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No. 379, February 2023 DOI: 10.17528/cifor/008803 | cifor-icraf.org

What happens after conservation payments stop?
Key findings from REDD+ in Brazil

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Key messages

- We assess the impacts of a REDD+ project that paid smallholders to reduce deforestation in the Brazilian Amazon, during and after payments.
- We find that payments were effective at reducing deforestation, but only while they were ongoing.
- After payments had ended, deforestation resumed, but not at a rate that eliminated previous forest conservation outcomes.
- Deforestation reductions required payments, but the environmental gains lasted.

Introduction: Forest conservation outcomes during and after payments

Conservation payments known as Payments for Environmental Services (PES) are conditional transfers in which money or in-kind compensations are provided to land managers in exchange for the adoption of conservation practices, such as reducing deforestation and conserving forests (Wunder 2007, 2015). They were the main type of intervention originally envisioned for the on-the-ground implementation of REDD+ (reducing emissions from deforestation and forest degradation), though many other local-level interventions have been implemented as well (e.g., non-conditional livelihood enhancements, law enforcement and tenure clarification) (Duchelle et al. 2017).

Under the REDD+ umbrella, the PES rationale is to make forests more profitable standing than cut (Angelsen and McNeill 2013), thereby inducing beneficiaries to actively support conservation efforts. For this strategy to work, payments for forest conservation must exceed the opportunity cost of avoided deforestation – i.e., the foregone profits from abandoning deforestation-dependent economic activities (e.g., swidden agriculture, extensive cattle ranching) (Wunder 2008). Importantly, PES implementers need to monitor service providers' compliance, verifying how well enrolled properties have fulfilled contract conditions (e.g., conserving forests) before making payments (Wunder et al. 2008).

Even before REDD+ was launched, PES were already popular in developing countries (Engel et al. 2008; Ezzine-de-Blas et al. 2016), probably for two reasons. First, PES could be more cost-efficient in reaching conservation outcomes than indirect strategies, such as Integrated Conservation and Development Projects (ICDP) (Ferraro and Kiss 2002). Second, PES are potentially more socially just than traditional enforcement-oriented command-and-control instruments as they remunerate land managers for the voluntary (rather than forced) adoption of conservation behaviours (Jack et al. 2008). Hence, PES can promote win-win outcomes (i.e., forest conservation and poverty reduction) (Leimona and Lee 2008), which has encouraged implementers to target poor smallholders.

Despite the enthusiasm around PES, their effectiveness remains debated. Most PES impact evaluations indicate some extent of success in reducing deforestation and conserving forests (e.g., Robalino and Pfaff 2013; Costedoat et al. 2015; Jayachandran et al. 2017; Montoya-Zumaeta et al. 2019), though typically with moderate effect sizes (Wunder et al. 2020). However, not many PES programmes have been scrutinized, and the studies are not always free of methodological problems (Snilsveit et al. 2019). Thus, the final word is not yet out on PES effectiveness.

Even less studied is the extent to which PES conservation outcomes persist after payments are suspended, an issue that forest carbon literature refers to as "permanence". Many PES are designed as long-term programmes, where

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payments might even be maintained indefinitely (Pagiola et al. 2016). However, continuous funding is rarely guaranteed, and many PES initiatives have been suspended because of budget restraints (Jones et al. 2017; Hayes et al. 2022). Other PES initiatives are planned from the outset as pilot programmes without long-term payment horizons (Jayachandran et al. 2017).

What permanence scenario should we expect? Theoretically, deforestation reductions promoted by temporary PES would also tend to be temporary: after payment suspension, competing land uses (e.g., agriculture, cattle ranching) would once again be more profitable than conserving forests, inducing the resumption of deforestation (Swart 2003; Phelps et al. 2013).

Yet, a lower deforestation trend might be sustained in the post-payment period under two primary conditions. First, a PES programme could provide incentives to boost the adoption of more profitable, sustainable livelihood alternatives (e.g., agroforestry systems) that could permanently outcompete deforestation-dependent activities (Pagiola et al. 2020). Second, PES programmes could increase participants' altruistic motivations to conserve (i.e., motivation *crowding-in*), leading them to conserve more forest than they did before the payments (Ezzine-de-Blas et al. 2019).

Furthermore, even if deforestation resumes after PES suspension, forest gains from PES would still be "permanent", as long as former beneficiaries do not "catch up" the foregone deforestation (World Bank 2018). This could only happen if, post-payment, deforestation rates become even higher than what would have happened in the absence of the programme – i.e., a counterfactual scenario to be estimated through proper controls (Skutsch and Trines 2010; Costedoat and Pfaff 2022).

A project could cause an acceleration of deforestation that overtakes its forest conservation gains only under exceptional circumstances. For instance, this could occur if beneficiaries invested PES incomes in purchasing forest-clearing tools (e.g., chainsaws) and/or boosting extensive farming (e.g., pastures with low carrying capacity). Another possibility would be if receiving payments for conserving forests undermined beneficiaries' intrinsic motivations to conserve (i.e., motivation *crowding-out*) (Rode et al. 2015), leading them to deforest more than they would have done absent payments.

This leads to the four permanence scenarios displayed in Figure 1, as per Carrilho et al. 2022:

i. Permanence of deforestation reduction (S1): former participants continue to cut less forest than the counterfactual even after PES suspension, thus sustaining deforestation reduction.
ii. Permanence of the conservation gains (S2): former participants resume deforestation, reaching the counterfactual deforestation rates without overtaking them, which means deforestation reduction was not permanent, but PES conservation gains were saved.
iii. Zero-permanence – i.e., full erosion of gains (S3): former participants overtake the counterfactual deforestation rates until they "catch up" the foregone deforestation, meaning PES conservation gains faded away. Then, they return to the counterfactual deforestation rates.
iv. Negative-permanence outcome (S4): former participants overtake the counterfactual rates and then continue cutting forests at a higher rate, which would indicate that, in the long term, negative conservation outcomes had been promoted by PES.

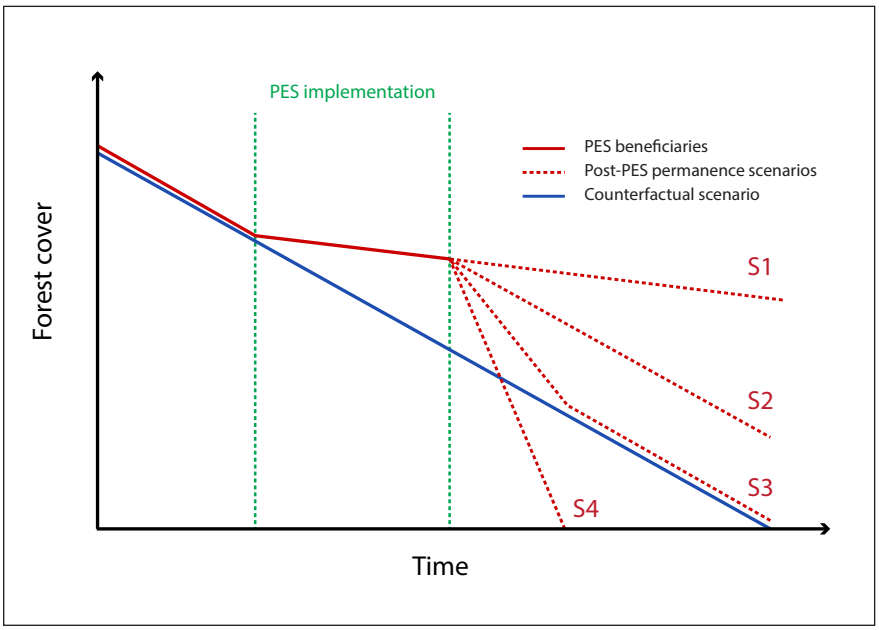

Figure 1. Stylized scenarios for the permanence (or lack thereof) of forest conservation outcomes from PES

Note: All scenarios departed from the same assumption that PES effectively reduced deforestation while payments were ongoing. They differ from what occurs after payments end, illustrating four degrees of permanence: S1) the lower deforestation rate was sustained; S2) deforestation resumes but the forest conservation gains from PES were preserved; S3) deforestation increases until the forest conservation gains were eliminated; and S4) deforestation continues to increase, promoting negative conservation outcomes in the long run.

Source: Adapted from Carrilho et al. (2022)

There have only been a few evaluations of the permanence of the forest conservation outcomes achieved by PES-like programmes. Most commonly, they found support for the more optimistic scenarios showed above – i.e., S1 and S2 from Ecuador and Uganda, respectively (World Bank 2018; Etchart et al. 2020). Yet, there is also an example from Indonesia highlighting the risk of negative outcomes, corresponding to our S4 scenario (Erbaugh 2022).

In sum, permanence is crucial for the effectiveness of any conservation intervention over time. Yet, our empirical knowledge about the degree of permanence and its drivers remains limited. The theoretical rationale behind PES programmes suggests that deforestation will resume post-payment: you would only get what you pay for. However, as shown above, other scenarios are also possible.

In the following sections, we condense the main findings of our impact assessment of a REDD+ project that paid smallholders in the Transamazon region (western part of Pará State, Brazilian Amazon) to reduce deforestation. The project was evaluated both during implementation and after its end, as part of the Global Comparative Study on REDD+ (GCS REDD+) led by the Center for International Forestry Research (CIFOR). The research was originally published in *Ecological Economics* (Carrilho et al. 2022).

The Transamazon REDD+ project

We scrutinized Sustainable Settlements in the Amazon (SSA), a REDD+ project implemented by the Brazilian NGO *Instituto de Pesquisa Ambiental da Amazônia* (IPAM). SSA started in 2012, but was suspended in 2017 after a refinancing request was denied by the Amazon Fund.

Approximately 2,700 households in Pará State participated in SSA (IPAM 2016). However, our study focused on the 350 households to whom IPAM had offered PES. They lived in twelve communities near the Transamazon Highway, a high-deforestation area dominated by smallholders – mostly colonists from northeastern Brazil – with properties below 100 hectares (ha) in area (Godar et al. 2012; Stella et al. 2020).

The households' main economic activities were cattle ranching and swidden agriculture. Despite poor transportation infrastructure, part of their production was sold (e.g., cassava, meat). Secondarily, households depended on forest resources collected mainly for auto-consumption, such as firewood for cooking, fruits, fish and bushmeat (Carrilho et al. 2022). Most households also received monetary income from other sources, such as government transfers (Cromberg et al. 2014).

The central goal of SSA was to reduce deforestation rates. IPAM relied primarily on direct payments of up to USD 725 per household per year, conditional on deforestation reduction, and ICDP-type support (i.e., technical assistance and free agricultural inputs) to boost the adoption of sustainable livelihood activities, such as horticulture, black pepper, and cocoa production. Moreover, participants received administrative support to register their properties in Brazil's Rural Environmental Registry (*Cadastro Ambiental Rural* – CAR), combined with awareness raising meetings on environmental legislation and tenure regularization.

Assessing PES-REDD+ effects on deforestation

To estimate the impacts of the REDD+ project on deforestation, we used quasi-experimental methods. These methods allowed us to select an appropriate control group for constructing a valid counterfactual scenario (i.e., what would have happened in the absence of the REDD+ project). The impacts of the project were thus estimated by comparing the outcomes observed in the REDD+ participating units (i.e., a treatment group) and in the counterfactual scenario (Ferraro 2009).

The variable used in the comparison between the groups (i.e., the outcome variable) was forest cover, measured as the sum of the percentages of primary and secondary forest on the properties, as self-stated by the household respondents in surveys, and validated through remote sensing data. All methodological procedures are described in detail in Carrilho et al. (2022).

We compared the changes in forest cover over time between the treatment group and the counterfactual scenario during two evaluated periods. The first was between 2010 (the baseline) and 2014 (two years after the project began), to measure the effects of PES during the project. To isolate the effects of PES, in 2014, data collection occurred before the ICDP-type support for alternative livelihoods began. The PES contracts had already been signed almost a year earlier (in early 2013) and the first payment would start very soon. Thus, we expected that participants had reduced deforestation during 2013 to become eligible for the first payments. If that were the case, we would find a significant difference between the changes in forest cover of the treatment group and the counterfactual scenario over the first evaluated period. It is worth mentioning that, besides IPAM, several other organizations offered administrative support in the Transamazon region for registering households' properties under CAR. Consequently, most control households received the same intervention. Any additional effect of CAR on deforestation would thus be nullified by the comparison of the treatment and control groups.

The second evaluated period was between 2014 and 2019 (two years after the project ended), to assess the extent to which the effects of PES were permanent. As shown in Figure 1, four permanence scenarios could have been possible.

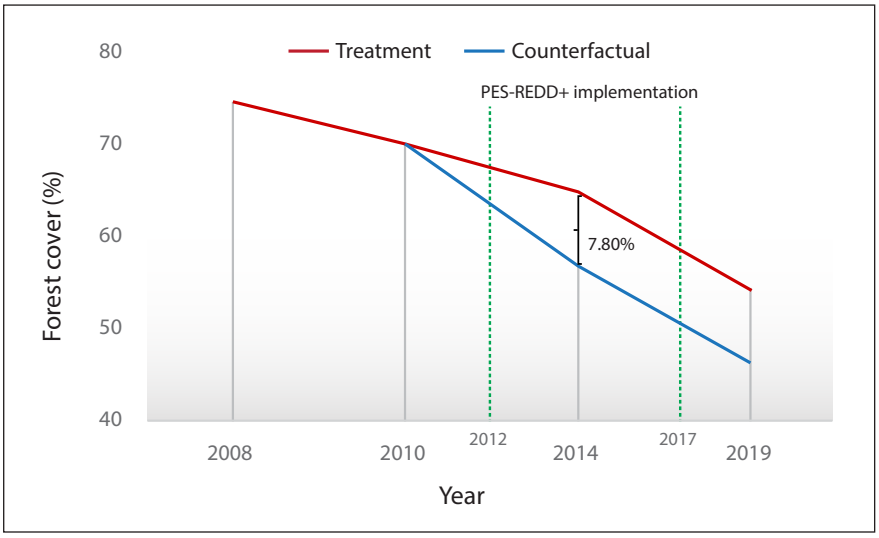

Figure 2. Change in forest cover (% of forest of the household property) in REDD+ participant households and its estimated counterfactual

Note: This figure illustrates the PES-REDD+ impacts during and after the evaluated project. While being implemented, the project saved an average 7.8% of forest cover per participant property. After its end, deforestation resumed, reaching the counterfactual deforestation rates, but leaving the previous project-avoided deforestation gains intact.

PES effects during the REDD+ project

Our results indicate that the REDD+ project reduced deforestation while it was offering direct conditional payments. When comparing the differences between the treatment group and the counterfactual scenario during the first evaluated period (i.e., 2010–2014), we found statistically significant results. These results show that the project saved an average 7.8% of forest cover per property, equivalent to 6.1 ha (Figure 2). The forest cover continued to decrease in both treatment and control groups. However, we detected a break in the forest loss trend between 2010 and 2014 in the treatment group, which we can attribute with high confidence to the REDD+ project.

As stated above, deforestation reduction probably resulted from PES. That being so, our findings corroborate the majority of impact assessments showing the effectiveness of PES in reducing deforestation and conserving forests (see Introduction). The most likely explanation for the success is that payments did, to some extent, offset the opportunity cost of avoided deforestation. Accordingly, farmers chose to reduce forest conversion to other land uses (e.g., agriculture and cattle ranching) to receive payments.

The permanence of PES effects

After the project ended, deforestation resumed to match counterfactual deforestation rates. Thus, the project failed in promoting a sustained rate of lower deforestation. In the second evaluated period (2014–2019), we failed to detect significant differences between the percentage of forest cover of the treatment group and the counterfactual scenario. This indicates that, during this period, the former participants had, on average, neither increased nor decreased forest cover vis-à-vis what would have occurred in the absence of the project.

As the theory behind PES programmes predicted (see Introduction), after payment suspension, forest conversion would again become more profitable than forest conservation. Therefore, deforestation practices were also expected to resume. As long as the environmental externality persists – i.e., standing forests cannot outcompete other land use yields – we cannot expect a temporary payment to induce a permanent change in the productive system logic.

However, the REDD+ project still left a lasting environmental gain: the treatment group went back to clear forests again just as quickly as their peers making up the counterfactual scenario, but without exceeding it. In other words, deforestation resumed but not at a rate that eliminated previous conservation gains. This means a net forest gain persisted over time, as illustrated by the empirical deforestation trends in Figure 2. Our findings here match neatly with a previous evaluation of the permanence of PES outcomes in Uganda (World Bank 2018).

Conclusions and perspectives

The evidence we present here about a REDD+ project in the Brazilian Transamazon region (Pará State) indicates that temporary, land-use conditional PES transfers were indeed successful in significantly reducing deforestation, but only while payments lasted. The deforestation trend reduction from PES was thus impermanent, but conservation gains were saved, as anticipated in our theoretically expected scenario (S2, Figure 1), and observed elsewhere in the tropics.

Notably, the project implementer also attempted to induce more ambitious self-sustained deforestation reduction by promoting sustainable land uses that would keep trees standing, and thus change the production logic more permanently. In fact, this was the project's main stated goal, with investments in ICDP components featuring alternative livelihoods. However, it seems these promoted

alternative livelihood activities were not widely adopted by the beneficiaries over time, or they produced only complementary incomes, while deforestation-dependent activities persisted (Barrett et al. 2001). That said, further research would be needed to clarify the adoption of and returns from the project's ICDP components.

The main lesson for forest conservation donors and implementers here may be: you only get what you pay for, while you are paying. Long-term PES interventions are thus preferable, allowing deforestation reductions to persist longer. A permanent reduction in the deforestation trend (Scenario S1) was hoped for, but not achieved: permanently changing the logic of livelihoods at the forest frontier through ICDP investments is a complex undertaking.

Still, even this temporary PES programme had lasting project permanence in the sense of keeping achieved conservation gains during PES implementation fully intact after payments ended: deforestation did resume at an accelerated pace, but not exceeding its counterfactual. Thus, the PES project did not permanently solve the deforestation problem, but it did serve as a useful trend break – a bracket in time, saving forests for climate change mitigation and co-benefits while the intervention lasted and beyond.

Methodologically, our rigorous impact evaluation techniques allowed us to flesh out these outcomes in detail. More studies on post-project performance and the hoped-for permanence of conservation gains are definitely needed. Our newly proposed terminology for different degrees of permanence should also be useful here for asking the right questions: was there a permanent change in *deforestation trends*, or, at least, were the *conservation gains* from the intervention permanent?

Acknowledgements

We thank Erin Sills and Jordano Roma for their valuable comments and contributions to the manuscript. This document is part of GCS REDD+ (https://www.cifor-icraf.org/gcs/) funded by the Norwegian Agency for Development Cooperation (Norad), the International Climate Initiative (IKI) of the German Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUB) and the CGIAR Research Program on Forests, Trees and Agroforestry (CRP-FTA), with financial support from CGIAR Fund donors.

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