

# Gender and payments for environmental services: impacts of participation, benefit-sharing and conservation activities in Viet Nam

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**Abstract** There has been a rapid expansion in the use of payments for environmental services (PES) as a key conservation finance policy. However, there is insufficient understanding of how gender can affect PES implementation and outcomes. We present results from a case study in Viet Nam, where a national PES programme has been in place for a decade. Through panel household survey data, focus groups and interviews, we examined how women have been involved in PES policies, what the impacts have been on decision-making by men and women, participation rates and use of PES income over time, and the potential conservation outcomes. Our research confirms that resource use varies between men and women, and changes in access rights can fall disproportionately on women. Participation in PES has been lower for female-headed households and for women within male-headed households, although gradually more equitable participation has evolved within households. Female-headed households reported expending more yearly effort on PES activities despite protecting less land, and also increased their conservation activities over time as they presumably became more familiar with PES. Use of income from PES also showed differences between male and female-led households, with men more likely to spend funds on non-essential goods. Within households, although men initially decided how to spend PES money, decision-making has become more equitable over time. We conclude with some recommendations on how to increase attention to gender in PES projects and future research to improve outcomes.

**Keywords** Asia, conservation finance, equity, gender, household livelihoods, impact evaluation, market-based conservation, payments for ecosystem services

## Introduction

Payments for environmental services (PES) programmes, which provide funding from beneficiaries and users of ecosystems to those who ensure conservation, have rapidly expanded in size and scope since the 1990s (Wunder et al., 2018). Empirical studies on the effectiveness of PES in achieving goals, from stopping deforestation to alleviating poverty, have also increased (Salzman et al., 2018). However, there remain gaps in our knowledge regarding gender and PES (Cruz-Garcia et al., 2017). Although there have been arguments in favour of paying attention to women's participation in PES on the basis of equity and inclusion (Pascual et al., 2014; Phạm & Brockhaus, 2015), there has been less empirical research on how gender roles and responsibilities affect PES implementation and outcomes for conservation, as well as how PES programmes could affect men and women in different ways (Boyd, 2002; Kariuki & Birner, 2015; Schwartz, 2017; Vardhan & Catacutan, 2017; Andeltová et al., 2018; Bee, 2019; Benjamin et al., 2018).

The existing, although limited, literature on gender and PES has identified several important areas of research, which we briefly review here. Although there has been considerable work on how gender has influenced other conservation approaches, such as community-based natural resource management (Rocheleau et al., 1996; Resurrection & Elmhirst, 2008), we focus here on PES as a relatively new approach using financial incentives. We argue there is a need to have greater knowledge of the gender implications of the mechanisms of PES so as to improve outcomes.

Existing studies suggest that projects to promote conservation behaviours, such as PES, may have different impacts on men and women simply because they use and value resources differently (Fortnam et al., 2019). Women often value, prioritize, collect, grow or otherwise use ecosystem services producing energy, food, water and medicine more than men (Walter & Wannitukul, 2002; Sunderland et al., 2014; Calvet-Mir et al., 2016; Yang et al., 2018; Cruz-Garcia et al., 2019; Pearson et al., 2019). As a result, restrictions on use of natural resources may have a disproportionate effect on women's well-being (Agarwal, 1997a; Kerr, 2002; Larson et al., 2018), and if this is not compensated for by sufficient or targeted payments, PES could lead to declines in women's income and livelihood options, as well as decrease their willingness to participate (Kerr, 2002; Daw et al., 2011).

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Participation is a key aspect of PES that can be influenced by gender dynamics, both in programme design and in making payments (Boyd, 2002; Corbera et al., 2007). There are numerous examples of women being excluded from meetings about PES (vonHedemann & Osborne, 2016) or accessing them at lower rates than men, often because of discrimination or time constraints (Khadka et al., 2014; Samdong & Kjosavik, 2017; Bee, 2019). Women may also not have input into or control over assets (namely land) that are required to participate in PES programmes (Kariuki & Birner, 2015), or PES activities may not be available to women or not compensated at the same rates because of gender norms about male and female roles (Boyd, 2002; Caro-Borrero et al., 2015; Ishihara et al., 2017; Vardhan & Catacutan, 2017; Andeltová et al., 2018). To combat these problems, some PES programmes have explicit requirements on minimal numbers of women at PES meetings or numbers of female-headed households receiving payments. However, this can lead to so-called tokenism, such as in Mexico, where women have been nominated as leaders to get points in PES applications without their real involvement (Bee, 2019) and, despite the formal quotas, participation of women still lags behind men (Corbera, 2010).

Many studies of household payments for environmental services have looked primarily at opportunity costs and poverty impacts from these investments (Tacconi et al., 2013); however, treating the household as a unified whole can ignore intra-household dynamics (Agarwal, 1997b). For example, if men receive payments, they may spend it differently than women (e.g. on large purchases and recreation), whereas women tend to use benefits for pressing household needs (e.g. school fees or food; Walter & Wannitukul, 2002; Caplow et al., 2011). Schwartz (2017) also found increased inequality in decision-making in PES-participating households compared to non-participants in Costa Rica. Women in some studies have expressed support for individual PES accounts, rather than household or community payments, because of exclusion from decision-making at both scales (Martin et al., 2014; Kariuki & Birner, 2015).

The conservation impact of PES in relation to gender is the least well-studied dynamic (Andeltová et al., 2018), as there is little reported effect of increased female participation on improved conservation outcomes. However, lessons could be drawn from community forestry, where improved conservation has been reported when women are more involved in decision-making and authority (Agrawal et al., 2004; Agarwal, 2009a,b).

### **A case study of payments for environmental services in Viet Nam**

Since 2010, Viet Nam has implemented a national policy that charges fees on hydropower plants, domestic water

suppliers, and a few other industries, and transfers this money to upland areas for forest protection (McElwee, 2012; Phạm et al., 2013). Approximately USD 100 million per year is paid to c. 500,000 participating households living in > 5 million ha of eligible watershed forest (c. 40% of the country's total forest area). The payment rates vary depending on watershed and province, from as low as VND 2,000 (USD 0.09) per ha to VND 1,300,000 (USD 55) per ha or more (Nguyễn & Vương, 2016).

To date, there has been little research on the gender impacts or outcomes of the PES programme, with a major impediment being lack of data: statistics kept by the national PES-coordinating office do not include information on whether any female-headed households participate or how many women benefit from the programme. Few women work in leadership in PES roles or offices (McElwee & Nguyễn, 2015). There is also no formal guidance from authorities on gender mainstreaming for PES (Phạm & Brockhaus, 2015). In some areas, the local Women's Union helps disseminate information to attract women applicants, or disburse funds, but this is ad hoc and not widespread (Phạm et al., 2010).

Previous research has indicated that gender does have important effects on resource use in Viet Nam, including differential valuation of ecosystem services between men and women (Tien et al., 2018). Participation in PES by women has not been the subject of systematic studies, but reported barriers include inability to access information (Phạm & Brockhaus, 2015; Loft et al., 2017), exclusion from meetings (Tuijnman et al., 2020), and gender discrimination within households (Phạm et al., 2013). Some voluntary PES schemes outside the national programme have tried to include community benefits for women, such as microcredit, as part of payments (Do et al., 2018), but the government system does not have any formal gender-differentiated benefits.

### **Methods**

A multi-year research project to learn about the development and impact of PES over time began in late 2011 in three provinces, representing south, central and northern Viet Nam respectively (Lâm Đồng, Thừa Thiên Huế and Sơn La provinces; Fig. 1), which were chosen because of their significant forest cover and participation in PES. For each study province, five villages in two districts were selected for in-depth research (villages in these areas typically have 200–500 households).

In each village, a random sample of 15–16 households was drawn so that a target of 75 households per province could be interviewed. Included in the sample were households who had received payments for environmental services and those who had not. The survey was piloted in summer 2011 before being used in fall/winter 2011. The survey questions

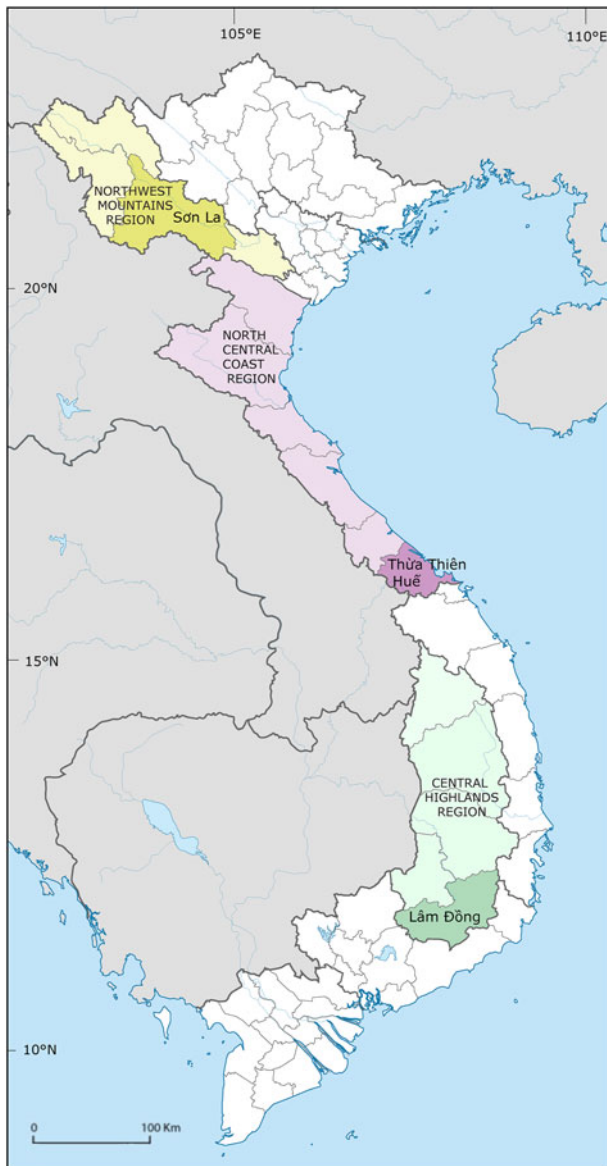


FIG. 1 The three provinces of Viet Nam in which fieldwork took place (Lâm Đồng, Sơn La and Thừa Thiên Huế).

assessed local livelihoods, labour, ethnicity, income and expenditures, land holdings, natural resource use, impacts of climate hazards, and participation in forest projects, including PES. We followed up in spring and summer 2015 with another round of interviews with the same households in only two provinces (Lâm Đồng and Sơn La), as there was a delay in implementing PES in Thừa Thiên Huế. The final database comprised 227 cases (households) in 2011 measured on 602 variables (indicators), and the second survey in 2015 comprised 133 cases on the same variables. The surveys were carried out by both male and female surveyors, including the authors and several students who were trained by us.

Although we did not deliberately stratify our sample to include them, 45 female-headed households were interviewed in 2011 (20% of the sample) and 31 were

re-interviewed in 2015 (23% of the sample). The reasons for female headship varied: in Lâm Đồng province, ethnic Koho communities have traditionally followed matrilineal inheritance, so women are often listed as household heads, even when the husband is still present. In the other sites, female-headed households were more commonly women who had been widowed, divorced or whose husband was away as a migrant worker.

Focus groups were also organized in each research village in 2011, 2012 and 2014, with one specifically female focus group in each province, led by Vietnamese women researchers, whereas the other focus groups were mixed. Activities in the women's focus groups included discussing time management activities, gendered natural resources use, and risk-mapping. Interviews with government officials and policymakers in each field site (> 50 total) also took place in 2011, 2012 and 2014; gender issues were one of the many topics discussed.

## Results

Sixty-seven per cent of households surveyed in 2011 received some cash income from forest production, collection or conservation, across categories such as fuelwood, timber, non-timber forest products (NTFPs) and PES (Table 1). These activities contributed 20% of household incomes in Lâm Đồng, 10% in Thừa Thiên Huế and 3% in Sơn La in 2011. In 2015, forest income had increased to 31% of total household incomes in Lâm Đồng (primarily a result of PES) and 6% in Sơn La.

### Use of forests

There were gendered differences in forest use, as a women's focus group in Lâm Đồng noted: in particular, women were in charge of water provisioning, biomass (fuelwood), food, and NTFPs, whereas men's work included pest control, marketing of goods, and finding timber for house repair. Non-timber forest products were recorded as important for women across all sites in 2011: in Lâm Đồng, forest mushrooms and medicinal plants were collected; in Sơn La, food such as tubers and roots were consumed; and in Thừa Thiên Huế, rattans and bamboos were sold. However, by 2015, we saw a considerable drop in income from NTFPs to zero in Lâm Đồng, with its complete replacement by PES income, and in Sơn La (which had low payments for environmental services), income from fuelwood and honey had increased in value (Table 1).

Women were responsible for household energy supplies, and the majority of survey households (79%) reported using fuelwood in 2011, with many households reporting shortages and increasing lengths of time to collect it in Lâm Đồng and Sơn La (Table 2), whereas in Thừa Thiên

TABLE 1 Mean household income (VND 23,000 = USD 1) reported from forestry-related activities across the three study provinces (Fig. 1) in 2011 and 2015.

Sources	Lâm Đồng				Sơn La				Thừa Thiên Huế <sup>1</sup>	
	2011 VND	% total forest income	2015 VND		2011 VND	% total forest income	2015 VND		2011 VND	% total forest income
Fuelwood	420,000	4.2	0	0.0	1,752,382	56.2	5,673,333	62.0	1,260,527	31.5
Timber from planted forest	0	0.0	0	0.0	0	0.0	*		2,667,105	66.8
Timber from natural forest	0	0.0	0	0.0	39,474	1.3	*		0	0.0
Fodder	32,000	0.3	0	0.0	265,263	8.5	*		0	0.0
Honey	0	0.0	0	0.0	82,895	2.7	3,060,000	33.0	0	0.0
Forest foods	732,934	7.4	0	0.0	822,368	26.4	0		0	0.0
Bamboo/ rattans	0	0.0	0	0.0	658	0.0	0	0.0	34,868	0.7
Medicinal items	198,667	2.0	0	0.0	0	0.0	0	0.0	0	0.0
Leaves	21,067	0.3	0	0.0	39,066	1.3	0	0.0	25,263	0.5
Animals	217,067	2.2	0	0.0	1,316	0.0	*		0	0.0
PES	8,251,573	82.8	17,031,250	100.0	115,763	3.7	446,250	5.0	789	0.0
Other	81,333	0.8	0	0.0	0	0.0	0		0	0.0
<i>Total</i>	9,954,641	100.0	17,031,250	100.0	3,119,184	100.0	9,179,583	100.0	3,988,553	100.0

\*Only one household reported income from this category.

<sup>1</sup>There were no interviews in 2015 as there was a delay in implementing PES.

TABLE 2 Per cent of households reporting changes in access to and use of fuelwood across the three study provinces in 2011 and 2015.

	Lâm Đồng 2011 (64% of households reported use)	2015 (0% of households reported use)	Sơn La 2011 (93% of all households reported use)	2015 (96% of all households reported use)	Thừa Thiên Huế <sup>1</sup> 2011 (82% of households reported use)
Fuelwood collection. . .					
. . .takes more time now (%)	56	–	75	53	30
. . .is the same as before (%)	25	–	14	36	18
. . .takes less time than before (%)	19	–	11	11	52

<sup>1</sup>There were no interviews in 2015 as there was a delay in implementing PES.

Huế, households reported having improved access to fuelwood as a result of tree plantations. By 2015, a major change occurred in Lâm Đồng: all households reported no fuelwood use, a result of having purchased liquid petroleum gas stoves and/or electric rice cookers.

#### Are women participating in PES?

We examined how household structure influenced participation in PES by comparing male-headed households in the survey with female-headed households (Table 3). Male-headed households had higher enrolment in PES (56% of all male-headed households surveyed were enrolled in the programme, whereas only 40% of surveyed female-headed households were), and over time more male-headed

households joined PES, whereas in female-headed households enrolment did not increase.

We also examined participation within households. In 2011, more men than women did PES-related activities (e.g. attending meetings, patrolling forests) in all three sites (Table 4). According to respondents, forest protection is considered a man's job, as it is physically demanding and requires work away from the home. Women stated they were less involved because of the perception that forest monitoring was potentially dangerous (e.g. encountering poachers), but that women would do such patrols if men were unavailable. Women also reported being too busy with housework to participate in PES, or feeling that their attendance and participation was unnecessary or unwanted. However, by 2015, with several years' experience,

TABLE 3 Enrolment in the PES programme among surveyed households and by household head types in 2011 and 2015, in all three study provinces combined.

	2011	2015
% of surveyed households enrolled in/benefitting from PES	52	56
% of surveyed male-headed households enrolled in/benefitting from PES	56	62
% of surveyed female-headed households enrolled in/benefitting from PES	40	40

TABLE 4 Household member participation in PES meetings and activities across the three study provinces in 2011 and 2015.

Household members participating the most in PES (% of households) <sup>1</sup>	Lâm Đồng		Sơn La		Thừa Thiên Huế <sup>2</sup>
	2011	2015	2011	2015	2011
Husband	87	71	74	45	84
Wife	4	3	6	7	0
Both equally	7	17	4	36	0
Others; e.g. children, cousins	2	9	17	10	16
Do not know	0	0	0	2	0

<sup>1</sup>Columns do not necessarily sum to 100% because of rounding.

<sup>2</sup>There were no interviews in 2015 as there was a delay in implementing PES.

TABLE 5 Household decision-making on payments for environmental services across two of the three study provinces in 2011 and 2015. Variation in the number reporting reflects households who reported having received a payment in the previous year.

Who decided how the PES money would be spent (% of households)? <sup>1</sup>	Lâm Đồng		Sơn La	
	2011 (n = 46)	2015 (n = 35)	2011 (n = 41)	2015 (n = 36)
Husband	22	11	85	11
Wife	48	3	10	3
Both	28	83	2	78
Other	2	3	2	8

<sup>1</sup>Columns do not necessarily sum to 100% because of rounding.

more gender-equitable participation was reported: in both Lâm Đồng and Sơn La, the per cent of households reporting that both husbands and wives participated equally in PES rose, with a striking increase in Sơn La.

#### Do women and men use payments differently?

In nearly all cases, men in the household physically received the payment, which was usually paid in cash by government officials. Respondents were asked, 'Who decided how the PES money would be spent?' (Table 5), and the results revealed cultural differences across sites (Thừa Thiên Huế is

not in this analysis as few payments had been made at the time of the survey). In 2011 in Sơn La, where the dominant ethnic group, the Thai, has traditional patriarchal norms, the husband decided how to use the money (85% of households). In Lâm Đồng in 2011, the wives decided in 48% of households, reflecting matriarchal norms among the Kôho ethnic group. But by 2015, both sites had converged: 83% of respondents in Lâm Đồng and 78% of in Sơn La reported joint decision-making. A female village head in Lâm Đồng told us that women's power in the household was now shared with men more than in the past, attributed to men having received payments for environmental services.

Participants in a women's focus group in Lâm Đồng stated they preferred to receive payments, rather than the men doing so, as they had certain livelihood activities they were already in charge of and were familiar with family budget needs. Women in a focus group in Sơn La stated that the lack of wives' names on land tenure certificates was probably the reason men were paid the PES money. Although women did not report major arguments between husbands and wives over how to spend the payments, some stated they believed men had wasted some of the PES money on alcohol or tobacco; for example, some women were confused about the exact payment rates they should expect to see, and believed that money had not been returned fully to the household.

We also surveyed households about how payments were used. In 2011, PES money was primarily spent on food, household goods, and schooling fees and expenses for children (Table 6). Only a small number of households reported they used part of the protection money PES funds on direct forest activities, such as purchase of tree seedlings or hiring labour for forest work, and the results in 2015 were largely the same. We saw some differences in expenditures between male- and female-headed households in a few categories: in 2011, male-headed households spent less of their PES money on household goods, more on house construction, and considerably more on other expenses, a category for non-essential expenses that was left open for respondents to specify, and which usually included recreation, cigarettes or travel. Female-headed households in 2011 spent nothing on other expenses, whereas 25% of male-headed households mentioned this category. By 2015 women-headed households had increased their spending in the non-essential category, which could be a result of more disposable income, as well as a realization that use of PES money is not monitored (women may have been more reluctant to spend the income on non-essential items in the initial years of the programme).

Participating PES households were also asked about their opinions on the benefit distribution system (Table 7). Most households wanted a higher payment per ha, and both female- and male-headed households had largely similar suggestions (asking for 725,000–750,000 VND/ha on average, or slightly more than double what was paid per ha in Lâm Đồng, and seven times higher than the payments in

TABLE 6 Use of PES money within households and across household head types in 2011 and 2015. Variation in the number reporting reflects households who reported having received a payment in the previous year.

What were payments spent on (% of households)? <sup>1</sup>	Overall (n = 92), 2011	Overall (n = 70), 2015	Female-headed households (n = 15), 2011	Male-headed households (n = 77), 2011	Female-headed households (n = 11), 2015	Male-headed households (n = 59), 2015
Direct forest care costs (e.g. seedlings, hired labour)	8	1	0	9	0	2
Food	90	79	93	90	82	78
Agricultural production	17	14	13	18	45	8
Household goods	32	39	40	30	45	37
School fees	26	23	26	25	36	17
House construction	2	3	0	3	0	3
Other	21	19	0	25	18	19

<sup>1</sup>Multiple categories could be chosen and therefore columns do not necessarily sum to 100%.

TABLE 7 Opinions on benefit distribution across household types in Lâm Đồng and Sơn La combined in 2015.

Opinions on benefit distribution	Female-headed households (n = 11)	Male-headed households (n = 59)
Feel current payment amount is sufficient (% of households)	16	21
Higher amount would be sufficient, average suggestion (VND/ha)	725,000	750,000
Provide land tenure certificate (% of households)	25	17
Provide community investment (% of households)	0	2
Provide in-kind food donations (% of households)	42	16
Other (% of households)	17	19

Sơn La). More female-headed households were also interested in food supplies in lieu of cash payments, and men requested additional subsidies of fuel (for motorbikes for forest patrolling) and uniforms. Additionally, in several areas of Sơn La, payments were made to collective organizations in addition to individuals, and the Women's Union was one such beneficiary. These small sums of money were used to fund the association's activities, such as support for ill members, and this collective benefit was strongly supported by women in focus groups.

Does PES induce different conservation activities between households?

A comparison between female- and male-headed households participating in PES showed that the former spent more labour days on PES work in 2015: the 12 female-headed households in the sample with PES contracts reported spending on average 40 days/year on PES activities (including both meetings and patrolling), whereas 64 male-headed households with PES contracts reported spending 31 days/year. This was despite the fact that the women had less land to protect in their contracts (25.6 ha on average for female-headed households vs 30.7 ha for male-headed households).

There were also differences between female- and male-headed households in terms of changing their land use

practices after receiving payments for environmental services (Table 8). In particular, 46% of female-headed households who had received payments in 2011 reported they had done nothing differently after receiving them, confirming low conditionality in early implementation (McElwee et al., 2014); in other words, female-headed households went to PES meetings and on patrols, but still may have used lands as they did previously, such as for firewood collection. Yet by 2015, the women reported more behaviour change than male-headed households, including higher self-reporting that they did not participate in logging or had reduced their fuelwood collection.

## Discussion

Our unique panel data gives us some indicative findings regarding the impacts of PES on gender issues over time. Although there are other issues that can affect conservation actions, our focus on gender has allowed us to highlight where PES projects may need to pay attention in the future. In all sites, natural resource use varied between men and women, and PES activities resulted in restrictions on forest use, particularly around fuelwood and NTFP collection, disproportionately the realm of women. Yet the large payments at one site (Lâm Đồng) had allowed women to make up for a loss of fuelwood by the purchase of gas cookers, which had also freed up women's time and was viewed positively.

TABLE 8 Conservation changes made after receiving payments for environmental services, by household type, in 2011 and 2015. Variation in the number reporting reflects households who reported having received a payment in the previous year.

Conservation change (% of households) <sup>1</sup>	Male-headed households, 2011 (n = 77)	Female-headed households, 2011 (n = 15)	Male-headed households, 2015 (n = 59)	Female-headed households, 2015 (n = 11)
No changes in forest practices	21	46	3	9
Did not convert land to fields	1	0	20	36
Did not remove logs (for house building or sale)	16	0	36	73
Did not collect fuelwood	13	0	19	27
Replanting/regeneration	5	13	20	0
Prevent others from using forest	49	40	69	64
Prevent forest fires	57	47	56	55
Other	10	6	3	0

<sup>1</sup>Multiple categories could be chosen and therefore columns do not necessarily sum to 100%.

However, in another site (Sơn La), payments were not high enough to provide income and energy substitutes, and income from collection of fuelwood had increased.

Rates of participation in PES activities were lower both for female-headed households and for women within male-headed households, confirming global trends. In particular, the per cent of female-headed households enrolling in PES was lower overall and did not increase over time, a sign that quotas in PES policy could be useful for these households. At the same time, female-headed households reported expending more yearly effort on PES contracts when they did have them, so additional support for these households (who may be labour constrained, depending on circumstance) may also be warranted, such as through higher payment rates or other subsidies.

Despite women lagging behind in participation, the overall trend has been towards more equality between husbands and wives (Tables 4 & 5). Initially gender perceptions regarding the types of work required for PES limited women's involvement, but this appears to have changed towards more equal participation of women within male-headed households within just a few years, despite a lack of formal quotas or guidance. We speculate this is probably a result of more familiarity with PES over time and a recognition that women can do the tasks necessary for payments (e.g. patrolling or forest restoration activities). This is in contrast to the case in Costa Rica where inequality in participation between men and women increased over time, perhaps reflecting cultural patterns rather than the structure of the PES system (Schwartz, 2017). However, regardless of our finding that over time more equitable participation has been achieved at the family level, we cannot yet conclude there is improved women's empowerment at the community level through participation in PES. This will require further study.

Trends in the use of PES money within the household have also changed over time, with significant differences

between sites, reflecting cultural norms. Initially in Lâm Đồng, with cultural histories of matriarchal households, women were the main decision-makers on payments, but within a few years that had changed towards joint decision-making. In Sơn La, where initially men were the primary decision-makers, this site also showed higher joint participation within a few years. Thus, in matriarchal societies, there has been an increased role for men, whereas in patriarchal ones there has been a shift to increased roles for women. As others have pointed out, gender is not the only factor influencing involvement in PES, as class, ethnicity, and other factors may be as important (Yang et al., 2018).

Would conservation in PES be different or more successful with more gender-specific policies? We are not yet able to conclude this definitively based on our data, although they do indicate positive trends. Payments for environmental services over time have increased conservation efforts for most households, particularly in reducing collection of forest products and fuelwood in areas where payments were larger. Female-headed households receiving payments also reported being more active in forest protection activities after a few years of incentives than they were at the beginning, when they lagged behind men. This may be an argument for avoiding short-term projects and ensuring there is sufficient time for female-headed households to secure the benefits of both payments and overall forest conservation.

Based on our findings, we conclude with a few suggestions for building attention to gender into PES projects. Firstly, where PES restrictions fall more heavily on women (e.g. fuelwood collection), additional in-kind investment, such as in alternative cooking fuels, could be beneficial. Secondly, increased involvement of civil society organizations (either local women's organizations or NGOs) in PES could improve women's ability to be seen and included, particularly for female-headed households; additionally, NGOs could fund training for male staff members of PES

institutions, or collect data on women's participation in PES, which is not being done by the government system. Thirdly, including women's names on land titles has been shown to lead to lower poverty incidence and higher education attainment (Menon et al., 2017); explicit inclusion of women's names on PES contracts could be expected to have similar positive outcomes.

Finally, we highlight several areas of research where attention to gender remains insufficient. Firstly, more attention should be paid to how PES income affects households in different settings in terms of decision-making, benefit-sharing and land management, as our data shows PES can change behaviours (Caro-Borrero et al., 2015). Secondly, despite growing attention to cultural ecosystem services and social justice in PES, there has been little explicit attention to gender in this regard, and this could be improved (Jackson & Palmer, 2014; Singh, 2015). Finally, more studies that explicitly compare PES with other conditional cash transfer programmes for social welfare (for which gender is a strong component of research) would improve understanding of the unique dynamics of PES (Rodríguez et al., 2011). Attention to these issues will help reduce the amount of gender blind approaches in PES and has the potential to improve sustainability and conservation outcomes as well.

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**Ethical standards** Research with human subjects was approved by Rutgers Institutional Review Board (11-606 M; originally approved 25 April 2011 and renewed annually). A statement about the research was read to each interviewee verbally, and signed consent forms (for survey respondents and focus group attendees) or verbal consent (for stakeholder interviews) was obtained from all people interviewed. This research otherwise abided by the *Oryx* guidelines on ethical standards.

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