Local capacity for implementing payments for environmental services schemes: lessons from the RUPES project in northeastern Viet Nam

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Abstract

Enabling local stakeholders to implement a Payment for Environmental Services (PES) scheme requires a critical understanding of their knowledge, interests and expectations of landscape functions. Bac Kan was among the first provinces in Viet Nam to pilot a Payments for Forest Environmental Services scheme, in 2012, after two years of technical assistance and training of local stakeholders. Stakeholders' knowledge and skills were found to be highest instantly after the training but quickly dissipated when not used or if not immediately followed by further training. The perceived complexity of PES and low understanding of buyers of environmental services and financial management demotivated stakeholders but they still aspired to implement PES schemes because the schemes were perceived to support livelihoods and enhance forest protection. Concerns are raised that local capacity for implementation is not highlighted in policies and guidelines. A comprehensive capacity-development program is required, including progressive training.

Keywords: Environmental services, Bac Kan, Viet Nam, capacity, PES implementation

Acknowledgements

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Acronyms

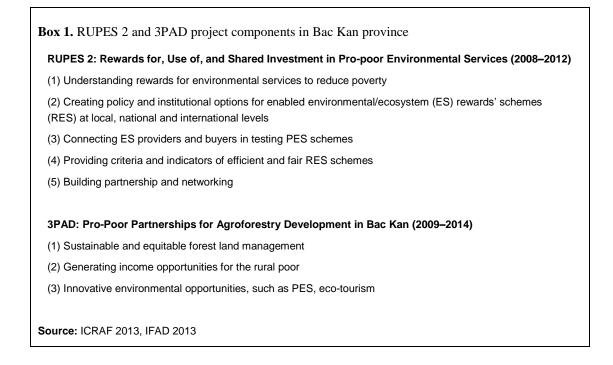|	
3PAD	Pro-poor Partnerships for Agroforestry Development project, Bac Kan province, Viet Nam
CATIE	Centro Agronómico Tropical de Investigación y Enseñanza (Tropical Agriculture Research and Higher Education Centre)
CIPAV	Centro para la Investigación en Sistemas Sostenibles de Producción Agropecuaria (Center for Research in Sustainable Farming Systems)
DARD	Department of Agriculture and Rural Development, Viet Nam
DONRE	Department of Natural Resources and the Environment, Viet Nam
ES	Ecosystem/environmental services
FAO	Food and Agriculture Organisation of the United Nations
FONAFIFO	Costa Rican Forestry Fund
GEF	Global Environmental Facility
ICRAF	International Centre for Research in Agroforestry (legal name of the World Agroforestry Centre)
IFAD	International Fund for Agricultural Development
KASA	Knowledge, attitude, skills and aspirations
PES	Payments for Environmental Services
PFES	Payments for Forest Environmental Services
PIMRV	Planning, implementation, monitoring, reporting and verification
REALU	Reducing Emissions from All Land Uses
REDD+	Reduced Emissions from Deforestation and Forest Degradation plus Conservation
RedLAC	Red de Fondos Ambientales de Latinoamérica y el Caribe (Latin American and Caribbean Network of Environmental Funds)
RUPES 1	Rewarding the Upland Poor for Environmental Services project
RUPES 2	Rewards for, Use of, and Shared Investment in Pro-poor Environmental Services
TNA	Training needs assessment

1. Introduction

Various attempts have been made to raise awareness about and estimate humans' roles as transformers of the natural environment. For example, the Millennium Ecosystem Assessment (2005) aimed to better understand the impacts of land use change for human wellbeing. The assessment identified 24 ecosystem services that can be derived from various types of landscapes that were categorised as supporting, provisioning, regulating and cultural services. However, 'modern intensive agriculture demands a continuous and constant trade-off between provisioning and regulating/supporting [ecosystem] services', meaning that the production of food, fuel, wood and fibre is typically increased to the detriment of ecosystem functions such as climate-change stabilization, fresh-water regulation, pollination and soil-erosion control, which in turn are supported by photosynthesis, biodiversity, soil formation and nutrient cycling (FAO 2011 p. 1).

Paying and rewarding land users for protecting environmental services and functions is becoming a way to promote sustainable use of natural resources. Therefore, understanding and agreeing on what and how landscapes perform multiple functions is crucial in managing and enhancing their multifunctionality. In this paper, we assessed local stakeholders in northeastern Viet Nam on their knowledge, attitudes, skills and aspirations (KASA) in relation to their landscape and towards implementing Payments for Forest Environmental Services (PFES) schemes. The study aimed to ascertain the impact and sustainability of Viet Nam's PFES policy by reviewing PFES activities in Bac Kan province between 2010 and 2012 as well as assess the effects of a Payment for Environmental Services (PES) training, using the KASA framework.

Training and PFES activities were implemented through two projects funded by the International Fund for Agricultural Development (IFAD); the projects were Rewards for, Use of, and Shared Investment in Pro-poor Environmental Services (RUPES) and Pro-poor Partnerships for Agroforestry Development (3PAD) in Bac Kan.

The RUPES program consisted of two phases, both coordinated by the World Agroforestry Centre (ICRAF). Phase 1, called Rewarding the Upland Poor for Environmental Services (RUPES 1), started in 2000 with the goal of integrating rewards for environmental services into development programs to alleviate poverty and protect the natural environment, however, this phase did not include Viet Nam. Phase 2, Rewards for, Use of and Shared Investment in Pro-poor Environmental Services (RUPES 2), was implemented between 2008 and 2012, and included three pilot districts in Viet Nam's Bac Kan province. In Asia, the project has achieved greater grassroots awareness of the RUPES concept, strengthened local institutions and multistakeholder networks and generated knowledge on environmental services as global public goods (ICRAF 2013).

The 3PAD project is being implemented between 2009 and 2014 (Phase 1) in the same three districts as RUPES 2. The overall goal is sustainable and equitable poverty reduction and improved livelihoods of the rural poor in Bac Kan by establishing a framework for sustainable and profitable agroforestry development (IFAD 2013). For details see Box 1.

2. Literature review

Overview of Viet Nam's payments for forest environmental services policy

Changes in Viet Nam's use of its uplands over the past three-to-four decades can be summarized into two trends. First, a shift from natural forest deforestation to reforestation, mainly as (monocultural) plantations. Second, from shifting subsistence cultivation to more intensive monocultivation of annual crops in the north and perennial cash crops in the central highlands (Clement and Amezaga 2008). The spread of more diversified and multifunctional farming systems, such as agroforestry, seem to have stalled from the 1980s with the popular garden-pond-livestock systems (abbreviated VAC for vuon-ao-chuong in Vietnamese), primarily introduced through committed individuals in farmers' associations (VACVINA, the organization promoting VAC). Some common reasons given for the poor uptake of conservation agriculture are that farmers expect fast economic returns and/or less labour-intensive systems. However, the benefits from agroforestry so far are mostly observed and assessed in terms of direct economic returns at the farm level, while forest functions are well-known at farm and landscape (watershed) scales, in particular through PFES schemes and Reducing Emissions from Deforestation and Forest Degradation (REDD+) policies. Recent trends across Viet Nam indicate that deforestation for monocultivation of cash crops and/or aquaculture is reappearing, in particular, with the introduction of hybrid maize varieties and associated inputs. Hence, it may be argued that short-term economic gains at the plot level are a key modifier of landscape environmental functions.

The Vietnamese Government piloted two PES projects in Lam Dong and Son La provinces starting in 2009 under Decree 380, which informed the expansion to a national PFES policy (Decree 99/2010/ND-CP). Decree 99 identifies five types of forest environmental services, including soil and watershed protection, clean water production, forest carbon sequestration, landscape beauty and biodiversity conservation, and spawning grounds for aquaculture. The policy determines the payment rate and has developed guidelines for payments depending on forest quality, type of function, forest origin and forest management (k-coefficient). Payments for water and landscape beauty are generated locally, while the carbon payments are expected to come from international and national voluntary carbon markets, such as Norway's REDD+ fund. There is no compliance for watershed payments, however, for carbon it may depend on the payer. Ten PFES actors in eight provinces in Viet Nam highlighted several factors making the policy hard to implement in practice (Catacutan et al 2012). Challenges include a lack of clear ES performance indicators and monitoring system; high transaction costs; limited participation by local people in making key decisions; and, weak compliance and poor engagement of ES buyers. While the Vietnamese Government is preparing to implement the national PFES policy, the results from this assessment may help to inform the capacity needs of local stakeholders so that they can be better equipped and contribute to the successful implementation of PFES.

Theory of change of landscape management and stakeholder interaction

Figure 1 illustrates a dichotomy between incentives of ES providers or land managers, and ES beneficiaries who may be very distant. Several PES challenges can be inferred from Figure 1.

Figure 1. Exchange of ES services between providers, that is, the modifiers of landscapes, and ES buyers (beneficiaries) via intermediaries. For the provider the immediate trade-offs include payments and/or rewards for ES services such as landscape beauty, forest carbon and water environmental services versus the provisioning services (food, feed, fuelwood) and the opportunity costs for changing the land uses to comply with ES buyers' requests. The grey box to the left indicates services that are not immediately paid for. The scale indicates that the providers weigh lighter as they run the risk of buyers finding alternative ES providers.

Adapted from van Noordwijk et al 2012

First, the regulating and supporting services operate at different spatial scales, for example, pollination < water purification < carbon sequestration, while the provisioning services are noticed largely at the farm scale. However, relatively little is known about what can create an incentive or disincentive for farmers' participation in PES schemes or how the stakeholders' perceptions of their environment change during the project. Current PES initiatives in Viet Nam are mainly creating incentives for conservation practices at the plot scale by involving individual households or groups of farmers within a watershed. Hence, managing these services requires successful cross-boundary cooperation between land owners, users and managers (FAO 2011 p. 265). Furthermore, identifying the roles of intermediaries and establishing trust with ES sellers, who often are less informed and the weaker party in negotiations, requires multi-sectoral approaches (Pham et al 2010).

Second, stakeholders' understanding, interests and expectations of the landscape and its functions are diverse. Petheram and Campbell's (2010) study of Cat Tien National Park in Viet Nam shows that research often fails to sufficiently account for the views of local people in their potential roles as ES providers. For example, for an upland subsistence farmer the primary goal is to ensure household food security, while for the hydropower company the goal is to maximize profits by generating electricity; for policymakers it is to ensure a constant energy supply for citizens, and for consumers, it is electricity at the lowest cost. However, it may be that neither downstream hydropower consumers nor upstream farmers are aware of how deforestation causes siltation of dams or the costs of other environmental damage. Basic knowledge about the environment and its functions, signing legal documents and access to further information is unevenly distributed among the stakeholders. Without thorough understanding of the transaction costs in PFES schemes, it may be difficult to incentivize farmers' participation and ensure the expected outcome, such as conservation of environmental services for future generations. To et al (2012) compare three PES schemes in Viet Nam and find that they may have adverse effects on both poor farmers' livelihoods and long-term environmental sustainability. Their study is primarily concerned with institutional aspects of PES but also touches on forest owners' lack of ownership during the process. The PFES law and guidelines in Viet Nam can be contrasted with REDD projects, which clearly require free, prior and informed consent (FPIC)[1] and which, at least in theory, should meet some minimum level of understanding about the contract and stakeholders' roles and responsibilities, along with a choice to protect forests or not. PFES has no similar clearly stated requirement (variations may appear locally).

Capacity building for PES

Studies suggest it is vital to address capacity building for local stakeholders to 'buy in' and implement PES projects (for example, McElwee 2012, Pagiola et al 2005, Mayrand and Paquin 2004 in Kosoy et al 2008). Although capacity is often recognized as a key component in successful PES implementation, the literature typically examines efficiency/effectiveness of the entire PES system, or institutional capacity, rather than individual capacity (Bollman and Hardy 2012). For example, Wunder et al (2008) found that many obstacles facing PES schemes across the world were linked to technical and administrative capacities, such as monitoring costs or overburdening of local governments. Other studies suggest that capacity building strategies are often missing from PES

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[1] http://focusweb.org/sites/www.focusweb.org/files/FPIC%20on%20REDD.pdf

schemes and projects that use participatory learning approaches tend not to report in easily accessible fashions, such as using visual tools (Petheram and Campbell 2010).

In addition, our review of PES training reports from several countries (table 1) suggests that the reported training mostly is provided for technical staff or intermediaries (as capacity building) and conducted separately from training the ES providers, who are mostly farmers. As a result, more training is provided to societal segments with the best access to information sources (policy makers and technical staff), sometimes in anticipation that they will act as the trainers of trainers. This approach may lead to little available documentation of training ES providers (farmers) and end users (consumers).

The roles of intermediaries in raising awareness, training, absorption of transaction costs, monitoring and evaluation should not be underestimated (Huang and Upadhyaya 2007). Kosoy et al (2008) established that the continued provision of intermediary functions, such as technical assistance and project design, were critical for sustained PES. However, Petheram and Campbell (2010) found that involvement in a PES scheme affected the willingness to participate, owing to ES providers' perceptions of their own capacity or resources needed (referred to as self-efficacy). Petheram and Campbell (2010) hypothesize that if their study participants were involved in a PES scheme and became more aware of the needed skills, resources and policy framework, their willingness and adherence would likely decrease.

Knowledge, attitudes, skills, aspirations: the KASA model

Learning outcomes can be evaluated as knowledge and behaviour, attitude, skills and aspiration, also referred to as the KASA model. Some advantages of the KASA analysis include: (i) that it can monitor and address changes in views, opinions, behaviour and feelings; (ii) its usefulness for mixed types of stakeholders; and, (iii) its usefulness for verifying achievements in human capacity building, for example, for logical frameworks (Krueger 2012, Drechsel et al nd). Nevertheless, many training courses are conducted as one-off events where changes in knowledge are at best monitored immediately before and after training while behavioural changes may be inferred from project outcomes (table 1).

Table 1. Review of stakeholders' training in environmental services

Location	Stakeholder categories	Environmental services, aspects covered	Training organiser	Evidence of changes in stakeholders' knowledge, attitude, skills, and aspiration	Reference
Bolivia	Community-based organizations	Role of ES, PES and REDD	The Environmental Leadership and Training Initiative, Forest Trends	Discussion (no evidence provided)	The Katoomba Group 2009. Training report p. 1
East Africa	Research institutes, government technical staff, policy makers, private sector ES buyers, NGOs	PES potential for sustainable land management	FAO, CARE Tanzania	Basic information on ecosystems and NR management practices (knowledge), potential areas for PES mechanisms (aspiration)	FAO 2008 Training workshop report
Mexico	Technical staff of environmental funds	PES development	Funbio, Brazilian Biodiversity Fund, Mexican Fund for Nature Conservation	Participants wrote essays on: 'How do you intend to apply the knowledge acquired in this workshop to implement PES mechanisms, according to the reality of your fund and your country? Please describe the steps you are willing to take in the medium term.' (knowledge, attitude, skills, aspiration)	RedLAC 2010 Training report
Uganda	Community leaders, private landowners and local communities	PES, carbon (REDD)	Katoomba Group, Forest Trends, Chimpanzee Sanctuary and Wildlife Conservation Trust	Basic PES project design, contracts, land use change commitments (knowledge)	The Katoomba Group 2011 Training report

Location	Stakeholder categories	Environmental services, aspects covered	Training organiser	Evidence of changes in stakeholders' knowledge, attitude, skills, and aspiration	Reference
Nicaragua, Costa Rica, Colombia	Local institutions, farmers	Ecosystem management, sustainable cattle farming	CATIE, CIPAV, GEF, FAO, FONAFIFO	Potential of integrated management systems to deliver ES (knowledge)	Porras and Neves 2006 Project summary p. 3
Lam Dong, Viet Nam	forest-dependent communities and private sectors	Water services, forest conservation	ARBCP	Ten contracts between private enterprises and raw material producing farmers (skill, aspiration). Evidence of forest enrichment, improved wildlife habitat, maintained buffer zone to the National Park	ARBCP 2011 Project report p. 22–24

3. Background of PFES in Bac Kan province

Bac Kan was selected as an action site for piloting PFES in 2008 during the second phase of the RUPES program and developing a project idea note for carbon-sequestration projects under Reducing Emissions from All Land Uses (REALU). Bac Kan was selected for its high poverty levels among upland households (51%), high degree of forest cover and biodiversity, high dependency on agriculture and forestry for livelihoods (85% of upland households) and documented interest from stakeholders at province to village level (Dam et al 2012b). A major activity was to document good practices and support capacity building for linking the supply of environmental services with demand in a cost-effective way. One hypothesis was that by bundling the environmental services and the ES providers, the transaction costs would be reduced, hence delivering outcomes more efficiently and effectively (Box 1).

Scoping and piloting activities were undertaken from 2009 to 2012 in collaboration between ICRAF, the 3PAD project and Bac Kan Department of Agriculture and Rural Development (DARD) on joint activities such as scoping studies, capacity building and the PES mechanism design, which was approved in 2012. Information about the PFES area, stakeholders and the resulting payments rates are in table 2.

Table 2. Coverage of payments for forest environmental services in Bac Kan province

	Bac Kan province: Nang River watershed
Projects	2009–2012 RUPES
	2010– ICRAF/3PAD
Environmental services	Watershed protection, carbon, landscape beauty
Area covered by PES project	Pac Nam, Ba Be and Na Ri districts
Capacity-building activities	See table 3
ES providers	Appr. 200 farmer households in May 2013
ES Payment	VND 1700–200 000 ha/year
ES beneficiaries	Na Hang hydropower station
	Boat cooperative in Ba Be National Park
	Households with homestay businesses in Ba Be National Park
ES intermediaries	Local 'government-like agencies' (e.g. DARD, DONRE)
	3PAD project
	Ba Be National Park

Key activities to prepare local stakeholders for the PES scheme included participatory approaches for landscape analysis, poverty-line analysis and land-use dynamics, and participatory carbon monitoring (table 3). The preparation steps for the specific training on PES are described in Supplementary Table 2a–c. In short, these consisted of a training needs assessment (TNA) of stakeholders, preparing the training manual report, conducting the training with primarily quantitative pre- and post-test assessments of training and drawing conclusions about capacity impacts. Knowledge generally

improved after training in areas such as payment mechanisms for forest environmental services, planning, monitoring, and implementing payments, understanding of PES steps and Decree 99, the benefits of PES, how to measure carbon, REDD+, and calculating the k-coefficient. However, there was some variability based on the specific subject and administrative level. Awareness gaps were identified prior to the training, for example, all local authorities had heard about PFES but only one-third of the farmers (Dam et al 2012c p. 29–30). Training was meant to facilitate the execution of pilot models for the 3PAD project. Although training of trainers was conducted, it is unclear whether the knowledge was applied to train others.

In this paper, we report on the follow up with 32 of the 130 trainees who participated in the three-day training in PFES policies in Viet Nam. The training course was conducted between April and May 2012 and consisted of five modules: 1) PES Overview; 2) PFES Mechanism; 3) PES Management; 4) Planning, Implementation, Monitoring Reporting and Verification; and, 5) Training Adults. The final training step was discussing challenges, opportunities and solutions. Although knowledge seemed to have improved over the course of the training, when asked for ideas to improve monitoring and appraisal of PFES models, the trainees showed limited understanding.

Table 3. Key activities to enhance stakeholders' awareness about environmental services and landscape functions, including participatory surveys and capacity-building activities during the pilot period under the RUPES, REALU and 3PAD projects

Date	Activity	Type			Stakeholder			Reference
Month/ Year		P	T	C	S	IM	B	
Nov 2010 – Mar 2011	Participatory landscape analysis Participatory analysis of poverty, livelihoods and environmental dynamics (both carried out in three districts)	X			X			Perez-Teran et al 2011 de Groot 2011
Dec 2010	Awareness of PES and Decree 99 at provincial, district, commune and village level			X	X	X		
Jan 2011	Stakeholder consultation on PFES			X	X	X	X	Hoang and Do 2011
Apr 2011	Trees in Multi-functional Landscapes in Southeast Asia project toolkit training	X	X			22		Simelton 2011
Apr, Dec 2011	Participatory carbon monitoring and measurement	X	X		X	X		Dam et al 2012a
Mar 2012	TNA of PES policies			X	6	22	2	Dam et al 2012b, See Suppl Table 2a-b
Apr –May 2012	PFES polices in Viet Nam		X		X	X		Dam et al 2012c; See Suppl Table 2c

Legend. 1) Type of activity: P= participatory survey; T= training, C = consultation; 2) Stakeholders: S = seller (e.g. hydropower staff, Ba Be National Park staff), IM = intermediary (officers of government-like agencies, 3PAD staff), B = Buyer

4. The training modules

The training modules were developed based on training needs identified through consultation with leaders at all levels and on the results of the TNA. In general, the topics were outlined by the trainers, the content was suggested by participants, and trainers adapted the levels based on the TNA. Table 3 shows the target trainees and schedule of implementation. More specifically, the content covered:

The TUL-Viet[2] training, which was a two-day theoretical and two-day practical training course for 3PAD staff, province and district stakeholders (DARD, DONRE, forest rangers, extension workers) in Bac Kan. The training included lectures and practical training on participatory methods, such as Participatory Landscape Analysis (PaLA), Participatory Poverty and Livelihood Dynamics (PaPoLD) and reverse auction for determining payment levels. The practical part of the training included supervised household surveys to estimate income per land use, and data compilation as well as carbon measurements.

The Participatory Carbon Monitoring and Measurement training was a 2.5-day training course, including one day for carbon measurements in the field, for forest rangers and forest owners in Na Ri and Ba Be districts. The training covered conducting participatory measurements of forest carbon stocks, mobilizing forest protection patrols and planning for regular REDD planning, implementation, monitoring, reporting and verification (PIMRV).

Payments for Forest Environmental Services policies in Viet Nam was a two-day training course for leaders at province to village levels and 3PAD staff in Bac Kan. The training covered the following topics: (i) Overview of environmental services; (ii) How PES works and estimating potential payment levels for water and carbon; (iii) Planning, implementing, monitoring, reporting and verifying PFES at community level; (iv) Managing the PFES fund; and, (v) Participatory methods for training adults.

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[2] Training in the 'toolkit' of methods and computer models for Vietnamese conditions developed as part of the Trees in Multifunctional Landscapes in Southeast Asia project

5. Study questions and methods

The objective of this study was to assess if preparations for a PES scheme have influenced local stakeholders' awareness about PES. Specifically, to:

1. assess if and how PES schemes had influenced the knowledge, attitude, skills and aspirations of local stakeholders and whether their capacity to implement PES schemes (provincial to commune level) had changed since 2009;
2. identify what stakeholders perceived to be the main constraints and opportunities to developing PES schemes at different administrative levels; and
3. draw insights on the sustainability of the national PFES policy.

The study used data from project documents and pre- and post-test responses from training events, as well as information gathered through focus group discussions and questionnaires. The KASA framework (table 4) was applied in the context of PFES, where 'knowledge' was used to denote new knowledge about PES; 'attitude' for the stakeholders' attitudes, perspectives and willingness to change or their desire to actively learn and take part in discussions; 'skills' as the degree to which knowledge and experience were being implemented in current tasks and behavioural change that can be achieved through practice and education; and, 'aspiration' denoted what stakeholders hoped to achieve with PES in the future. The knowledge and skills categories overlap, so for this analysis we differentiated between knowledge of PES, such as Decree 99 and the k-coefficient, which can be reiterated, and skills for implementing PES schemes and carbon measurements, which require actionable knowledge (table 5). The study used the following methods:

Review documents of RUPES and REALU field activities with stakeholders in Bac Kan province, including participatory landscape assessments, stakeholder consultations and trainings (see table 2). The review included TNAs, training evaluations, stakeholder consultations regarding PES, and project evaluations between 2009 and 2012.

Pre-, post- and post post-test. Questionnaires to monitor knowledge, skills and (in some cases) attitudes were carried out before (pre-test) and after (post-test) a three-day training course on PFES policies in April and May 2012, here referred to as PT. Seventeen questions from the PT tests were repeated in a post-post-test (PPT) in October 2012, five months after the training, with a random group of trainees. Out of these, 11 questions were the same and six questions were rephrased, and some multiple choice questions had mock answers (for list of questions see table 6). Alongside the 17 PT questions, 10 new questions were added, and a questionnaire was conducted with 32 respondents. The questions were developed to cover knowledge, skills and attitude. The responses were coded according to a set of indicators, which were then grouped into KASA categories (assumptions for KASA are detailed in table 4; and the questionnaire with responses is stated in table 5). Questions with > 50% 'no answer' were not used for the primary comparison between pre-, post- and post-post-tests. Although the response frequency varied, all responses of the remaining questions were used for analysis, also noting 'no response' (NA).

The total number of respondents for each test were 77 (pre-test), 79 (post-test) and 32 (post-post-test). The respondents in all three tests represented provincial, district and commune and village levels, as well as ES sellers/providers, intermediaries and, when available, buyers/beneficiaries (see table 6 for a list of PPT participants). The 32 respondents had participated, on average, in four of the five PFES modules, while only nine had taken all five. Twenty-four participated in the module on PES Overview, 24 on PFES Mechanism, 22 on PES Management, 24 on PIMRV and 13 on the module about Training Adults. Three modules had no gender divide, however, 10 of the 11 men attended the PFES Management module, while only four of the 13 women took this course and a slightly higher number of women than men took the Training Adults module.

Focus group discussions. During the PFES training, 18 intermediaries took part in a focus group discussion, carried out as (i) a 'strengths, weaknesses, opportunities, threats' (SWOT) analysis of the potential to implement PES in the province; and (ii) stakeholders' expectations of landscape multifunctionality per land-use type. The second set of focus group discussions was carried out as a follow-up with 32 PFES stakeholders who participated in training organized by RUPES/REALU; they were the same 32 post-post-test PFES trainees as above (also see table 6). Both focus group discussions used open-ended questions and SWOT analysis. One SWOT was performed for each focus group. (The topic guide is presented in the second part of Supplementary Table 1.) For the 'strengths' and 'weaknesses' areas, participants wrote their responses on sticky notes which were appended to a large board (hence, each participant could submit several responses). In the second focus group, for 'opportunities' and 'threats', the approach included further discussion and brainstorming by participants, which was transcribed by the researcher and coded according to KASA (as step 2 above).

Synthesis. Lastly, results from the three questionnaires and the two focus group discussions were synthesised to analyse the 'impact' and 'sustainability' of the PFES project. The assumptions for the evaluation are outlined in Table 4. For example, it was hypothesized that the impact of the training and sustainability of the PFES would be reduced if the marks for the post-post-test questions were lower than the post-test.

Table 4. Criteria for qualitative and quantitative assessments of stakeholders' current capacity

Criteria	Impact of training		Sustainability of PFES	
	Negative	Positive	Questionable	Promising
Knowledge	Questionnaire: PPT ≤ PT results for knowledge (compared questions see Supplementary Table 1). Focus Group: Participants make confused statements or cannot discuss PES.	Questionnaire: PPT ≥ PT results for knowledge (see fig. 6). Focus Group: Participants can discuss PES content and know what their personal limitations are.	Questionnaire: If PPT < PT results (knowledge is not used and/or declining). If < 25% self-rate their knowledge of PES from average to strong (rate 3–5). If < 25% know what ES they can buy/sell and to whom. If many consider PES difficult to understand.	Questionnaire: If PPT > PT results (knowledge is used and/or increasing). If < 75% self-rate their knowledge of PES from average to strong (rate 3–5). If > 75% know what ES they can buy/sell, and to whom. If many consider PES easy to understand.
Attitude	Questionnaire: PPT questions have >50% 'no Answer'. Focus Group: FG members do not think other stakeholders are interested in PES; focus on the limitations.	Questionnaire: PPT questions have <15% 'no Answers'. Focus Group: FG members think other stakeholders are positive towards PES; focus on the potential.	Questionnaire: If great differences between stakeholder groups, especially if sellers are unmotivated. (Not answering can indicate lack of knowledge or understanding of question or interest.)	Questionnaire: If all groups are motivated, for example, positive to more training. If > 75% answer a question, even if wrong, suggesting a will to try.
Skills	Questionnaire: PPT < PT results for skills on carbon pools. Focus Group: IM trainees have not practised skills within five months after training.	Questionnaire: PPT > PT results for skills on carbon pools. Focus Group: IM trainees have practised skills gained at training within five months after training.	Questionnaire/Focus Group: IM trainees have not worked with PFES since the training. If < 25% disagree/strongly disagree that training prepared them for PES projects. Focus Group: Participants lack constructive ideas for improving PFES.	Questionnaire/Focus Group: IM trainees have practised PFES skills after the training. If > 75% agree/strongly agree that training prepared them for PES projects. Focus Group: Participants have constructive ideas for improving PFES.
Aspiration	Focus Group: FG members can't see the potential for PFES in their environment	Focus Group: FG members are able to envision new potential PFES projects in their environment. Interviewees have taken action for new PFES initiatives	Questionnaire/Focus Group: If participants have a narrow range of information sources on PES. If there is little or no difference in solutions provided to challenges before training and PPT FGD. If great differences between groups and few are inspiring others to explore PFES potentials.	Questionnaire/Focus Group: If participants have a wide range of information sources on PES. New potential PFES activities are being explored at PPT FGD compared to before the training. If results are similar between all categories of groups and/or individuals are able to inspire others.

Legend. IM = Intermediary; FGD = Focus Group Discussion (the first focus group was conducted during the training and the second 5 months after the training); PT = Pre-test and post-test questionnaires conducted before and after the PFES training respectively; PPT = Post-post-test conducted 5 months after the PT.

Notes. KASA and 'sustainability' outcomes inferred from the 'impact' of PFES training based on questionnaires and focus groups discussions. The questions are given in Supplementary Table 1

Table 5. Questions indicating knowledge, skills and attitudes (KASA) asked five months after the last PES training (n=32)

KASA	Question	Response	NA n,%
Knowledge*	What kind of ES are bought/sold here [in Bac Kan province]?	Fully correct answer: 4 (11%); Partially correct answer: 22 (68%)	8 (25%)
Knowledge	Who are the PES buyers and sellers in Bac Kan province?	Know: 21 (66%); Do not know: 5 (15%)	6 (19%)
Knowledge	How would you describe Decree 99?	Advanced knowledge: 1; Basic knowledge: 18 (56%); No knowledge: 4 (13%)	10 (31%)
Knowledge, Attitudes	How would you rate your knowledge of PES? [Likert scale]	Average rate: 2.9; Rate 5 –SKn–: 0; Rate 4: 5 (16%); Rate 3: 8 (25%); Rate 2: 4 (13%); Rate 1 –NKn–: 1	14 (44%)
Knowledge*	Please briefly describe how you understand the k-coefficient [open-ended]	Advanced knowledge: 2; Basic knowledge: 17 (53%)	13 (41%)
Skill	Are you aware of methods of measurement and quantification of carbon absorbed under mechanism REDD+ service? [open-ended]	Answers indicate Awareness: 8 (25%); No awareness or unclear on the methods: 6 (20%)	18 (55%)
	Which ones? [open-ended]	Answers indicate Some knowledge or skill: 6 (20%)	22 (68%)
Skills * (knowledge)	When measuring carbon, which kind of forest carbon pools need to be measured? [Options: Aboveground living biomass, belowground living biomass, dead trees, dead branches and falling leaves, c=y(x/0.2022), soil carbon, fresh leaves, tree height]	All answers are correct except the equation, which was made up. 7 trainees fell for the mock equation; Responses indicate Advanced knowledge/skill: 8 (25%); Some knowledge: 18 (56%); No knowledge or skill: 4 (12%)	6 (19%)
Skill	What are the key steps to set a model of environmental services payment at the local level? [open-ended answer]	Responses indicate Advanced skill: 2; Some skill: 7 (22%)	25 (78%)
Skill	What is your level of understanding to determine the benefit sharing payment for environmental services? [Likert scale]	Average rate: 2.9; Rate 5 –SUn–: 3; Rate 4: 3; Rate 3: 5; Rate 2: 5; Rate 1 –NUn–: 3	13 (41%)
Attitudes	How did the training affect your knowledge of PES? [Likert scale] / Did it make you more interested in PES?	Average rate: 1.3; Rate 5 –SDa–: 0; Rate 4: 0; Rate 3: 0; Rate 2: 7 (22%); Rate 1 –SAg–: 20 (63%)	5 (15%)
Attitudes (Self-assessed capacity)	Did the training prepare you for participating in PES projects? [Likert scale]	Average rate: 1.4; Rate 5 –SDa–: 0; Rate 4: 0; Rate 3: 0; Rate 2: 10 (31%); Rate 1 –SAg–: 17 (53%)	5 (15%)
Attitudes	Has this knowledge [from the training about PES] been useful in your job? Please give some examples.	Yes: 18 (56%); Unclear answers: 2	12 (38%)

	Please rank your opinion [Likert scale] Rank your opinion [Likert scale]	Average rate	Rate 1 SAg, n	Rate 2 Agree, n	Rate 3 Neutral, n	Rate 4 Disagree, n	Rate 5 SDa, n	NA n,%
Attitudes	PES is easy to understand.	2.5	6	6	9	3	1	7 (22%)
Attitudes	Decree 99 is easy to understand	2.6	4	6	10	3	1	8 (25%)
Attitudes	PES is easy to implement.	2.7	4	7	7	3	2	9 (28%)
Attitudes	Decree 99 is easy to implement.	2.7	5	5	9	3	2	8 (25%)
Attitudes	PES is an important policy for socioeconomic development.	1.3	18	6	1	0	0	7 (22%)
Attitudes	PES is an important policy for environmental protection.	1.2	21	4	0	0	0	7 (22%)

Legend: Questions marked * exist both in the pre-, post-test and post-post-test questionnaires (see Supplementary Table 1). 'NA' stands for 'no answer'. SKn = 'Strong knowledge' (rank 5), NKn = 'No knowledge' (rank 1), NUn = 'No Understanding' (rank 1), SUn = 'Strong understanding'(rank 5), SAg = 'Strongly agree' (rank 5), SDa = 'Strongly Disagree' (rank 1).

Note: Details of the respondents are provided in table 6. The 'average rate' refers to the average of those who answered, that is, excluding NA options.

Table 6. Stakeholders who participated in focus group discussion and post-post-test five months after the PFES training, and average number of modules attended per administrative level

Admin. Level	Number of stakeholders	Functions in PFES			Gender	Avg modules attended of 5
		Seller	IM	Buyer	Male/Female	
Province	3	0	3	0	1M/2F	4
District	10	0	9	1	5M/5F	3
Commune	9	0	9	0	5M/4F	4
Village	10	10	0	0	7M/3F	4
Total	32	10	21	1	18M/14F	4

Legend: IM = Intermediary. Source: Authors' fieldwork, October 2012.

6. Results

This section is structured following KASA. First, we present the findings from the post-post-test questionnaires and compare the results with the pre- and post-tests when relevant. Next, we present the focus group discussions to highlight and generate more insights.

Knowledge

Figure 2 shows that the self-rated knowledge about PES was highest immediately after the training. Although the trainees' awareness about PES may have increased, five months after the training the knowledge levels were pretty much back to the same as before the training.

Before the training, few knew in general about water ES and there were big differences in awareness of environmental services between trainees from the provincial and commune levels. After the training, trainees at all levels had increased their awareness of ES, notably water ES, and the knowledge gaps between provincial and district levels were reduced (Dam et al 2012c pp. 32, 38). However, no stakeholder group could name all environmental services that could generate payments in their province.

Five months after the training, about the same proportion of participants as immediately after the training (nearly four-fifths) could name a few ES, four of 32 (11%) gave a fully correct answer and 22 (68%) a partially correct answer (see table 5). Furthermore, two-thirds knew the PES buyers and sellers in their province, while the 34% did not know or did not answer. In terms of the fundamental policy for PFES, Decree 99, only one considered himself having 'advanced knowledge', more than half or 56%, had 'basic knowledge', while 44% had 'no knowledge' or gave 'no answer'. However, their self-rated knowledge about PES in general was considerably low. Nobody considered him/herself having a strong knowledge about PES; 16% rated above average, 25% rated 'average', and 13% below average. Only one stated 'no knowledge' while 44% did not answer. Eight participants reiterated statements reflecting self-evaluated limited knowledge, such as that they found PES confusing (2), there was a lack of high-level officials with PES knowledge (1) and lack of knowledge on financial management (1). One reason could be that not all officials could attend all training sessions (two of the respondents) and were thus unable to complete the training. It appeared that the main source of information about PES at district, commune and provincial levels was the

training provided by ICRAF (seven of 32), while four said it was Decree 99, two stated DARD circulars, two stated 3PAD, only one stated the 'internet' and more than 50% did not answer the question.
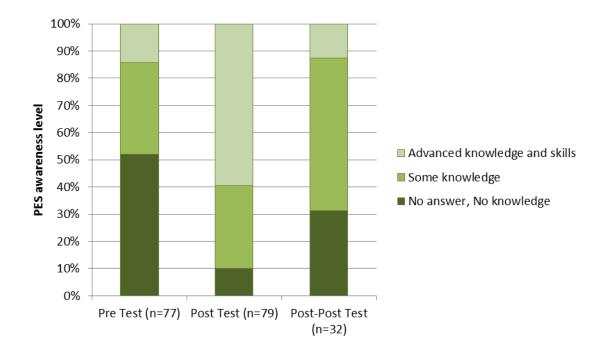

Figure 2. Development of knowledge and skills about PES immediately before (pre-test) and after (post-test) and five months after (post-post-test) training

Note: Average of results for questions marked * in table 6. Source: Dam 2012c and authors' fieldwork, 2012

Attitudes

Questionable attitudes

Figure 2 shows that fewer participants did not answer (NA) directly after the training than at the PPT. In this assessment 'no answer' can be considered as showing a negative or unsatisfied attitude rather than not understanding the question when there are tick-box options for multiple choice or Likert scales, as opposed to open-ended questions (See table 5). Based on this assumption a large group consistently refrained from answering. Specifically, in the PPT, the minimum frequency of 'no answer' ranged 15–25% and it was often the same respondents; however, the highest share of 'no answer' was 78%. Some questions could easily be answered and were still left out. For example, five out of the 32 (15%) did not answer if they thought the training had affected their knowledge of PES or prepared them for participating in PES projects and 38% did not answer as to whether the training had been useful for their jobs. Over two-fifths (44%) chose not to rate their knowledge in PES and over half (53%) did not state their main source of information on PES (this could also be that the option 'none' did not exist).

Some questions requiring technical knowledge or skills had high degrees of 'no answer'. For example, two-fifths (41%) did not describe the K-coefficient (open-ended). Moreover, while only 19% did not answer what carbon pools are measured (multiple choice), more than half (55%) did not answer if they were aware of carbon measurement methods for REDD+ (open-ended) and two-thirds did not list any method (open-ended). For the knowledge and skills questions with open-ended answers, the 'no answer' response was generally higher than for multiple choice answers, hence some of the 'no answer' responses may indicate 'don't know'. This suggests that many may know 'what', especially with multiple choice options, but not 'how'.

Open-ended questions require more effort than ticking boxes and do not enable guessing. However, for certain self-rating questions, such as one's level of understanding of determining the benefit sharing payment for environmental services, 13 participants (41%) preferred not to answer rather than marking a level of understanding. For the set of attitude questions posed as Likert scale options, it was surprising that seven to nine respondents (22-28%) (the same ones) did not answer any, as these questions were enquiring for opinions rather than knowledge.

Promising attitudes

With regards to indications of positive attitudes, 85% of the trainees thought the training had affected their knowledge of PES, 63% strongly agreed and 22% agreed (table 5). Almost the same proportion share the thought that the training had prepared them for participating in PES projects: 53% strongly agreed and 31% agreed. These were the two questions with the least 'no answer' responses. Specific examples of how PES was useful in participants' jobs included: participating in environmental work at the commune level (1), working with youth organizations (2), being aware of the k-coefficient (1) and carbon payment calculation (1), helpful for identifying trees (1) or using PES knowledge for Master thesis (1). However, these comments should be viewed against the notably large number, 25 (78%), who did not answer how to set up a PES model (during the training this was explained as a five-step model), suggesting they did not remember or know one fundamental component for implementing PES. The PPT focus group discussions gave further evidence of overall positive perceptions of the potential, applicability and/or benefits of PES, such as 'highly relevant' owing to the importance of agriculture and forestry (Ba Be district), and 'PES can contribute to forest protection and development' (Bac Kan province). These perceptions at least partly originated from the training. Some believed that farmers and local people were interested in PES and more than 10 trainees thought that the Government and government officials were interested in PES. Statements reflecting an interest in learning more included that the training was not enough (3), notably training for farmers (2); the duration between the training sessions was too long (2), and a desire to have fieldwork (4).

Skills

The self-evaluated skills levels at the post-post-test were generally low. For example, less than 25% of the 32 respondents indicated that they had skills for setting up a PES model at the local level. Unsurprisingly, the two most detailed answers were given by 3PAD staff who were practically involved in the process (table 6). The focus group discussions further pointed out limited institutional and personal skills. Specific institutional skills that appear to be lacking were management (3) and the means to measure impacts on the forest (1). The only existing skill mentioned was to calculate the

carbon stock (1). Specific personal skills that appeared to be lacking were the ability to identify types of payments, such as landscape beauty or carbon (6), to identify buyers, sellers (3) or intermediaries (1), practical applications and fieldwork (2), to solve problems between buyers and sellers (1), to calculate carbon levels or k-coefficient (2).

Interestingly, the knowledge of carbon stocks remained about the same five months after the training. At the post-test and post-post test, 75–85% of the stakeholders (n=79 and 32) were aware of methods for measuring or quantifying carbon stocks, as compared to 10–20% before the training. The most popular answers were aboveground biomass and dead trees. (Dam et al 2012c p. 39). At the post-post-test, 25% (n=32) showed an advanced knowledge and 56% some knowledge. Now the most selected carbon pool was aboveground living biomass (23) and the least identified was living leaves (15). However, the lack of understanding is evident in that seven of 32 marked the mock equation. The reason may lie in the practical fieldwork for participatory carbon monitoring. The strong need for practical application rather than lectures on theory was emphasized both during PT and PPT activities. Five months after the training, knowledge about PES remained limited. Trainees from the commune level said that PES was difficult to understand and/or implement (5), especially farmers 'lack perceptions of PES' and 'don't understand PES policy' (15), and more advanced knowledge was needed (5).

Aspiration

Here, evidence of aspirations is assessed as being able to give concrete recommendations. Firstly, in correspondence with the stated limitations in knowledge and skills, there were suggestions for more opportunities for practice and fieldwork (3), learning to calculate carbon stocks (3), more training in general for farmers (4) and for commune officials (1). Secondly, with regards to PES mechanisms, participants identified a need for a specific fund for PES (5), clearer or improved payment mechanisms (4) and intermediaries that could connect buyers and sellers (1). Thirdly, for implementation, there were recommendations for clearer documents explaining PES implementation and one for guidelines for farmers and forest owners (1), for increased levels of farmers' participation (1) and for a PES management team (1). Lastly, aspiration was also evident as a wish to spread or apply PES further in Bac Kan province (3), such as piloting another PES project (1).

7. Sustainability of PFES

Main constraints and opportunities for developing PES schemes

The various challenges that stakeholders perceived with PES during the training could be broadly clustered into four main themes: (i) lacking examples and experience; (ii) complex natural conditions; (iii) socioeconomic conditions; and (iv) institutional conditions (for the results, see table 7. For classifying the sustainability of PFES as questionable or promising, see the two rightmost columns of table 4).

Five months after the PES training many challenges remained the same. Both the PT and PPT results and the FGDs indicate a general consensus that trainees still considered themselves and/or others as

having insufficient knowledge/skills to implement PES. Many were also concerned about the institutional arrangements for payment mechanisms. Similar opinions emphasized in both PT discussions and PTT focus groups included government having high stakes in PES; concerns regarding PES disincentives for farmers and the payment system (for example, 'Does payment rate meet the needs of people?'); negative perceptions of capacity and lacking knowledge at the local level; particularly financial management; and, perceptions of problems with PES itself. For example, participants indicated concern regarding sustained funding for PES or the lack of PES intermediaries. With regards to the payment mechanisms, the system was considered too complex (6), the payments too low (8), and payments were delayed or not received at all (3). Finally stakeholders perceived that the incentives discouraged farmers' participation (5) and at least five expressed discouragement by the limited PES funds.

During the training, PES stakeholders' expectations of the environmental functions of their landscapes varied by land use type. As for protection forests, which have no economic value to farmers, it was expected that external compensations or contracting farmers to protect forests would improve biodiversity. For production forests, stakeholders foresaw intensification with priority plants with high economic value. Clear land would be afforested or reforested with fast-growing timber species such as *Mangletia glauca* and *Acacia* spp, principally the same species as for state-funded reforestation program. Agroforestry was considered an alternative for the uplands with target fruit trees, legumes and small crops such as turmeric, arrow root, or mixing maize with grass. Some stakeholders considered rehabilitating orchards and developing geographic indicator trees. The challenges for implementing these land uses were similar, such as limited allowances, difficult geographic, social and economic conditions, unstable yields and/or prices, high investments and/or technical skills required (Dam et al 2012c p. 23).

Five months after the training, the trainees were asked to compare their past and present thoughts on PES (table 7). The province level staff said officials at all levels displayed an interest, as it could enhance forest protection and improve farmers' living standards. Now, although they had gained a deeper understanding of PES, they also realised they had to learn more and were keen to implement PES in the province. The district level trainees said they first thought PES was applicable and that it could address soil erosion, but they did not understand it well. Now that they had better knowledge, they still thought PES was relevant for protecting natural resources and creating jobs and that it could be applied, especially as more forest land would be allocated but they also thought PES was too complicated for farmers. The commune level trainees first said they had no or basic understanding but were generally positive as it could help protect forests and increase farmers' incomes. Five months after the training, as they had gained knowledge and a better understanding for how important it was to protect forests, they thought more training and practice was needed and PES was difficult to understand, especially for farmers. They also said they didn't know who would buy carbon services.

Table 7. Synthesis of challenges and solutions identified by trainees during and after PES training

During the PES training		Five months after PES training	
Challenges	**Solutions**	**Challenges**	**Solutions**
Lack of examples, experience Other villages may damage the pilot models No lessons learnt to apply Difficult to implement a new service	Create consent among villages and stakeholders Develop specific guidelines Integrate PES with other programs and projects	Lack of experience PES is not applied in Bac Kan PES is difficult to implement, requires that farmers understand Training not enough	More training (strong implementers 3PAD, ICRAF) PES pilot is learning by doing
Natural conditions Complex topography makes monitoring difficult		ES coverage PES doesn't address problems of water pollution and household waste	
Socioeconomic conditions Unsure if payment rates satisfy the needs of the local people Limited awareness about PES of individuals and organisations	Develop clear benefit-sharing mechanisms between state-owned and non-state owned forest owners Establish more communication channels for PES Invest in experimental models	Socioeconomic conditions If payments are lower than opportunity costs of deforestation , farmers will not join Payments don't arrive on time	Clear, fixed payments for specific forest types
Institutional setting Stakeholders need to be coordinated to implement pilot models Uncertain payment sources Poor financial management	Need stable payment sources and mechanisms Engage donors, businesses and enterprises in PES implementation Promote the role of intermediaries Synchronise payments and policies from central to local levels	Institutional framework It is a long way for payments from province to farmer Nobody is responsible Difficult to find buyers, lack middlemen Only water has clear payment system; carbon is difficult to calculate and buyers difficult to find	Set up a specific team and manager to implement PES Set up an independent fund for PES

Source: Dam et al. 2012c, p. 22.

Arguably, the sustainability of PFES can be considered 'questionable' or hard to predict, as most indicators were rated 'average' or 'questionable' (tables 4 and 5). For example, there is no significant change between PPT and PT results; the self-rated knowledge in PES was low and fewer than 75% knew who the ES buyers were. Also, many thought the farmers' capacity was low as well as the institutional capacity. In terms of attitude, many questions were left unanswered. In particular, the trainees had few information sources and did not search for it autonomously. Based on these criteria, the sustainability of PFES is at risk, if this trend continues. On a positive note, after the training, at least 25% of the trainees had practised some skills, and nearly 75% had been asking questions and participated in group work on PES, especially among provincial staff. A few promising indicators of PFES sustainability included that at least 75% knew at least some of the local environmental services; and the differences in knowledge between various stakeholder categories had reduced compared to before the training.

8. Discussion

Increased knowledge and awareness about environmental services, but skills?

A few statements reflected on humans as modifiers of landscapes and showed appreciation for the environment. In particular, awareness of water environmental services had increased since the pre-test was given. The role of forests for preventing sedimentation was also recognized and some participants reflected on other aspects that are not considered in current PFES schemes, such as water pollution and waste. Despite attending several training courses, a considerable share of the trainees still considered themselves lacking in skills and capacity for implementing PES projects. It could be that the training and/or the methodology failed to translate the content to the appropriate levels of understanding for the trainees. It could also be that PES requires a high degree of basic understanding that many farmers and local leaders simply do not have, such as ecology, financing and management. However, it also appears obvious that some elements make PES unnecessarily complicated, for example, the k-coefficient (Catacutan et al 2011). The trainees' response before and after the PES training suggested that they were now more convinced about the need for forest protection but that the modalities for implementing PFES were more complicated than they expected. This finding is consistent with Petheram and Campbell (2010), who concluded that too much information too early about the knowledge and logistics needed for being involved in a PES scheme could reduce stakeholders' willingness to participate.

In terms of attitudes, negative attitudes were discerned, (a) indirectly by high numbers of 'no answer'; and (b) directly, during responses in focus group discussions. The questions that the post-post-test respondents did not answer included open-ended questions on carbon measurement methods (68% NA) and key steps to set up a PFES model (78% NA). We interpret this as a result of a lack of practice, which was an apparent obstacle. It is interesting to note that at the evaluation after the training, 78% of the trainees appreciated having 'a lot of practice during the training' (Dam et al. 2012c p. 24). This highlights a missing link between supplying knowledge and developing skills that can only partly be maintained through positive 'attitudes' towards PES. To ameliorate such gaps, Petheram and Campbell (2010) found that the understanding of PES was enhanced by particular, participant-generated photography and video, picture diagramming, music and visual aids. In the case of Bac Kan, training in participatory methods was offered, however, not all participants followed through. Clearly, the lack of a trainee's knowledge on the substance of the subject matter is unlikely to lead to enhanced understanding. The main issues reflecting negative attitudes seemed related to institutional aspects, to the payment system itself, and the knowledge required to implement PES. One of the more discouraging statements on attitudes was the perception that PES may be more complicated that it needs to be, similar to the conclusion from other PES projects in Viet Nam (Catacutan et al 2012). The complexity and lack of clarity could instigate various forms of elite capture, in particular with insecure land tenure (To et al 2012).

The evidence presented in terms of knowledge and attitudes suggested that participants required more and continuous opportunities to maintain their optimism towards PES. In this case, external support is still needed to enthuse local PES stakeholders as the local capacity remains weak or limited to take

over the scheme in the immediate future. The fact that some government officials were unable to complete the training could indicate that local government units do not prioritise PES capacity building, or that they are understaffed. To solve this issue, it seems important that a PES project budget be allocated for continuous training and perhaps offering the same training three to four times a year, rather than once. This will also likely improve the quality of the training, as lessons learned can be implemented.

Did the trainees change perceptions of their roles as modifiers of the environment?

More 'post- post-focus group' participants said that PES had a socioeconomic potential than environmental. Such trade-offs between environmental and social interests are realistic and inevitable (Kosoy et al 2008). It seems that the training also has helped raise awareness that farmers' harsh socioeconomic living conditions drive deforestation. For example, trainees expressed that PES is unlikely to succeed 'if the payments don't meet the cost and benefit of deforestation'. Such an elaborate answer would have seemed unlikely before the project. While the role of water environmental services apparently became clearer to trainees, the buyers of carbon remained vague, particularly as the other buyers were local and concrete. For the longevity of PES, conditionality is essential as buyers want to see results delivered. Equally important is that the payment levels create incentives for farmers to protect forests. Van Noordwijk et al (2012) discuss three different types of PES. At the national level, issues of leakage across landscapes, such as between forestry and agricultural land, can be evaluated and hence this is the scale for fully commodified payments for environmental services (for example, carbon credits). At the local level, farmers may be motivated by co-managing the schemes, which may require that they co-invest. To transfer between these two scales, compensations need to be high enough that farmers skip other opportunities, such as deforestation or conversion to cash crops. Furthermore, as compensation can be given in-cash (payments) as well as in-kind in the form of rewards (for example, agricultural inputs, training) or commune infrastructure, they can also benefit communities and rural development more widely.

9. Conclusion

Our analysis of local capacity and issues encountered by multiple stakeholders in Bac Kan province on landscape multifunctionality in the context of PFES, generated lessons and capacity implications for the sustainability of PFES projects not only in the province, but also nationally and generally in the context of developing countries. The findings presented here raise a new question: can PFES projects meet the 'sustainability' targets without a shared (minimum) understanding of environmental services and natural resource management among stakeholders? Clearly, a comprehensive and continuous training program is a prerequisite for enhancing current local capacity. Such training programs should consider and include among others, the following:

Courses offered several times during the year, with modules that address local stakeholder concerns and are combined with practical activities.

Using local expertise from ongoing PES projects, such as in Lam Dong province. Trainees need to be motivated to learn by doing and search out information by themselves, as well as learning from peers.

Focus on awareness about landscapes and understanding of ecosystem functions and environmental services to enable farmers and local level stakeholders to make informed decisions about taking part in PFES schemes. A minimum knowledge requirement for participating in PES needs to be established.

It is also important to highlight the links between different land uses with the environmental services produced, so that upstream and downstream stakeholders understand the full cycle of landscape interactions and their impacts, thereby increasing buy-in for a PES agreement. Ultimately, the Vietnamese Government needs to invest substantially in developing the stakeholders' capacity if PFES projects are to succeed, given the complex nature of PES and the low payment level offered to local communities for enhancing landscape multifunctionality.

Appendix

Supplementary Table 1. Corresponding questions (and answering options) for comparing results from (a) pre-test, post-test and post-post-test questionnaire results; and (b) focus group discussion

Criteria		Pre-test	Post-test	Post post- test
Questionnaire	(Q)			
Reflects knowledge of ES provided		What kind of environmental services can people receive payment for?		What kind of ES are bought/sold here?
		Answer: Multiple choice for 5 options (all possible):		**Answer:**
		Land protection, erosion and sedimentation limitation,		open-ended
		Regulate and maintain water sources for pure water production, Regulate and maintain water sources for production,		
		Natural landscape protection and biodiversity conservation, Absorption and storage of CO_2,		
		Provision of natural spawning positions, feeding sources, and breeding animals		
Reflects primarily knowledge about carbon pools, potentially also skills to identify carbon in field		When measuring carbon, what kind of forest carbon pools need to be measured?		When measuring carbon, what kind of forest carbon pools need to be measured?
		Answer:		**Answer:**
		Multiple choice for 5 options (all possible):		Multiple choice for 8 options, same as pre- and post-test and in addition:
		Aboveground living biomass		c=y(x/0.2022)
		Belowground living biomass		Living leaves
		Dead trees		Tree height
		Dead branches and falling leaves		
		Soil carbon		

Criteria	Pre-test	Post-test	Post post-test
Reflects skill (ability to determine k-coefficient)	Do you know which of the following are used to determine the k-coefficient? **Answer:** Multiple choice with 4 options (one possible): Forest types Forest status Forest origin Level of difficulty and advantages of forest protection	Do you understand how to determine the qualification K to distribute the payment for forest environmental services? **Answer:** Multiple choice with 4 options, same as pre-test	Please shortly describe how you understand the k-coefficient. **Answer:** open-ended
Reflects attitudes towards PES. The pre- and post-test questions may be understood differently	Do local people understand about PES? **Answer:** Yes No	Are PES concepts and documents difficult or easy to understand? **Answer:** Easy to understand Difficult to understand	PES is easy to understand. **Answer:** Likert scale 1 to 5 (strongly agree to strongly disagree)

Focus group discussions (FGD)

During training (FG1)

Stakeholders' expectations on landscape multifunctionality break down per current and future land use types

Participatory SWOT analysis

What are the challenges, solutions and opportunities in developing PES schemes at the local level?

Post-post training (FG2)

For comparing attitudes before and after training:

What did you think about PES when you first heard of it?

What do you think about PES now?

Participatory SWOT analysis*

Strengths

What do you think are the strengths of PES in your village/district/etc.

Weaknesses

What do you think are the weaknesses or drawbacks for PES in your village/district/etc.

Threats

What do you think are the major/hardest to overcome problems for PES in your village district/etc.?

Opportunities

How do you think you can use the strengths you mentioned and overcome the challenges we have discussed in the future for PES?

* For the strengths and weaknesses respondents wrote their answers on sticky notes. For identifying threats and opportunities, a brainstorming discussion was used.

Note: See table 4

Supplementary Table 2a. Stakeholders consulted to prepare training documents

Group	Members	No. of people
Policy makers	Representatives of provincial, district and commune people's committee and involvement of other agencies. Provincial level: Forest management agency, forestry agency, environmental protection agency, extension service centre, Department of Agricultural and Rural development, finance service. District level: Ba Be authority, managers of Natural Resources and Environment Division in Na Ri district. Commune level: Lang San's authorities.	8
Technical staff	Specialized agencies with expertise in various fields belonging to people's committee: Provincial People Committee: Forest management agency, Department of Agricultural and Rural development, finance service, agricultural extension service. District level: Staff working at Environmental and Resources Agency, Ba Be and Na Ri; Ba Be park forest management board, Ba Be forestry farm, extension service, Kim Hi reserve. Commune level: officers in Quang Khe, Lang San; extension service staff in Lang San.	13
Social organizations	Provincial level: Women's Union, Farmers' Union, Fatherland Front. Commune level: Lang San Women's Union.	3
Community and household	Environmental service providers including forest owners (individuals, households, household groups, community): Leo Keo village, To Dooc village.	6
Total		30

Source: Dam et al 2012c, p. 9

Supplementary Table 2b. Consulted trainees' recommendations for training material

Section	Recommendations
Lesson 1: General Introduction about Environmental Services	1 hour is enough for 1 lesson
Lesson 2: Mechanisms to conduct PFES	- Need to update k-coefficient information, environmental service kinds following Circular 80/2011/TT-BNNPTNT which instructs how to determine PFES. - Show how to calculate carbon. - Clarify PES implementing processes. - PES in all governance scales, determine payments.
Lesson 3: Planning, implementing, monitoring, reporting and clarifying community PFES	Agree with the draft version (without added ideas).
Lesson 4: Managing PFES	- Clarify PES steps. - Need to have steps implementing PES following Circular 80/2011/TT-BNNPTNT, which instructs how to determine PFES. - The structure and content of the fourth lesson should focus on financial management in real life (financial sources, financial distribution, fund management fees, etc).
Lesson 5: Methods and skills to train others	- Need to teach training methods. - Reorganize the content to be brief and focus on applicable knowledge to train the farmers.

Source: Dam et al 2012c, p. 18

Supplementary Table 2c. Overview of PES training manual

	PES Training Manual
Goal	Improve PES understanding of governance officers (provincial, district and commune levels) and residents in three districts implementing the 3PAD project.
Course objective	After the course, trainees can understand, explain and apply the knowledge, skills and attitudes in their work relating to PFES policies or in implementing PFES pilot models.
Target trainees	Government officers (provincial, district and commune levels) and residents in three districts implementing the 3PAD project.
Schedule	2–3 days: 3 days for provincial officers; 2 days for district and commune officers *Lesson 1:* General introduction about environmental services. *Lesson 2:* Mechanisms to implement PFES. *Lesson 3:* Planning, implementing, monitoring, reporting and verifying PFES at community scales. *Lesson 4:* Finance management for PFES. *Lesson 5:* Methods and skills to train others.

Source: Dam et al 2012b, p. 17

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