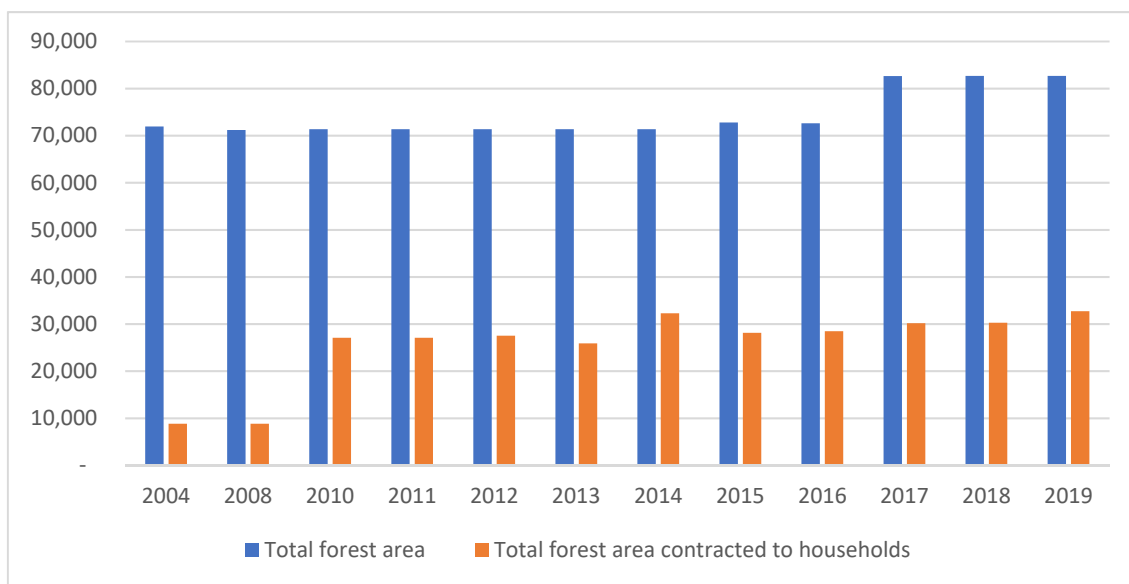


Figure 4. Area allocated to local people before and after PFES (before and after 2010). Source: Cat Tien National Park and compiled by research team.

Percentages of forest area allocated to people contracted to protect forests and for national park protection differ across the three provinces. In Dong Nai, the area under park protection accounts for more than 80%, with the remainder contracted to local people. In Lam Dong, most of the area providing PFES is allocated for protection by local people, and since 2016, part of the area has been allocated for park protection. In Binh Phuoc province, from 2014 to 2016, more of the PFES area was protected by the park than contracted to local people, but from 2017 to 2019, it was divided equally (see Figure 5). In general, compared to baselines, areas of forest in Dong Nai and Lam Dong provinces managed by the park have increased since PFES, leading to smaller areas being managed by households and communities. Binh Phuoc only shared a similar trend with the other two provinces for the first 3 years of PFES, but then gradually reduced the area managed by the park to provide more opportunities for local people to engage in the scheme. Interviewees from provincial government agencies and park management boards said government staff in Dong Nai and Lam Dong provinces did not believe local communities could protect forests, saying “It is better for the government to protect our own forests rather than allocating forest protection to local people who can cut down trees easily”. In contrast, government agencies interviewed in Binh Phuoc were confident in communities’ ability to protect forests and were willing to distribute larger areas of forest for protection by local households and communities under the PFES scheme.

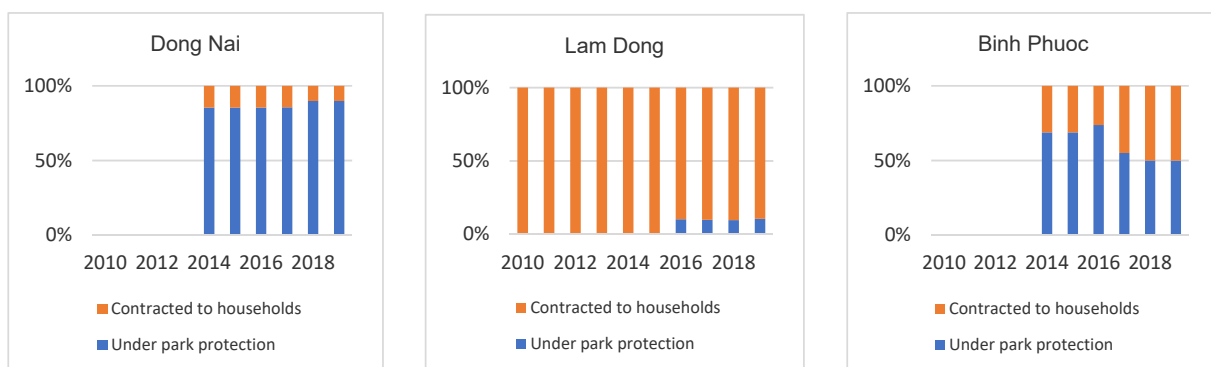


Figure 5. Area of Cat Tien National Park under park protection and contracted to local households. Source: Cat Tien National Park (2019).

3.3.2. Numbers of Households Contracted for Forest Protection and Receiving PFES Payments

According to Cat Tien National Park staff, communities participating in forest protection contracts from previous programs were selected for involvement in the PFES program. Changes in the numbers of communities participating in contracts (Figure 6 and Table 7) are mainly due to the merging and separation of communities in accordance with state guidelines, as well as the addition of Binh Phuoc and Dong Nai provinces in the PFES scheme in 2014. Although numbers of contracted communities have not changed before and after PFES, the overall numbers of households participating in forest protection contracts have been lower since PFES began (see Figure 6 and Table 7).

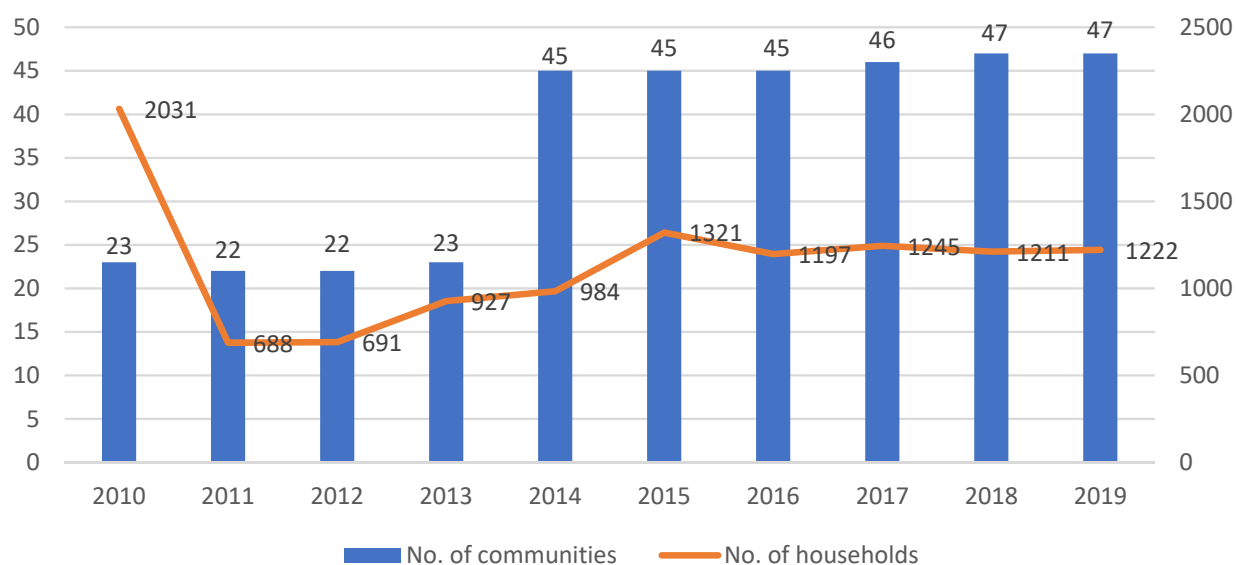


Figure 6. Numbers of communities and households contracted to protect forests in CTNP. Source: Cat Tien National Park.

Table 7. Numbers of communities and households participating in PFES by province.

Year	Đồng Nai		Lâm Đồng		Bình Phước	
	Number of Communities	Number of Households	Number of Communities	Number of Households	Number of Communities	Number of Households
2010			23	2031		
2011			22	688		
2012			22	691		
2013			23	927		
2014	12	239	27	585	6	160
2015	12	194	27	1023	6	104
2016	12	180	27	955	6	62
2017	12	221	28	963	6	61
2018	12	220	29	923	6	68
2019	11	190	30	952	6	80
		1244		9738		535

Source: Cat Tien National Park 2019.

According to interviews with Cat Tien National Park staff, forest protection outcomes from communities contracted before PFES were not as effective as expected, because no people in villages were assigned specific tasks for protecting forests, and no one felt responsible when forest loss occurred. In 2011, Cat Tien National Park decided to replace community contracts with contracts for groups of households. It guided and supported communities to vote and agree on certain households to participate in PFES contracts using criteria such as health, household poverty, and proximity to forest.

Table 8 shows numbers of surveyed households receiving PFES money varying between villages and ranging from 7–100% (Table 8). In village G where 100% of households participate in PFES, all interviewed households appreciated its role. In village E where only a small percentage of households participate in PFES (<10%), interviewees believed PFES benefits are concentrated in selected groups of people, and sometimes not widely shared.

Table 8. Households receiving PFES funds.

Villages Implementing PFES	Total Number of Households Receiving PFES Money	Total Number of Households in the Village	Percentage
Village A, Dac Lua Commune, Tan Phu District, Dong Nai Province	43	219	20%
Village C, Gia Vien commune, Cat Tien district, Lam Dong Province	27	178	15%
Village E, Tien Hoang Commune, Cat Tien District, Lam Dong Province	14	189	7%
Village G, Phuoc Cat 2 Commune, Cat Tien District, Lam Dong Province	35	35	100%
Total	119	621	19%

Source: Cat Tien National Park.

Unlike villages with PFES, until now none of the four villages not participating in PFES had households under any form of forest protection contracts. Even in the case of Village B, despite receiving support from the Decision 24 program, the money is only for community development activities and not for forest protection contracts. According to interviews with Cat Tien National Park staff, each hamlet in Cat Tien National Park receiving Decision 24 support must sign annual commitment agreements with the park. Forest protection performance forms the basis for Cat Tien National Park considering and accepting the results of villages' investments throughout the year, and also forms the basis for payments for the following year. If during the year people in the hamlet violate the commitments in these signed documents, or if the village's investment fails to accord with the approved plan or cost estimate, the Cat Tien National Park authority will discuss the issue with the Commune People's Committee to recover the payment advanced for the year, and, depending on the nature and the extent of violations, may not provide support the following year.

3.3.3. Average Amounts Paid from PFES per Day of Forest Patrolling and Protection

In the villages without PFES, no households receive remuneration for forest patrols. Meanwhile, in villages with PFES, households participate in the PFES program through contracted forest protection in community forests. Each community has a representative team leader who signs forest protection contracts with Cat Tien National Park. Communities have lists of households eligible to participate in PFES. Communities can be households in the same village or from more than one village. Contracted team leaders are responsible for developing forest patrol and protection plans, assigning patrol forces for contracted areas on a weekly, monthly, quarterly and yearly basis, and recording patrol working days for each household, which serve as the basis for PFES payments for households in the villages.

Before PFES, payments under forest protection contract programs, such as 661, 30A and 304 were not divided by workdays, but calculated by the hectares of forest protected by the whole community and divided equally between community members. Before 2010, the 661 program paid households participating in forest protection between VND 50,000–100,000 per hectare. Following PFES, from 2010 to 2016, forest protection contract money was divided equally between households in the community. Since 2017, however, each household's labor has been calculated by numbers of days spent patrolling and protecting the forest. In 2017, for example, the payment for patrolling and protecting forest in Village C was VND 493,000 a day. In 2019, in Village A it was VND 115,198 a day (see Table 9).

Table 9. Payment rates for forest protection contracts before and after PFES.

	Before PFES		After PFES	
	PFES	Non-PFES	PFES	Non-PFES
Form of payment	Not divided by workday, but by the number of hectares protected by the whole community, and then divided equally between community members.		Calculated by numbers of days worked patrolling the forest	Support money received only through community funds
Payment amount	VND 50,000–100,000/ha		VND 115,198–493,000/day	VND 40 million /year

Figure 7 below shows that average amounts received by households from PFES have tended to increase from year to year.

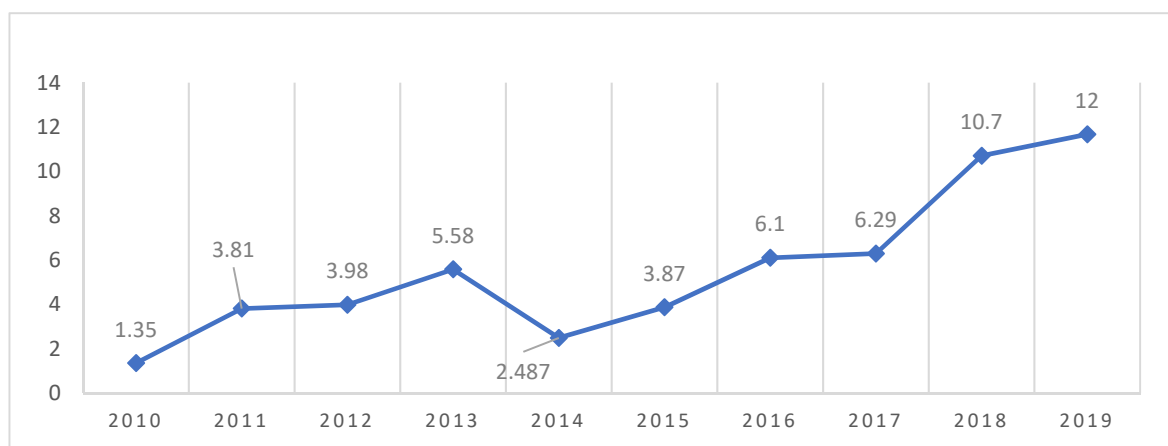


Figure 7. Annual income from PFES by year (VND × million). Source: compiled by the research team.

PFES unit prices from 2010 to 2019 in Dong Nai, Lam Dong and Binh Phuoc provinces are shown in Figure 8. Unit prices have tended to increase year-on-year, but each year has shown minor fluctuations depending on the services used by forest environmental service purchasers in those years. It is important to point out that in each province, the PFES payment is a ratio between the total PFES revenue generated from payments made by the public to hydropower plants and the total PFES area. As areas of PFES forest and total PFES revenues in each province differ every year, levels of payment are also different (Figures 8 and 9).

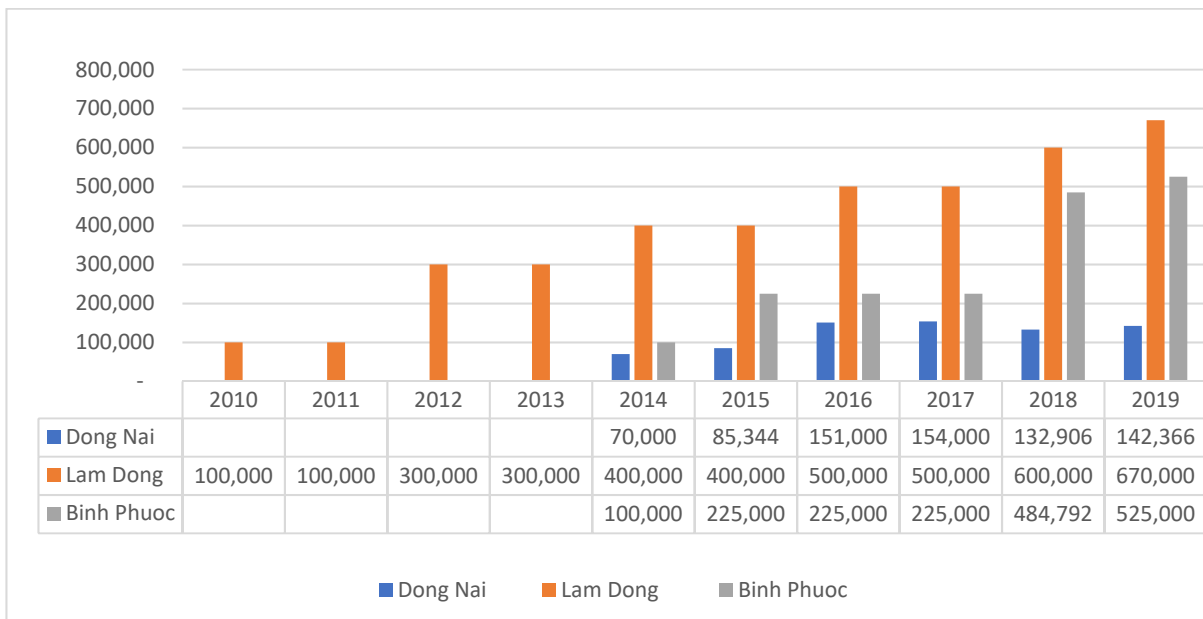


Figure 8. PFES unit prices. Source: Cat Tien National Park.

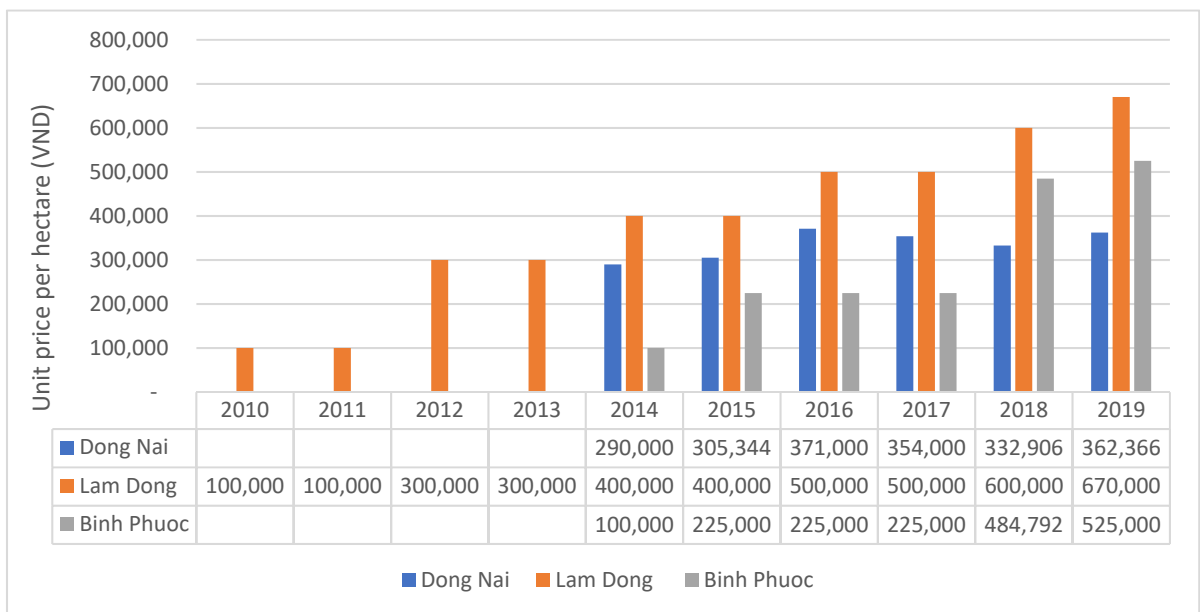


Figure 9. Unit prices for PFES and Decision 24 (only applies to Dong Nai). Source: Cat Tien National Park (2019).

Because PFES unit prices in Dong Nai are considerably lower than in Binh Phuoc and Lam Dong (Figure 8), Cat Tien National Park decided to use forest protection contract money under Decision 24 to add to the PFES payments made to people in Dong Nai. The national park balanced the budget, adding a unit price of VND 200,000–220,000 per hectare for the PFES forest protection area contracted to people in Dong Nai (Figure 9). However, after a state audit disagreed with forest areas having two payment sources, Cat Tien National Park issued a new regulation whereby the amount contracted in Dong Nai may not exceed VND 300,000 per hectare. The increase in unit price for Dong Nai has helped bring it closer to the price paid in Binh Phuoc.

3.3.4. Income from PFES as a Percentage of Total Household Income

For households identified as better-off based on village-defined criteria, PFES accounts for 20% (Village A) to 50% (Village G) of total household income. Figure 10 shows PFES contributing 4–100% of total household income, averaging 16–74% in the four study villages in 2019.

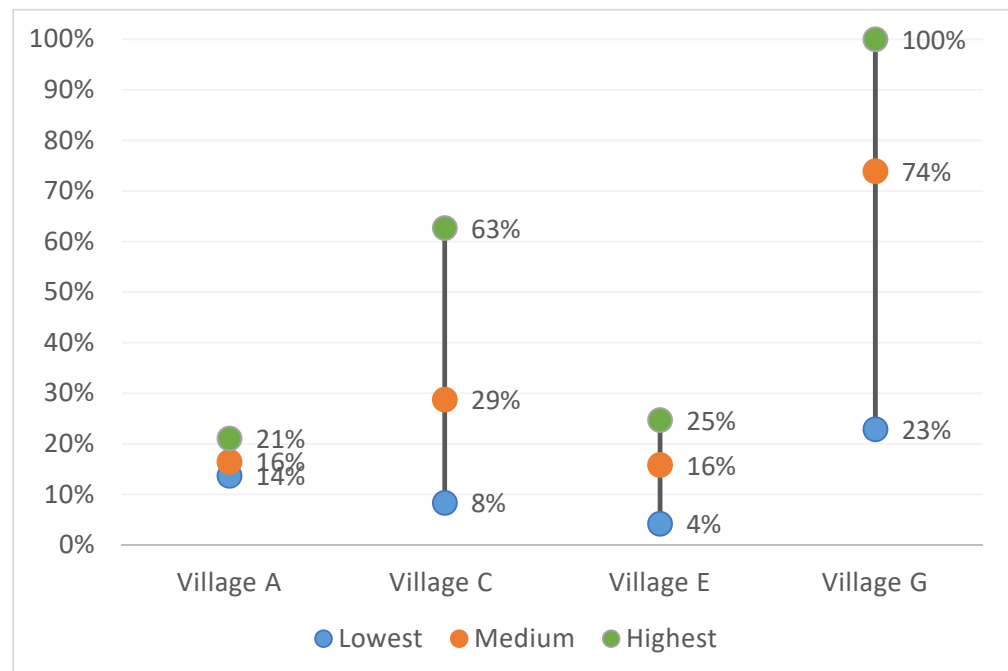


Figure 10. Contributions of PFES to total incomes in 2019. Source: compiled by the research team.

According to participants in the men’s group meeting in Village B, between 2015 and 2019, villagers had no jobs due to droughts, crop failure and a disease epidemic, which led to hardships and bank debts. People in a group meeting in Village H, meanwhile, said, “From 2017 until now, there have been steady crop losses, low latex prices have made the village economy difficult. In 2010, at the end of the season four tons of cashews could be harvested from each hectare. Now we can only harvest around 200 kg”. Participants in the women’s group meeting in Village G also said, “Cashew crops have failed over the last three years, and we have survived so far because of forest money”. In Village A, head of household, Hoang Van S said, “We lost crops for three years and didn’t earn any money”. Mr. Dieu K in Village G also said, “Due to crop failure and depreciation over the past three years I have cut down the remaining plot, which only earned about VND 1,000,000 a year”. People in Village G have faced many difficulties from 2016 onwards due to crop failure. Since then, State support programs for the village have included support for breeders, seedling support, and house building support. In the context of crop failures, PFES has become the only stable source of income helping people to survive. Many households interviewed said they felt lucky to “live on the forest money”. One village elder said, “I’m on my own and have no income source as I’m old. PFES has been a savior, particularly for old women like me who can’t work”. In this context, PFES is the only stable source of income to help people meet their daily needs.

If PFES has played a significant role wherever it is applied, it would be reasonable to expect a clear difference between people’s life security perceptions in a PFES village and a non-PFES village. However, Figure 11 below shows little difference between perceptions of life security over the last 10 years in households surveyed in PFES villages and non-PFES villages. This negligible difference can be explained by a few factors. Firstly, both PFES and non-PFES sites, which share similar characteristics and peoples, have similar sources of income. For those households where PFES contributes little to their overall

incomes (less than 10%), despite receiving additional payments from PFES, in terms of income and life security they are not noticeably better off than those not receiving PFES payments. Secondly, PFES only plays a critical role in ensuring life security in cases where households are 100% dependent on PFES payments as their main income source. Thirdly, there were different interpretations on life security between PFES and non-PFES sites. For some PFES sites, villagers perceived their lives could only be secure if they had modern houses and savings in the bank, while for the non-PFES sites (which have much lower incomes compared to the PFES sites), life security means having enough food to eat. As life security measurements differed between study sites, the findings cannot be interpreted as PFES sites having better incomes from PFES and more life security. Moreover, according to focus group discussion participants, life security is not only a matter of income but also includes environmental sustainability (no droughts or storms) and social stability (no social conflicts). Consequently, our findings reflect challenges for local villagers in securing livelihoods in both PFES and non-PFES sites. Furthermore, in PFES sites, having additional payments from PFES does not always mean life is better.

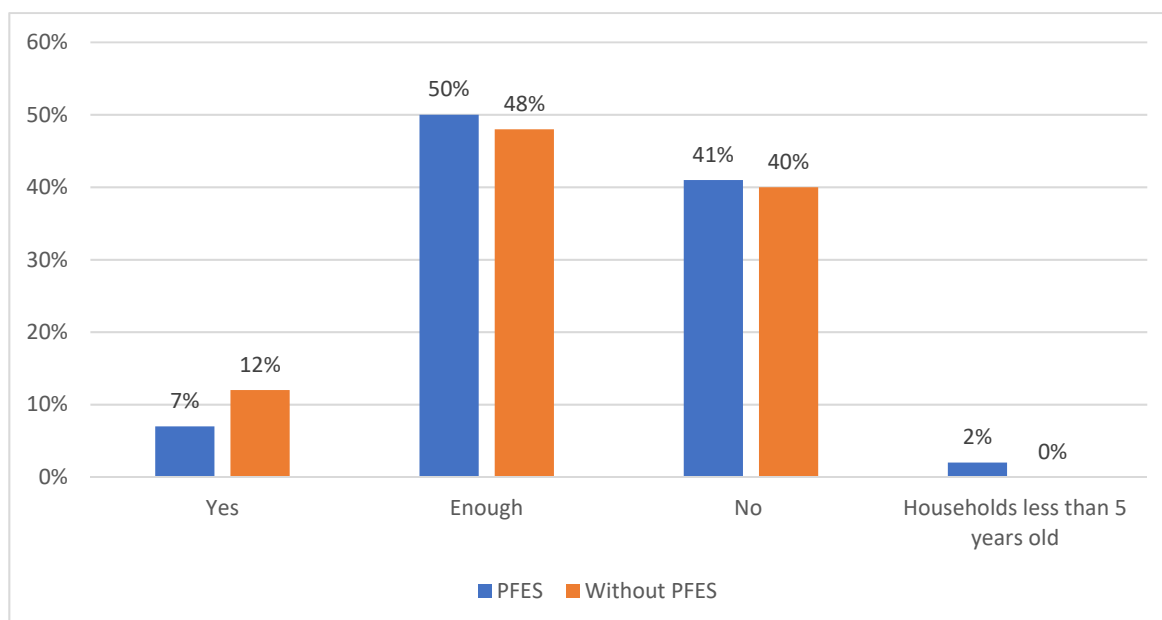


Figure 11. Stakeholder perceptions on whether household income has met family needs (i.e., life security) over the past ten years. Source: compiled by the research team.

4. Discussion

This research identifies knowledge gaps in providing empirical evidence regarding the practice and impacts of implementing PFES in a centralized governance and rural livelihood context, as pointed out by [20]. For Cat Tien National Park, conservation practitioners continue to seek viable policies and programs that strive to achieve not only ecological, but also economic and social benefits [21]. While previous research in other areas of Vietnam shows incomes from PFES programs not reaching the poor because of political and economic constraints [22], our research shows that PFES has brought positive economic and social impacts to many of the households participating in this study. Depending on how payments articulate with national, regional and local conditions, PFES has implications for property rights over targeted resources, local socio-political relations and livelihood transitions [22]. As our research shows, the fact the PFES program prioritizes poor and traditionally marginalized communities (such as ethnic minorities) as the main beneficiaries in Cat Tien National Park proves that these vulnerable groups have had better opportunities to access the program. Our research shows similar findings to [23]'s 2019 study, where poor households with PFES have slightly higher incomes than they would

have had, had they not participated in the scheme. Differences in total incomes between poor households with and without PFES, however, were insignificant, while incomes of better-off households with PFES were significantly higher than those without PFES. We also support other studies that demonstrate PFES impacts in supporting both land management and the attitudes and institutions underpinning prosocial behavior, and highlight an important line of inquiry as PFES continues to expand worldwide [1]. There needs to be a balance between social policy and PFES policy because forest protection and development needs to mobilize the resources of all members of society, while focusing on only one vulnerable group can undermine and reduce incentives for other social groups to join PFES. According to research results, the national park's designated standard for defining poor households is considered one of its main criteria for selecting communities to participate in and benefit from PFES, along with its aim to prioritize ethnic minority households. The study areas also have many poverty-reduction programs and projects running concurrently. Combining PFES with other pro-poor programs can avoid widespread and ineffective investments and create a greater incentive for the poor to participate in forest protection.

As our research has shown, PFES has several strengths compared to the old area-based remuneration systems, as not only are payments higher but they are based on performance, which creates stronger motivation for villagers to perform their tasks. As [4] and [16] have shown, the distinguishing feature of PFES lies in its conditionality (payments are only made when environmental services are delivered). In this regard, the addition of conditionality with PFES has increased households' motivation and commitment to patrol forests in comparison to previous contracts.

Although the unavailability of data on pre-PFES situations in study villages made it difficult to observe post-PFES impacts, comparisons with non-PFES villages did confirm that PFES creates additional income for villagers in PFES villages that those in non-PFES villages are unable to benefit from. PFES not only acts as the main risk-scoping strategy in response to shocks and unexpected events such as droughts, but can also be the main means to ensure food security for villagers during such times. However, as our findings show, there is no significant data showing PFES communities and households feel any more secure than their non-PFES peers, particularly when they are mere labor providers for the park and have neither land use rights certificates nor any assurance of PFES continuity. Since PFES contracts are signed annually and CTNP aims to rotate payments between villages for equitable distribution, there is no assurance of sustainability for risk scoping strategies. Moreover, local perceptions on and definitions of poverty and life security differ from place to place, so programs and project interventions addressing poverty need to be built on consultations with local people [4].

Yet, during years when villages and households can receive PFES payments with stable and steadily increasing income streams each year, PFES has helped alleviate poverty, increase incomes and create jobs for many households. PFES also seems to play an extremely important role in poor households where it appears to be the main income source. On the other hand, it also raises the question of whether some villages are over-reliant on PFES without having livelihood or employment alternatives; thus, potentially exposing themselves to difficulties when PFES revenue streams are affected.

In addition, the research results show that people participating in PFES have been trained in forest patrolling, carbon stock measurements and biodiversity assessments, which are important skills for stewards of the forest. However, so far only small groups of households and communities have had access to such support. While forest protection calls for collective actions, the fact that only PFES households and communities have received training has created power and information asymmetries between communities.

Policies that prioritize ethnic minorities also pose challenges in ensuring fairness to all communities. Although PFES revenues can be requested to fund social projects, they may still decrease social capital if there is elite capture or if the distribution of new funds disrupts existing fairness norms [1]. As our research shows, the government determines who will be selected to take part in the PFES program (either whole communities or groups

of households) with little consultation with local authorities. This centralized planning means that PFES program design entails political choices about which classes of people, in which locations, will have access to natural resources and their benefits, now and in the future [24]. PFES, like many other conservation projects, should be carefully designed to be effective so that certain characteristics of local communities can facilitate success [21].

Globally, payment for environmental services is expected to be an innovative market-based instrument to mobilize financial resources and improve the performance of conservation initiatives by recognizing the importance of ecosystem services, their contributions to human well-being and the need to boost tangible synergies between conservation and development [25]. As our research shows, the PFES program in Vietnam has contributed to conservation efforts in Cat Tien National Park, and the program has helped support increasing numbers of forest protection contracts and become an important source of funding for conservation activities. However, the extent to which this financial incentive contributes to other conservation outcomes requires further studies and rigorous assessment. Accurate monitoring and evaluation of PFES relies on systematic information collection. However, the lack of available data on pre-PFES situations poses a challenge to analyzing forest conservation impacts in particular. Addressing this data issue not only requires putting a system in place, but also necessitates training in relevant skills and methods for government officials, which are often unavailable at the grassroots level. Future research should examine whether PFES also complements social capital in a variety of other types of local institutional contexts, including those in which local institutions have less structure or formal support. PFES inherently supports landowners; hence future studies should further explore impacts on households without land use rights certificates. As PFES programs mature, future investigations should also focus on longer-term impacts, including the possible implications for behavior after contracts are completed. Our research answers recent calls both for more rigorous evaluations of PFES and for a better understanding of the social impacts of all types of participatory development programs [15,26]. PFES implementation in Vietnam is shaped by government agencies, national park authorities and local authorities, which leads to a hybrid model that has not been seen elsewhere, making it difficult to judge its success [27].

5. Conclusions

PFES has created additional incomes for villagers in PFES villages and brought more opportunities for local people to receive forest protection contracts. Villages without PFES do not have the same economic opportunities at the household level as PFES villages. PFES impacts vary and can be significant in cases of crop loss or unexpected events. However, PFES might also create power struggles and social conflicts as it can bring benefits for certain groups and create disadvantages for others. PFES effectiveness relies on appropriate benefit-sharing mechanisms that can promote people's participation and harmonize with other simultaneous socio-economic development policies. Our study reveals challenges in documenting PFES impacts of all sorts (social, economic as well as forest conservation effects), particularly when neither government agencies nor CTNP have made efforts to collect such data.

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Institutional Review Board Statement: The study was conducted according to the guidelines of the Declaration of Center for International Forestry Research (CIFOR), and approved by the CIFOR Research Ethics Review Board (or Ethics Committee) on 26 August 2019.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

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