PAYMENTS FOR ECOSYSTEM SERVICES IN SMALLHOLDER AGRICULTURE

Lessons from the Hivos-IIED learning trajectory

INA PORRAS, BILL VORLEY, ALEXANDRA AMREIN, WILLY DOUMA AND HARRY CLEMENS – 2015

SHAPING SUSTAINABLE MARKETS

Hivos people unlimited

CIAT International Center for Tropical Agriculture Since 1967 Science to cultivate change

iied

First published by International Institute for Environment and Development (UK) in 2015

Copyright © International Institute for Environment and Development

All rights reserved

http://pubs.iied.org/16598IIED
ISBN: 978-1-78431-221-3

For further information please contact: International Institute for Environment and Development (IIED), 80–86 Gray's Inn Road, London WC1X 8NH, United Kingdom. newbooks@iied.org, www.iied.org/pubs

Citation
Porras, I, Vorley, B, Amrein, A, Douma, W and Clemens, H (2015) Payments for ecosystem services in smallholder agriculture: lessons from the Hivos-IIED learning trajectory. IIED and Hivos.

Designed by
SteersMcGillanEves
01225 465546

Laid out by
Regent Typesetting
www.regent-typesetting.co.uk

Cover photo credit
Norandino

Edited by
Clare Rogers with Holly Ashley

Series Editor
Emma Blackmore

Shaping Sustainable Markets
Shaping Sustainable Markets is the flagship research project for the Sustainable Markets Group at IIED. Can markets be 'governed' to better benefit people and planet? This project explores the individual and combined impact of market governance mechanisms on sustainable development to find out what works where and why. Some of these mechanisms are well established. Others are innovative ideas yet to be tested in the real world. We want to improve and broaden understanding of how market governance mechanisms can be designed and used to secure livelihoods and protect environments. Find out more about our work at shapingsustainablemarkets.iied.org.

We welcome your comments on this publication or other aspects of Shaping Sustainable Markets. Please contact emma.blackmore@iied.org.

Disclaimer
This paper represents the views of the authors and not necessarily those of IIED.

Acknowledgments
We would like to thank the continuous support of our partners in Central and South America, including Ligia Marchena, Manuel Amador, Gabriel Rodríguez Benavides and Tony Nello from CEDECO; Pablo Alvarez and Juan Pablo Solís from Hivos local offices; Bayardo Betanco, Merlin Preza, Ligia López and Vera Arreaga from PRODECOOP; Juan Choc, manager of Cooperativa Nahualá, farmers from Lozahoren Cooperative in Dipilto and from José Alfredo Zeledón Cooperative in San Juan de Rio Coco; Kahlil Baker, executive director of Taking Root, Elvin Castellón, Elsa Gonzales, and David Baumann; Chris Stephenson from the Plan Vivo Foundation for useful comments and clarifications; Raphael Paucar Cárdenas from Progreso; Edmond Muller from ProClimate; José Rojas, Sabino Guerrero, Raul Calle and Dora García from Norandino. From the national Indonesia Domestic Biogas Programme we would like to thank Ibu Agi Cakradirana, Pak Wasis, Christina Haryanto and Retno Utami in East Java; and in Lombok: Pak Umar and Pak Krisna; as well as the government officials, business people, farmers, cooperative leaders, construction partner organisations and masons interviewed during the Indonesia study and to Lingga Tri Utama for unstinting support during the week, and for the excellent translation. In Kenya we would like to thank Jean Marc Sika and Absolom Wanjala from the Hivos Kenya office; George Nyamu, Roda Kilonzi and Bernard Mulandi from KENAFF; Hilda Galt from Climate Focus; and the farmers who welcomed us to their farms during our field trip.

Funding for this research comes from Hivos and UK aid from the Department for International Development. However, its conclusions do not necessarily reflect the views of the UK government or Hivos.

About the authors
Dr Ina Porras is a researcher at the International Institute for Environment and Development, with long-standing experience in markets for environmental services to tackle rural poverty in developing countries.

Alexandra Amrein is a consultant at CIAT for inclusive business models. She is co-author of the LINK methodology and contributed to its implementation and capacity building with different stakeholders.

Dr Bill Vorley is a senior researcher at the International Institute for Environment and Development, with over 30 years' experience in of sustainability in agriculture and food markets.

Willy Douma is programme officer for the Sustainable Economic Development bureau of Hivos, a development aid agency based in the Netherlands.

Harry Clemens is programme officer for Carbon Finance for the Green Entrepreneurship Programme of Hivos.

This document compiles the main messages from the PES Learning Trajectory Programme and many people have contributed to it. This report has been edited by Ina Porras and Bill Vorley from IIED, Alexandra Amrein from CIAT and Willy Douma and Harry Clemens from Hivos. To comment, please contact: ina.porras@iied.org.

About the Hivos-IIED PES Learning Trajectory Programme
IIED and development organisation Hivos launched a two-year strategic partnership to provide research-based policy advice to improve sustainable food systems and access to energy in developing and emerging countries. Through this research IIED and Hivos explore the feasibility of payments for ecosystem services (PES) as incentives to promote a shift to sustainable smallholder agriculture. We focus on practical learning from existing smallholder and community PES projects linked to energy and agroforestry activities. Working with local partners and project practitioners, we analyse the opportunities, challenges, strategies and potential 'no-go' areas in a pre-selected group of smallholder projects and analyse them within the global context of wider learning on what works and what does not in PES. Based directly on lessons drawn from partner studies, we adapt the value chain map and business model LINK methodology developed by the International Center for Tropical Agriculture (CIAT) to understand if and how PES and carbon approaches can help smallholders successfully enter and benefit from existing markets. Results from this research are published in the **Payments for Ecosystem Services in Smallholder Agriculture series** under Shaping Sustainable Markets, and can be downloaded online.

PAYMENTS FOR ECOSYSTEM SERVICES IN SMALLHOLDER AGRICULTURE

Lessons from the Hivos-IIED learning trajectory

INA PORRAS, BILL VORLEY, ALEXANDRA AMREIN, WILLY DOUMA AND HARRY CLEMENS – 2015

BOXES

TABLES

FIGURES

GLOSSARY

Additionality	In the context of carbon offsets, a project activity is 'additional' if anthropogenic GHG emissions are lower than those that would have occurred in the absence of the project activity. In the context of other ecosystem services, additionality refers to incremental services being delivered by the project.
Carbon dioxide equivalent (CO_2e)	The universal unit of measurement used to indicate the global warming potential of each of the six GHGs regulated under the Kyoto Protocol. Carbon dioxide – a naturally occurring gas that is a by-product of burning fossil fuels and biomass, land-use changes, and other industrial processes – is the reference gas against which the other GHGs are measured, using their global warming potential (Kossoy *et al.*, 2014).
Certification	Certification is a market-based mechanism, guaranteed by a third party, designed to encourage environmentally sustainable and/or socially responsible practices. Certification can also offer 'chain of custody' information.
Clean Development Mechanism (CDM)	This is a mechanism provided by Article 12 of the Kyoto Protocol, designed to assist developing countries in achieving sustainable development by allowing entities from Annex 1 Parties to participate in low-carbon projects and obtain Certified Emission Reductions (CERs)in return (Kossoy *et al.*, 2014).
Co-benefits	In carbon projects this refers to well-managed and sustainable projects associated with a variety of benefits beyond reduction of GHG emissions, such as increased local employment and income generation, protection of biodiversity and conservation of watersheds.
Certified Emission Reduction (CER)	A unit of GHG-emission reductions issued pursuant to the Clean Development Mechanism of the Kyoto Protocol and measured in metric tons of carbon dioxide equivalent. One CER represents a reduction in GHG emissions of one metric ton of carbon dioxide equivalent (Kossoy *et al.*, 2014).
Ecosystem services/ environmental services	Ecosystem services are the benefits that people obtain from ecosystems, and include provisioning services (like food, timber, etc), regulating services (eg climate regulation, flood management, water purification and disease control); cultural services (eg recreation, spiritual) and supporting services that contribute to soil productivity through nutrient cycling, soil formation and primary production (MEA, 2005).
Ex-ante offsets	Ex-ante offsets are determined by the future carbon fixation of an activity (often forest based). Accredited projects are then able to sell credits on the agreement of future activities within a set timeframe.
Greenhouse gas (GHG)	Both natural and anthropogenic, GHGs trap heat in the Earth's atmosphere, causing the greenhouse effect. Water vapour (H_2O), carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), and ozone (O_3) are the primary GHGs. The emission of GHGs through human activities (such as fossil fuel combustion or deforestation) and their accumulation in the atmosphere contributes to climate change (Kossoy *et al.*, 2014).
ICROA	The International Carbon Reduction and Offset Alliance is an industry body overseeing businesses that deliver carbon reductions and offset services. It promotes best practice to support voluntary climate mitigation efforts. www.icroa.org

Inclusive business models	A profitable core business activity that also tangibly expands opportunities for the poor and disadvantaged in developing countries. They engage the poor as employees, suppliers, distributors or consumers and expand their economic opportunities in a wide variety of ways (BIF, 2011).
Inclusive trading relationships	Inclusive trading relationships are the result of inclusive business models that do not leave behind smallholder farmers and in which the voices and needs of those actors in rural areas in developing countries are recognised.
Insetting	A variation of carbon offsetting, insetting is a partnership or investment in an emission-reduction activity by a company and their partners, where the company reduces its socio-environmental footprint (eg CO_2, biodiversity and water protection) while tackling procurement costs and risk and strengthening links with suppliers (Henderson, 2014). The 'in' within insetting highlights the fact that the carbon transaction takes place within a supply chain or a production area.
Intermediary	An intermediary is a mediator or negotiator who acts as a link between different parties in a supply chain, usually providing some added value to a transaction that may not be achieved through direct trading.
Offset	An offset designates the emission reductions from project-based activities that can be used to meet compliance or corporate citizenship objectives vis-à-vis GHG mitigation (Kossoy *et al*., 2014).
Outgrower schemes	Partnership between growers or landholders and a company for the production of commercial (usually forest or agricultural) products. The extent to which inputs, costs, risks and benefits are shared between growers/landholders and companies varies, as does the length of the partnership. Growers may act individually or as a group in partnership with a company, and use private or communal land.
Payments for ecosystems services (PES)	An economic instrument that addresses an environmental externality through variable payments made in cash or kind, with a land user, provider or seller of environmental services who voluntarily responds to an offer of compensation by a private company, NGO or local or central government agency. PES is anchored in the use of payments to correct an economic externality (Pigou, 1920; Coase, 1960). Coase argues that socially sub-optimal situations, in this case poor provision of ecological services, can be corrected through voluntary market-like transactions provided transaction costs are low and property rights are clearly defined and enforced (Ferraro, 2009; Pattanayak *et al*., 2010; Porras *et al*., 2008).
Poverty	While there can be many definitions of poverty, we understand it as the lack of, or inability to achieve, a socially acceptable standard of living, or the possession of insufficient resources to meet basic needs. Multidimensions of poverty imply going beyond the economic components to wider contributory elements of well-being. Poverty dynamics are the factors that affect whether people move out of poverty, stay poor, or become poor (Suich, 2012).
REDD+	A UNFCCC framework where developing countries are rewarded financially for activities that reduce emissions from deforestation and forest degradation and contribute to conservation, sustainable management of forests, and enhancement of forest carbon stocks.
Small producers/small farms	Although no common definition exists we follow Nagayets' (2005) approach, defining small farms on the basis of the size of landholding. This has limitations as it does not reflect efficiency. Size is also relative. Individual agricultural plots of <2 hectares are common in Africa and Asia but are generally larger in Latin America. Community forest land can include considerably larger patches.

Transaction costs	Pagiola and Bosquet (2009) define transaction costs in reducing emissions from deforestation and forest degradation (REDD)/PES as those necessary for the parties to reach an agreement that results in the reduction of emissions. The costs are associated with identification of the programme, creating enabling conditions for reducing emissions, and monitoring, verifying and certifying emissions reductions. Costs fall on different actors, including buyers and sellers (or donors and recipients), market regulators or institutions responsible for administration of the payment systems, project implementers, verifiers, certifiers, lawyers and other parties. The costs can be monetary and non-monetary, ex-ante (initial costs of achieving an agreement) and ex-post (implementing an agreement).
Validation and verification	Validation is the process of independent evaluation of a project activity by a designated operational entity against the requirements of the Clean Development Mechanism (CDM). Verification is the review and ex-post determination by an independent third party of the monitored reductions in emissions generated by a registered project approved under CDM or another standard during the verification period (Kossoy *et al*., 2014).
Value chains	The value chain describes the full range of activities that firms and workers do to bring a product from its conception to its end use and beyond. This includes activities such as design, production, marketing, distribution and support to the final consumer. The activities that comprise a value chain can be contained within a single firm or divided among different firms. Value chain activities can produce goods or services, and can be contained within a single geographical location or spread over wider areas (Global Value Chains Initiative, 2014).
Verified Emission Reduction (VER)	A unit of GHG-emission reductions that has been verified by an independent auditor. Most often, this designates emission reductions units that are traded on the voluntary market (Kossoy *et al*., 2014).
Voluntary carbon market	The voluntary carbon market caters to the needs of those entities that voluntarily decide to reduce their carbon footprint using offsets. The regulatory vacuum in some countries and the anticipation of imminent legislation on GHG emissions also motivates some pre-compliance activity (Kossoy *et al*., 2014).

ACRONYMS

CBO	Community-based organisation
CDM	Clean Development Mechanism
CEDECO	Educational Corporation for Costa Rican Development (Corporación Educativa para el Desarrollo Costarricense)
CIAT	International Center for Tropical Agriculture
CPO	Construction partner organisations
ICROA	International Carbon Reduction and Offset Alliance
KENDBIP	Kenya National Domestic Biogas Programme
M&E	Monitoring and evaluation
NGO	Non-governmental organisation
ODA	Official development assistance
PES	Payments for ecosystem services
REDD+	Reducing emissions from deforestation and forest degradation
SACCO	Savings and credit cooperative organisation
UNFCCC	United Nations Framework Convention on Climate Change

ONE
INTRODUCTION

IIED and development organisation Hivos launched a two-year strategic partnership to provide research-based policy advice to improve sustainable food systems and access to energy in developing and emerging countries. Through this research IIED and Hivos explore the feasibility of payments for ecosystem services (PES) as incentives to promote a shift to sustainable smallholder agriculture. We focus on practical learning from existing smallholder and community PES projects linked to energy and agroforestry activities. Working with local partners and project practitioners, we analyse the opportunities, challenges, strategies and potential 'no-go' areas in a pre-selected group of smallholder projects and analyse them within the global context of wider learning on what works and what does not in PES. Based directly on lessons drawn from partner studies, we adapt the value chain map and business model LINK methodology developed by the International Center for Tropical Agriculture (CIAT) to understand if and how PES and carbon approaches can help smallholders successfully enter and benefit from existing markets.

This synthesis report presents highlights from six projects in five countries – Guatemala, Indonesia, Kenya, Nicaragua and Peru – that are exploring the use of carbon projects in smallholder farming.[1] Two of the projects involve domestic biogas and carbon (Kenya and Indonesia), two involve organic coffee and carbon (Nicaragua and Guatemala) and two involve reforestation and carbon (Nicaragua and Peru).

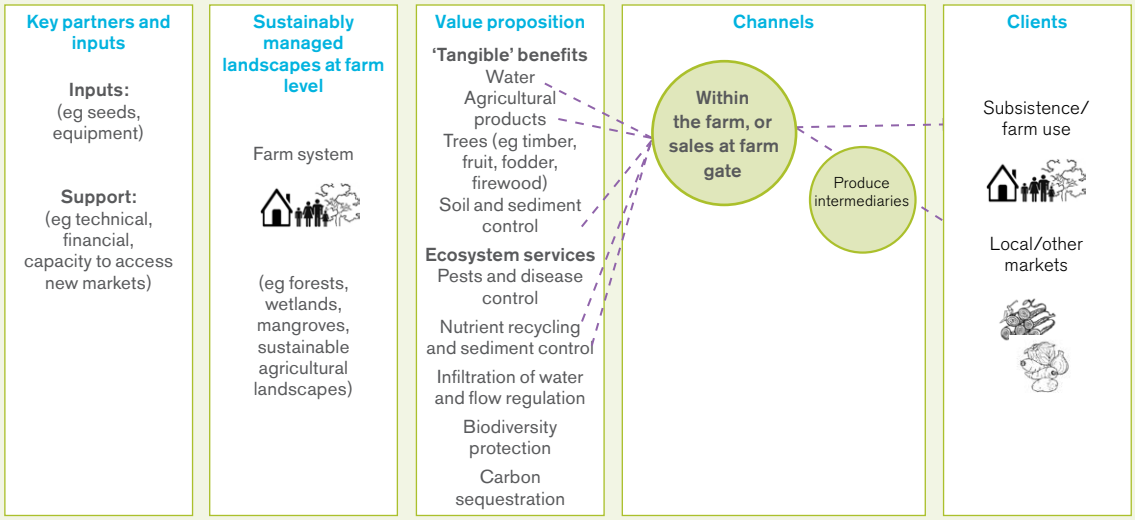
1.1 THE STATE OF SMALLHOLDER FARMING

Sustainable agriculture brings many benefits to farmers, as does the introduction of energy-efficient technologies, like domestic biogas, to farm households. Better agricultural practices help soils retain moisture and fertility, for example, and give higher yields of agricultural produce for subsistence purposes or to sell (see Figure 1). Despite these numerous benefits, sustainable agriculture is not yet the norm (see Box 1). Many sustainability projects are unable to move beyond the pilot stage, and do not manage to upscale. The reasons vary, but can include uncertainty caused by price volatility in markets, low-quality produce, poor share of benefits to farmers and a lack of technical support.

The introduction of knowledge, technology and institutional innovations can help make agriculture more sustainable, increasing its resilience to shocks, and improving its capacity to generate 'ecosystem services' (such as capturing atmospheric carbon or purifying water; see glossary). Some of these technologies include better water management in irrigated areas, technologies that reduce waste and the dependence on firewood, and strategies promoting reduced or zero tillage to reduce erosion and sedimentation. While the problems and possible solutions are not new, interest is now shifting towards the mechanisms and institutions to help tackle them. There is also increased interest in making markets work for the poor.

1. The individual reports are published as part of the **Payments for Ecosystem Services in Smallholder Agriculture** series and can be downloaded online – see the inside back cover for details.

FIGURE 1. SUSTAINABLE AGRICULTURE PROVIDES BENEFITS AT FARM LEVEL



Note: Existing models of sustainable agriculture provide benefits at the farm level, like increased productivity and resilience. But in many cases on-farm benefits are not enough to cover the costs necessary to achieve sustainable agriculture.
Source: based on CIAT's LINK methodology for inclusive business models (Lundy *et al.*, 2012).

BOX 1. CHALLENGES OF SMALLHOLDER AGRICULTURE IN MARKETS

Small-scale producers have many disadvantages when entering formal markets, including those involving ecosystem services, compared to large-scale farmers and suppliers who can offer better reliability and quality in supply. Typically, smallholder production is affected by:

- **Inadequate or ineffective infrastructure,** including roads, electricity, irrigation and wholesale markets.
- **Little or no access to training, credit, and inputs.**
- **Changes in climatic conditions.** Many smallholders (including many women) live on the agronomic and climatic margins, with implications for the reliability and quality of agricultural supply – especially when irrigation is not available. This is further exacerbated by climate change.
- **High procurement and transaction costs** when accessing markets, associated with collecting, grading and bulking products from dispersed suppliers. To compete in coordinated markets that require quality produce, produce from multiple small farms must appear the same to buyers as the produce of one large farm. If not selling a standard bulk commodity, 'linking worlds' will only work with 'organised' production (though not necessarily the organisation of producers into groups). Creative solutions are needed to aggregate production and guarantee the quality required by the markets. Even in organised ventures, there are problems with farmers 'side selling' to traders.
- **The heterogeneity of smallholders.** Smallholders are highly variable in terms of assets and attitudes – this has potential large implications for projects geared towards the poorest smallholders. The majority of small-scale producers are not formally organised into economic units, and poorer households are less likely to participate. When they do participate, they are often excluded from decision-making processes and/or used as outgrowers (see glossary).

To overcome these gaps, smallholder agriculture needs to develop and cement partnerships, and seek out new forms of revenue creation that balance livelihood needs with the generation of meaningful returns.

Source: Porras and Nhantumbo (2015).

According to the World Bank (2008), improving the productivity, profitability, and sustainability of smallholder farming is a key, if not the main, pathway out of poverty[2] for many people (see Section 4.1). Extra investment in ecosystem services through agriculture and forestry could help shield farmers from agricultural market volatility. Proponents of the idea of combining agriculture and PES suggest potential onsite benefits for the farmer (eg training, cash), and offsite benefits like conservation of biodiversity and water resources, and carbon sequestration.

1.2 PAYMENTS FOR ECOSYSTEM SERVICES IN SMALLHOLDER AGRICULTURE

In the context of this document we define payments for ecosystem services (PES; see glossary) as transfers that reward smallholders for improving agricultural practices and land use that result in better provision of ecosystem services. They are **conditional**, in the sense that agreed activities need to take place, and should be **additional** to what would have happened without the project. Payments can take different forms: they can be cash or in kind (or a mix of both), one-off, continuous or time-bound; they could be made directly to the farmer or to a community or a group of farmers. The key condition is that this transfer needs to be recognised by the farmers as a reward for their actions.

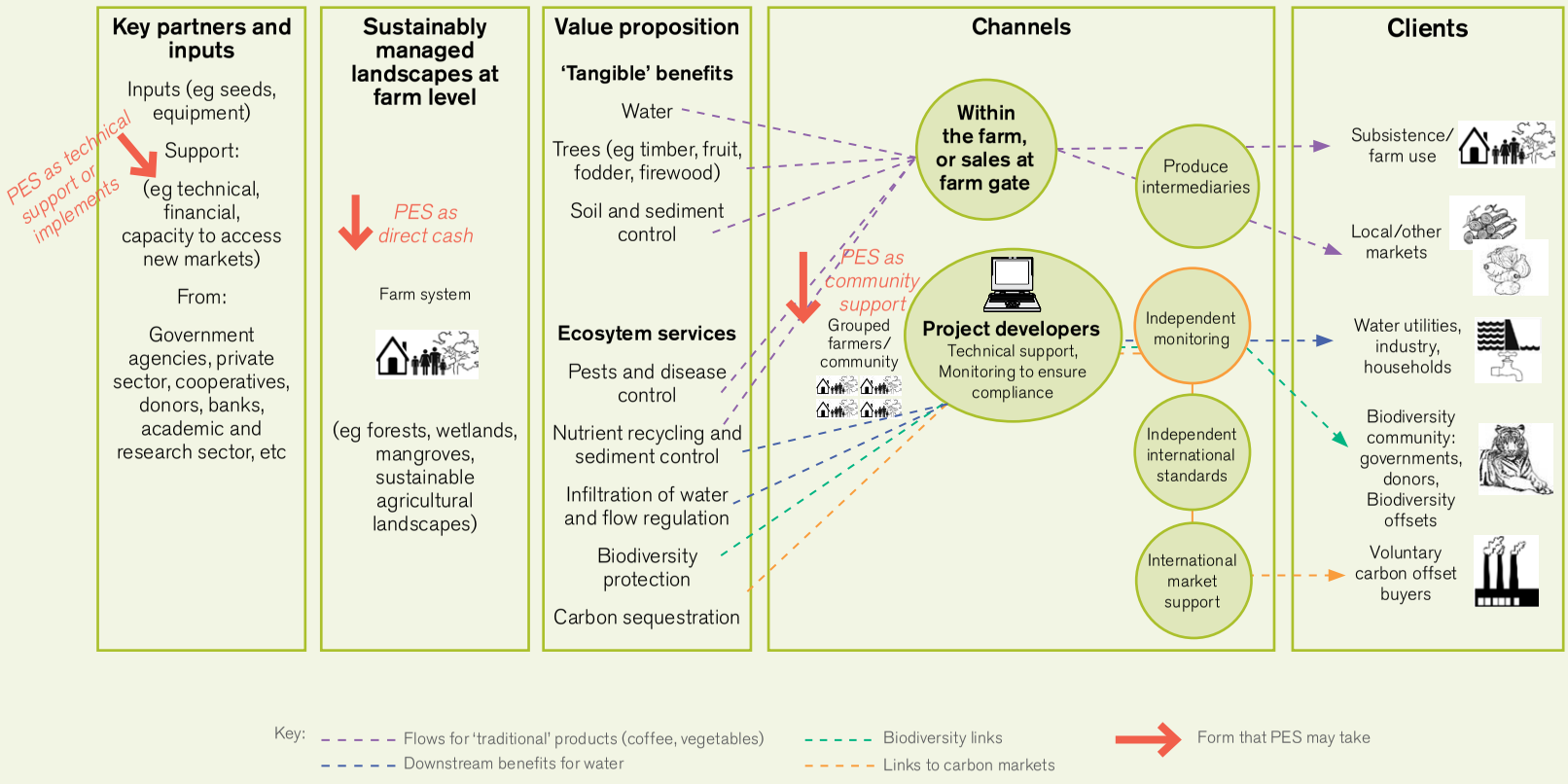
1.3 THE HYPOTHESIS: PES CAN ADD VALUE AND PERMANENCE TO SUSTAINABLE AGRICULTURE

Payments for ecosystem services (PES) are proposed as economic instruments to incentivise the provision of ecosystem services, providing the extra funding necessary to 'scale up' this provision, for example in energy and smart agriculture.

The hypothesis is that new resources will be available by making these ecosystem services 'tangible', and by creating the governance structure that would allow a bridge to be made between practices at farm level and beneficiaries of the ecosystem services (see Figure 2).

2. See the glossary for how the term 'poverty' is understood in this paper.

FIGURE 2. PES ADDING VALUE TO SUSTAINABLE AGRICULTURE



Note: PES can add value but it also requires an entirely new governance structure to aggregate smallholders and link them to buyers. Emerging experiences provide lessons on opportunities and bottlenecks, and strategies to capitalise on or overcome them.
Source: based on CIAT's LINK methodology for inclusive business models (Lundy *et al.*, 2012).

1.4 THE TEST: A LEARNING TRAJECTORY THROUGH PARTNERSHIPS

The questions informing this research are simple: does PES offer a viable financing strategy to support smallholder-led sustainable agriculture? How well does PES fit within the smallholder enterprise and farming system? And can finance from PES be a substitute for official development assistance (ODA) and/or other public subsidies?

The main objective of this one-year research project has been to set up a PES 'learning trajectory' to facilitate systematic and participatory learning from a selected number of PES projects, at different stages of development, to help answer the questions above. Through it we gain insights into the business models, the long-term viability and the practical outcomes of the PES-agriculture projects, as well as ways in which challenges can be addressed and PES initiatives can be improved. We also want to understand which designs can maximise potential for complementarity to existing activities under the Hivos Green Entrepreneurship Programme and IIED's Sustainable Markets Group (see Box 2).

Specific objectives include:

- To understand the role of ecosystem services as a component of activities in smallholder agriculture,
- To understand the context in which the projects evolve – and whether it helps or hinders the project in delivering on its aims,
- To understand the business models and governance structures attached to the projects: the concept, the stakeholders, the costs/revenue structure and how it works in practice,
- To gauge the potential leverage points to promote the initiative, as well as potential bottlenecks, and
- To learn lessons that can be applied to other smallholder agriculture-PES projects.

Our methodology is built upon:

- **Developing partnerships:** using an intensive learning process, we focused on six ongoing partner projects in countries associated with Hivos, which were identified through a participatory selection approach involving IIED and Hivos country associates (see Table 1). The partner sites helped to test the business model analysis and to make it relevant for both technical audiences and smallholder farmers.
- **The ecosystem service component:** our initial objective was to incorporate several ecosystem services in the analysis. Instead, however, **we focused on carbon offset projects** because we did not find sufficiently developed examples of other ecosystem services involving smallholders and agricultural value chains. These projects are all part of recognised international carbon standards (such as the Gold Standard, Plan Vivo and CarbonFix) providing reassurance to the market and to buyers that activities will result in the delivery of ecosystem services.
- **Poverty impact:** we have focused on **smallholder farmers**. Many of them are vulnerable and depend on subsistence economies for their main livelihoods. However, the farmers included in these projects are organised – for example into cooperatives – and have access to some form of capital (land – private and/or communal; some basic technologies; and some level of access to financial capital such as loans). As such they do not represent the poorest smallholder farmers,

though they may employ (and provide income to) farm workers from the poorest sections of the rural population.

- **Value chain maps and the Business Model Canvas:** we use some principles from the Business Model Canvas to understand how the (core) business model functions and how ecosystem service(s) and an agricultural business model can complement each other (see Box 2). We look at the overall value chain to gain insights into the dynamics of existing agricultural products and systems, key actors and their roles, and where the PES/carbon process can be involved (see Box 3).

In selecting our partner projects we look at instances where the private sector engages in activities to improve the provision of ecosystem services, for example by tackling a threat to security of supply due to climate change and environmental degradation; or by creating new economic opportunities that complement existing activities, for example generating bioenergy from production waste. These types of interventions in value chains need to pay attention to how they interact with the core business activities where the agent (farmer, cooperative, association, or firm) operates, in order to ensure the business's durability; or to take new market linkages to scale.

A farmer transferring forest seedlings for planting in Peru © Norandino

TWO
OVERVIEW OF PARTNER PROJECTS

Field visits and multiple Skype meetings took place between September 2014 and March 2015 to better understand these projects and answer the research questions. Table 1 shows some key characteristics of these projects.[3] Although all cases are built around carbon capture in smallholder agriculture, they show a range of conceptual and operational differences.

2.1 DIFFERENT COMBINATIONS OF CARBON AND 'TRADITIONAL' AGRICULTURAL ACTIVITIES

An objective of the Hivos-IIED research project was to explore a variety of PES experiences. Our partner portfolio included:

- Two projects involving domestic biogas and carbon: Kenya and Indonesia,
- Two projects exploring organic coffee and carbon: Nicaragua and Guatemala, and
- Two projects exploring reforestation and carbon: Taking Root in Nicaragua and Sierra Piura in Peru (Peru also included coffee).

In all cases farmers also practiced subsistence agriculture, which is typical of smallholder farming in developing countries. Due to the geography, only the upstream farmers in the Sierra Piura project in Peru had almost no connection to any type of market, though they are now engaged in reforestation through the project.

Women planting tree seedlings on a plantation in Nicaragua – part of the CommuniTree reforestation and carbon project facilitated by Taking Root © Kahlil Baker

2.2 DIFFERENT TYPES OF CERTIFICATION

While forestry-type projects in smallholder and community projects have a longer range of experience (early projects in Mexico date back to 1997), carbon offsetting in smallholder agriculture is still relatively new, and many of the

3. Further information can be found in the individual reports in this series.

methodologies to deliver and measure carbon and co-benefits are still being tested.

Access to these opportunities is affected by the same challenges that smallholder producers face when entering international agricultural commodity markets (like cotton or coffee). Stricter monitoring of quality is required as value chains expand from local to international markets, and the final buyer is more removed from the point of product creation. According to Hamrick and Goldstein (2015) a project standard is a 'must have'. Consumers in voluntary carbon markets (see glossary) show an interest not only in the final product (the carbon offset) but also the way the carbon offset is measured, verified and made available to final consumers; suggesting that governance structures that affect fairness and efficiency of offset production and marketing can affect buyers' willingness to pay (von Geibler *et al*., 2010; Suyanto *et al*., 2009; Swallow and Goddard, 2013).

All but one of the projects in this review are certified by Gold Standard. With a 19-per-cent coverage of existing voluntary carbon transactions (Hamrick and Goldstein, 2015), the Gold Standard has one of the widest reaches in carbon offset markets. Most of their projects are energy-related, such as wind turbines, and to a smaller extent, clean cookstoves and biodigesters. By incorporating the previously independent standard CarbonFix[4] into their portfolio in 2012 (as 'Gold Standard Version 3.0'), the Gold Standard has begun to expand into forestry and land-based projects (including our Sierra Piura example). They are also piloting a new agriculture standard (the Gold Standard for Land Use and Forests), for which projects will have to meet the requirements of Land Use Change and Forestry (LUF)[5] approved in December 2014, and methodologies for carbon accounting are under development. The Gold Standard for Land Use and Forests (GS LUF) will allow sales of 'validated' credits, as distinct from 'verified' credits (see glossary). This concept is still new and has not yet been tested in markets. Guatemala and Nicaragua have been using a methodology – CamBio2 – which provides a 'holistic' approach for organic agriculture and uses ex-ante sales of carbon (for example, where a project is able to sell credits on the agreement of future activities within a set timeframe, as happens in similar futures markets). Because of limited sales, the projects have been undergoing a transfer to the Gold Standard to improve their market access.

Taking Root is the only project covered by the Hivos-IIED research project that uses the Plan Vivo Standard for independent certification. This standard has been specifically designed for community forest and land-use projects, which allows ex-ante carbon issuance and has flexibility built in to its design; however, they do not include energy or soil projects in their carbon accounting. Although their share of the market is small (one per cent) it has been increasing since 2013 and the average price for Plan Vivo certificates has typically remained above the global average.

The choice of standard has significant impacts at the project level and is therefore an important choice. Some standards are more expensive than others, but may offer more recognition to offset buyers in international markets. However, while the choice of standard can help with recognition, marketing – looking for new buyers, and negotiating volumes and prices – remains the responsibility of each project and is a key challenge.

2.3 DESCRIPTION OF PES ACTIVITIES

Domestic biogas: the household cattle **biogas** system promoted in **Kenya** and **Indonesia** has significant benefits at the household level, providing an incentive for farmers to engage. It is a highly effective 'green' technology, both in terms of its primary product (biogas, a smokeless cooking fuel) and by-product (bioslurry, a high-value fertiliser). It fits well into smallholder dairy systems both in Kenya and in Indonesia, where cattle convert organic waste to dung to feed the biogas plant. This technology can radically improve quality of life, both in the household and via the farm enterprise.

4. See: www.goldstandard.org/the-gold-standard-announces-its-acquisition-of-the-carbonfix-standard

5. See: www.goldstandard.org/luf

Applying bioslurry and planting on an agricultural plot in Kenya © Ina Porras

Smallholder carbon projects face high initial transaction costs when entering the carbon market (for example, implementing technical studies and monitoring systems), while only offering a relatively low household carbon-capture rate. Large-scale aggregation is required to obtain economies of scale. However, the larger the project, the more important it is to have a system that facilitates the return of benefits to farmers. We found the carbon component of these projects to be small and unlikely to generate large amounts of revenue at the farm level. In both Kenya and Indonesia, bioslurry is the main link between biogas and sustainable or improved smallholder agriculture. A majority of biogas users in Kenya (98 per cent) are able to apply bioslurry (dry or wet) to their land and benefit from yield increases. In Indonesia the link is not so straightforward: some dairy-cow owners do not have land on which to apply bioslurry, and many of the remaining farmers' pasture is too remote to justify recycling bioslurry back into forage production. For Indonesia, a positive use of earmarked carbon finance could be improving the value of bioslurry, creating a market for dried slurry as fertiliser and feed, thereby closing the nutrient cycle between animals and pasture.

Operating the biodigester in Kenya © Ina Porras

Organic coffee: both the organic and agro-ecological **coffee** production projects in **Guatemala** and **Nicaragua** enter the carbon markets through their existing cooperative system. This provides a significant advantage in terms of having tested systems to organise and reach farmers, link input and technical providers, and most importantly, link to potential buyers of carbon offsets through their coffee value chains (through **insetting**; see glossary). Both of these projects have piloted their own methodology for ecosystem services at farm level using a highly innovative, participatory and farmer-focused approach, CamBio2, that accounts for past good behaviour with regard to emissions reductions. While this methodology has been very useful at farm level, it it does not respond well to international carbon requirements, especially in terms of 'additionality', or requiring additional emission reductions to what would have occurred in the absence of project activities. This tends to reward current or future improvements in behaviour, making it biased towards polluters; and most methodologies require additionality. Also, both cases have struggled to find a market outlet for the generated credits, as CamBio2 lacks international recognition as a standard. With support from Hivos they are in the process of being certified by Gold Standard. The projects' experiences feed the GS agriculture agenda. A stronger emphasis on marketing the offsets will be necessary to move from potential to actual carbon funding.

Reforestation: the coffee and **reforestation** project in Sierra Piura in **Peru** combines two independent farmer groups: carbon credit generators (subsistence farmers) and beneficiaries (coffee farmers), linked through an established cooperative that is well placed in the speciality coffee market. Both farmer groups are located in the same watershed, making this a carbon-offset project with a watershed services component – in turn facilitating **insetting**. Ten per cent of the carbon sales are also invested in coffee farmers' climate-change adaption activities. The project has made several sales primarily to coffee roasters, at a substantially higher price than the market offset average: US$15–16 per tonne of carbon dioxide equivalent (CO_2e; see glossary) which reflects both consumer awareness of the importance of ecosystems within value chains, and a good marketing strategy by the project. There is good potential for upscaling, through coffee or cocoa within the same cooperative, but more emphasis needs to be placed on securing buyers.

The Taking Root **reforestation** project in **Nicaragua** is one of the longest-standing projects in the learning trajectory and has been actively selling offsets for several years. It focuses on timber, promoting reforestation on marginal lands. The project uses a combination of planting commercial and native species through agroforestry, planting live fences (using trees to make a hedge) and intensive reforestation. Because of the relatively high carbon-capture rate per participating household they are able to make a sizeable (or significant) cash payment to the farmers. This is boosted by the emphasis that the project places on marketing and networking, ensuring a consistent market outlet for the credits created. This project is steadily extending its influence, both within Nicaragua and to other countries.

TABLE 1. PARTNER PROJECTS INCLUDED IN THE HIVOS-IIED LEARNING TRAJECTORY

	BIOGAS IN KENYA	BIOGAS IN INDONESIA	ORGANIC COFFEE IN NICARAGUA		ORGANIC COFFEE IN GUATEMALA	REFORESTATION IN PERU	REFORESTATION IN NICARAGUA
Date of field visit	04–07.11.2014	24–28.03.2015	24–28.11.2014		26–30.01.2015	02–06.02.2015	09–12.12.2014
Agricultural product(s)	Cattle, horticulture, coffee or tea	Milk, horticulture, cattle	Coffee		Coffee	Coffee/various subsistence crops	Mixed horticulture and grains
Means of carbon capture	Household biodigesters	Household biodigesters	Agro-ecological practices		Agro-ecological practices	Reforestation	Reforestation
Project developer + local leader	HIVOS + KENAFF	HIVOS + BIRU	CEDECO + PRODECOOP		CEDECO + FECCEG	Norandino + Proclimate + Progreso	Taking Root
Crediting period	21 years	10 years	20 years + past		Past only	25 years	50 years
Standard used	Gold Standard	Gold Standard	CamBio2 – moving to Gold Standard		Cambio2 – moving to Gold Standard	Initially CarbonFix, moved to Gold Standard in 2015	Plan Vivo
Issuance horizon	Ex-post	Ex-post	Ex-post (with potential recognition of past action)		Ex-post	Ex-post	Ex-ante
# Beneficiaries	15,000 women & men 38,800 children (expected)	34,000 families (expected)	2,275 families		40 families directly involved in activities (290 indirectly through cooperative)	540 families	290 families
State	Preparation for sales	Sales (one transaction)	Preparation for sales		Sales (one transaction)	Continuous sales	Continuous sales and up scaling of crediting area
Start of crediting period	2009	2009	2011		2013	2010	2010
Carbon credits sold to date (tons)	417,000	32,000	0		296	9,746	256,605
Average price for carbon credit (US$)	US$5.50–7.70	€6.50	€5.66 (expected)		€9.00	€15.70	€6.20
Carbon capture	5.2 tonnes/year/ household	2.6 tonnes/year/ household	2.98 tonnes/year/ household		N/A	6.9 tonnes/year/ha	17.7 tonnes/year/ household
Benefits to farmers from the overall[(1)] project	Health: biogas replaces firewood Bioslurry replaces need for fertilisers and increases farm productivity More jobs created with domestic biogas providers	Health: biogas replaces firewood Bioslurry replaces need for fertilisers and increases farm productivity More jobs created with domestic biogas providers	Technical support for climate-change mitigation and adaptation at the farm. Access to organic compost increases productivity. Investment in disease-resilient coffee varieties		Technical support for climate-change mitigation and adaptation at the farm. Access to organic compost increases productivity. Investment in disease-resilient coffee varieties	Upstream: better access to food from vegetable gardens, jobs for reforestation, technical and organisational support Downstream: increased coffee yield through irrigation system	Cash and creation of new jobs through timber chain (long term)
Benefits to farmers directly from carbon proposition	Collective (proposed): long-term technical support for biodigester and bioslurry technology through proposed call support centre	Collective (proposed): support to develop bioslurry business, and long-term technical support for the technologies	Individual: farmers receive detailed soil nutrition profiles Collective: capitalisation of producer organisations		Individual: farmers receive detailed soil nutrition profiles Collective: capitalisation of producer organisations	Upstream: individual (small compensation for labour for planting upstream – about 1/3 of total cost) Downstream: individual via 10% contribution to adaptation projects for coffee farmers downstream	Individual (cash payment to farmers over the first ten years)

Notes: (1) In most cases the PES (carbon) component sits within ongoing projects, adding value to the activities. We try to separate the impacts from the full projects (eg biodigesters) as opposed to the benefits received by the farmer from the added carbon proposition. This is only descriptive: we do not have detailed figures for the precise allocation of the benefits.

THREE METHODOLOGICAL APPROACH

In this section we explain the methodology used to analyse each project. We present a brief value chain map and description of the basic business model underlying the carbon proposition in relation to traditional markets (such as coffee and biogas). We used a combination of desk-based analysis, Skype meetings with experts, and field visits to project partners in the different countries.

3.1 THE BUSINESS MODEL CANVAS

We use the Business Model Canvas, developed by Alexander Osterwalder (see Box 2) to describe the rationale of how an individual (person or firm) creates, captures and delivers value. Using a common language (eg **how, what, who** and **how much?**) the canvas helps to explain how PES can aid/complement the main agricultural business model, or not. As a tool, the canvas facilitates the dialogue between farmers, development and business actors and, as a result, helps develop a clearer idea of how business processes can support social development and the provision of ecosystem services (see Figure 3).

BOX 2. WHAT IS A BUSINESS MODEL CANVAS?

The Business Model Canvas is a useful tool to assess how a key business in the value chain functions, to develop a shared language to describe and assess a business model, and to create a baseline for the development of innovations in the business model. By providing a 'visual picture' of the organisation's business model, and the potential bottlenecks and (financial) imbalances, it can facilitate the dialogue between farmers and development and business actors. As a result, it creates a clearer idea of how business processes can support social development and the provision of ecosystem services. Its four core areas are **how, what, who** and **how much?** This canvas is useful to assess the 'triple bottom line' (Elkington, 1994) highlighting the fact that companies create economic, social and environmental impacts and carry responsibility for all of them. The 'how much?' section of the canvas is useful to identify these positive and negative effects, as well as understand their distribution in terms of winners and losers. Understanding these impacts beyond profit is necessary to develop affordable monitoring strategies.

The key questions in applying the canvas are:

- **What** is the value proposition? (The value delivered to the customer)
- **How** is value obtained? (The key partners, resources and activities needed to produce the outputs of the value proposition)
- **Who** are the outputs channelled to? (The main buyers or customers)
- **How much** are the costs and benefits? (The costs of the key activities and resources, and income streams received).

Source: based on CIAT (2012).

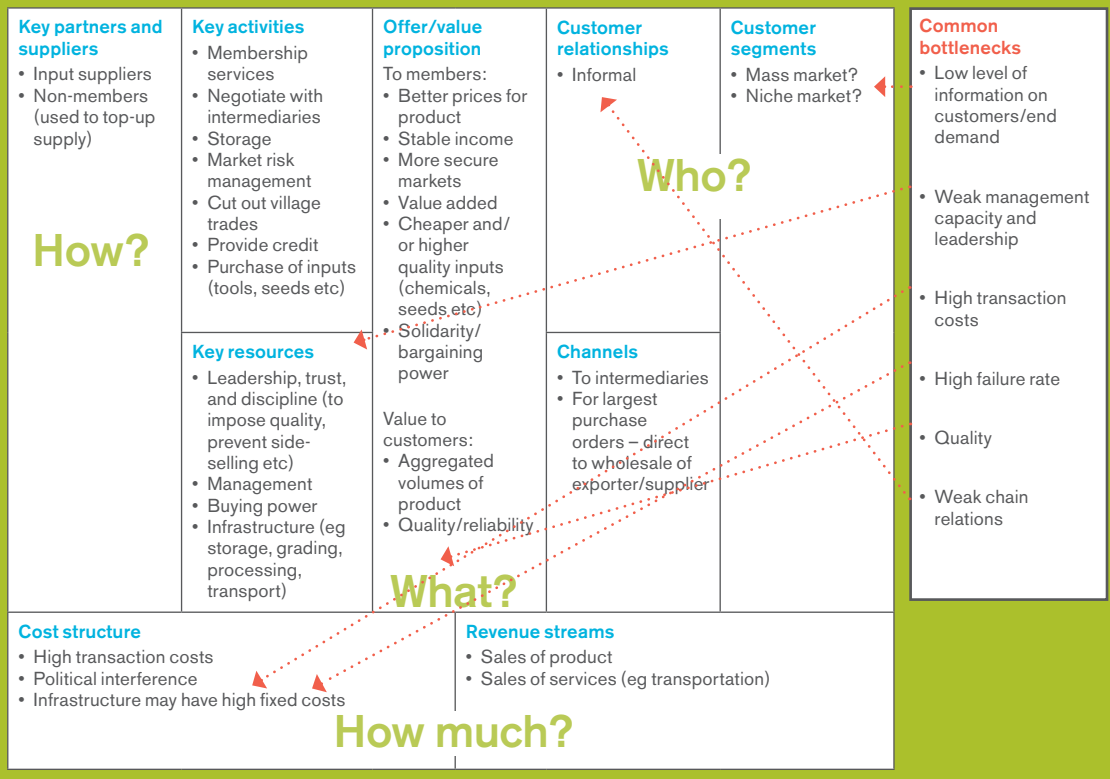


FIGURE 3. BUSINESS MODEL CANVAS EXAMPLE: SMALLHOLDER DAIRY FARM COOPERATIVE MEMBER, EAST JAVA

How?

Partners

Input providers:

Cooperatives
BIRU, CPO

Finance service providers:

- Cooperatives
- Cooperatives (channels subsidy from Nestlé)
- Cooperatives – 0% interest credit
- BIRU
- Provincial and district government

Technical service providers:

- BIRU
- Cooperatives
- CPO

What?

Activities

- Milk production (half to two thirds of business)
- Pasture and forage production and collection
- Value added from bioslurry eg earthworm production, aquaculture (minority)

Resources

Human capital:

Organisation into cooperatives gives farmers economies of scale, market access, some market power

Financial capital:

- Own capital
- Bank loans and microfinance

Manufactured capital:

- Zero-grazing dairy housing
- Biodigester (mainly 6m^3, though increasing number of 4m^3)

Natural capital:

- Dairy cattle (2–3 per household)
- Land for pasture ~1ha (though land ownership not essential)

Value proposition

Towards the market:

- Quality milk supplier for modern processing sector
- Carbon offsets from reduced use of non-renewables (LPG, firewood)

Towards the farm/household:

- Gas is primary attraction of the technology – reduced cost of LPG, reduced time to collect firewood. Quality and reliability of BIRU installation
- Organic fertiliser (bioslurry) as high value by-product. Reduction in fertiliser costs

Who?

Relationships

- Cooperatives. No sight of product beyond Nestlé (ie to consumer)
- BIRU reputation (quality, after-sales service) creates trust in CPO
- CPO and mason

Channels

- Deliver to cooperatives for sale to modern dairy-processing sector
- Farmer signs carbon clause with BIRU to cede rights to Hivos
- Hivos to voluntary carbon

Customers

Cooperatives and from there to Nestlé

Cost structure

- Cows
- Labour
- Farmer cost-share for digester (up to IDR6 million)
- Time and space for drying slurry – 1 week to dry from 90% to 70% water content
- Time and effort for transporting slurry to crop and pasture fields. Difficulty in applying in rainy season
- Labour cost of applying slurry IDR400,000/ha (compared to IDR50–100,000/ha for chemical fertiliser)

Income/benefits

- Sale of milk to dairy processor (Nestlé, Ultrajaya, Indolakto): price from cooperative up to IDR4,700/L if high quality. Large-scale farmers (with 5–10 cows/25% of cooperative members) deliver 50L/day. Half of cooperative members (1–2 cows) deliver <10L/day. A three-cow system at 35L/day and IDR4,300/L would give sales of IDR150,000 (EUR10.6)/day.
- 0% interest credit from Nestlé for installation
- Biogas – savings on LPG
- Cost savings from reduced fertiliser use. Example: reduction of 200kg/ha worth around IDR270,000
- Higher crop productivity. Example: maize yield increase of 0.5t/ha worth IDR1 million/ha
- Potential sale of bioslurry
- Potential added income from value-added activities from bioslurry use – worm cultivation, aquaculture etc

Key

____Traditional markets linkages (food, milk)
____Biogas and bioslurry linkages
____Carbon offsets linkages

How much?

Source: Vorley *et al.* (2015) based on Lundy *et al.* (2012).

3.2 VALUE CHAIN MAPPING

Next, the farm enterprise is analysed within its wider context. We use a value chain map, another tool of the LINK methodology, to help understand what role PES might play within the existing dynamics of agricultural product and value flows (see Box 3).

Understanding these business models is key to the successful linkage of small-scale producers to markets and to establishing sustainable trading relationships. This includes, for example, insights into what costs associated with the delivery of the ecosystem services can or cannot be handled by the existing markets and what other players (such as development NGOs or government agencies) may be necessary to contribute towards these costs – especially for ecosystem services with a strong public good component (like climate change).

Value chain mapping allows us to explore the costs and benefits that the new carbon markets offer to farmers, and how both business components complement (or contradict) each other. This requires an understanding of who the actors are along the value chains attached to

BOX 3. WHAT IS A VALUE CHAIN MAP (VCM)?

Value chain maps look at each step in a business that adds value to a product. In the context of PES in smallholder agriculture, VCMs help us understand the dynamics of existing agricultural flows (products and value), the key actors within the chain and their respective roles. A VCM is useful to:

- Define relationships and interconnections,
- Understand the flow of products, services, information and payments (ie value),
- Enhance communication between different actors, and
- Identify entry points or key leverage points to improve the value chain.

Value chain maps can also help identify the partner network, whose objective it is to support, intervene or assist the different links of the chain and facilitate the development of the business. Although not included in the value chain's core stages, these partners often play a critical role in the functioning of the business and enable the chain to operate efficiently. In particular they are a vital component in ensuring the delivery of ecosystem services.

Through value chain maps we also identify the larger socioeconomic systems and institutions in a country, either formal (ie legislation or laws) or informal (ie cultural practices) operating at diverse scales. These institutions affect not only the value chains of different products (eg coffee, dairy) but also the potential of PES as an economic instrument that affects producers' decisions.

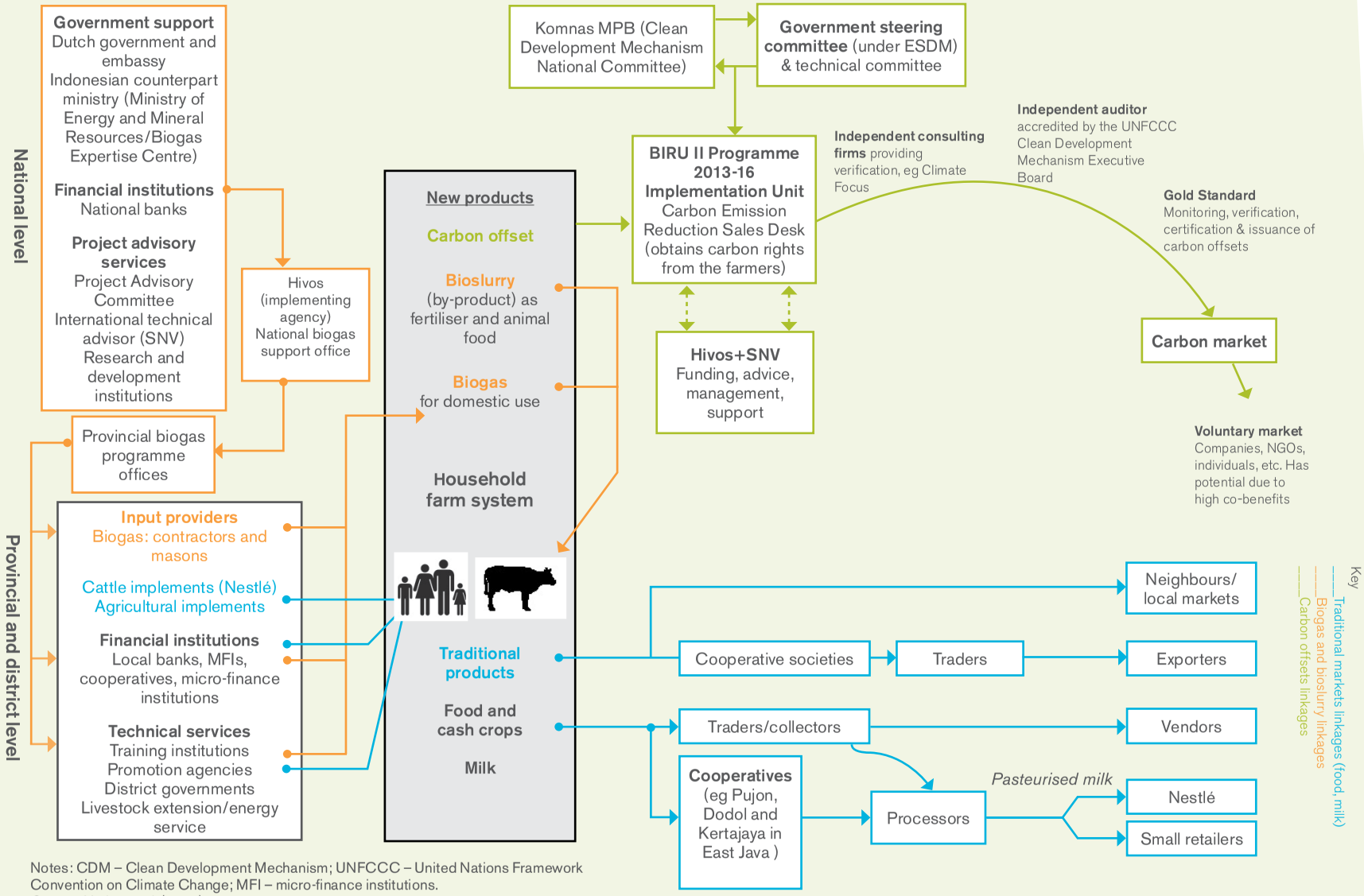
Source: Lundy *et al.* (2012)

the industry in the area (such as coffee or milk). Actors include, for example, input providers, those dealing with processing and wholesale commercialisation, as well as those associated with the newly created carbon link. At the start of the chain, the potential for carbon revenues to promote the participation of small-scale farmers (our target group) will depend on the different actors' business models, and their capacity for and resistance to change. Figure 4 presents an example of a value chain for carbon and domestic biogas at the farm level in Indonesia.

3.3 VISUAL ANALYSIS OF OPPORTUNITIES AND BOTTLENECKS

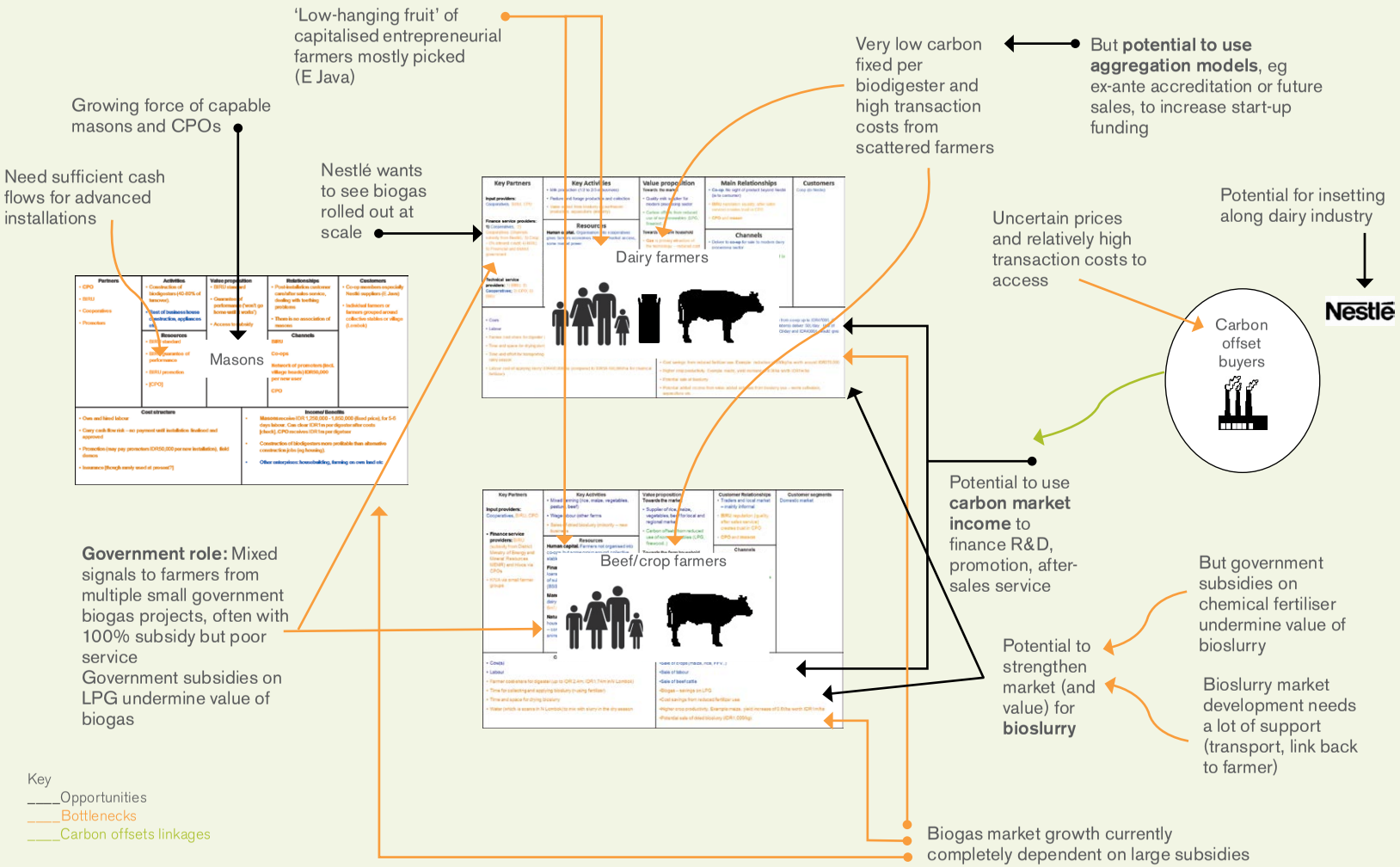
Taken together, the Business Model Canvas and value chain map can be used to identify the main opportunities and bottlenecks and imbalances faced in the carbon proposition. Each of the partner profiles explored in the individual reports is carefully analysed to highlight the potential entry points and areas to concentrate on in terms of upscaling. Lessons from all of the projects included in this research are presented in Section 4. Figure 5 presents an example of how we have brought together the business canvas and value chain information to analyse the carbon proposition of domestic biogas in Indonesia.

FIGURE 4. VALUE CHAIN DEPICTION FOR DOMESTIC BIOGAS AND CARBON IN INDONESIA



Notes: CDM – Clean Development Mechanism; UNFCCC – United Nations Framework Convention on Climate Change; MFI – micro-finance institutions.
Source: Vorley *et al.* (2015).

FIGURE 5. ANALYSIS OF OPPORTUNITIES AND BOTTLENECKS FOR CARBON AND BIOSLURRY, INDONESIA



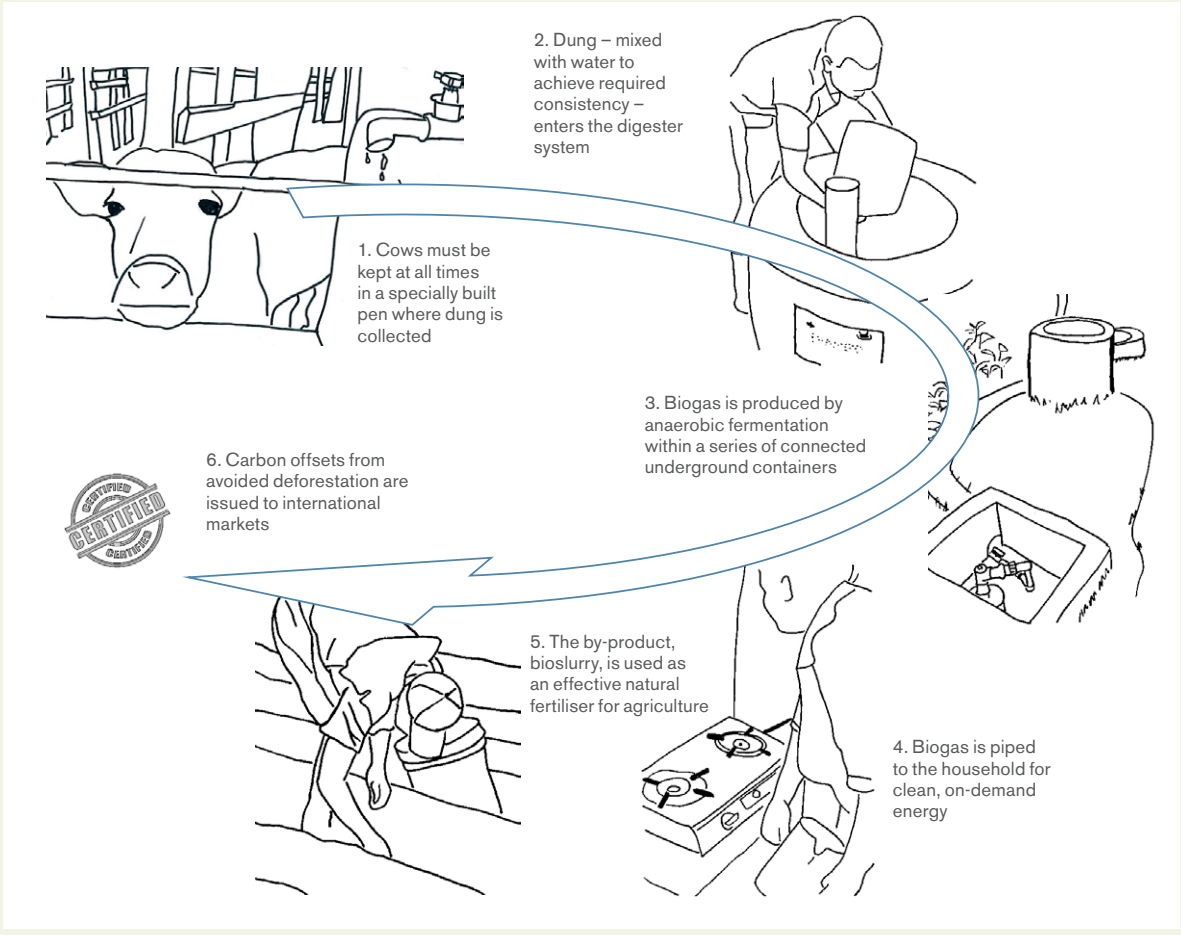
Notes: CPO – construction partner organisation; LPG – liquefied petroleum gas.
Source: Vorley *et al.* (2015)

3.4 AN EXAMPLE OF PES IN AN AGRICULTURAL BUSINESS MODEL

We use the example of the Kenya National Domestic Biogas Programme (KENDBIP), one of the projects from this series, to illustrate our methods of analysis.[6]

By promoting the installation of small-scale biodigesters, KENDBIP seeks to phase out households' dependence on firewood and charcoal for cooking. Apart from the benefits in terms of environment and energy, substituting conventional cookstoves with stoves fuelled by biogas has positive impacts on health and sanitation – for instance by reducing smoke within the household and providing on-demand energy for cooking and boiling water. There are additional on-farm benefits in the form of bioslurry, a by-product of the digester, as a substitute for chemical fertilisers to improve agricultural productivity (see Figure 6). And there are wider economic benefits, for example, jobs created by a new market for biogas-related products

FIGURE 6. HOW DOMESTIC BIOGAS WORKS



6. For more information about KENDBIP see: www.kenaff.org/node/30

and services, such as the supply and upkeep of biodigesters.[7]

The KENDBIP project has gone through two main phases since its introduction in Kenya in 2009. In its first phase, from 2009 to June 2013, householders could receive a subsidy to cover 30 per cent of installation costs for a biodigester (25,000 Kenyan shillings or KSH; roughly €223). In the second phase from June to December 2013, the subsidy was reduced to 20 per cent of installation costs (KSH18,500 or roughly €160). The subsidy was withdrawn at the end of 2013.

Taking the example of a **dairy farm with a biodigester** as the point of origin for carbon credits generation, we can identify the key products, inputs and outputs:

1. **Main farm system outputs, for household consumption and farm enterprise:**
    a. **Horticulture/grains and food crops** – for household consumption and for sale, mostly via informal markets. This includes growing cattle feed for the farm.
    b. **Milk** – for household consumption, as well as local formal and (mostly) informal markets.
    c. **Cash crops** like coffee – traded in formal export markets.
    d. **Biogas** – as a source of energy for the household.
    e. **Bioslurry** – the 'processed' manure from the biodigester is a valuable farm input that replaces chemical fertilisers and increases productivity. It can also capture and store carbon: our Indonesia research shows that bioslurry has a potential of 2.4 tonnes of CO_2e offset per hectare with current use.
    f. **Carbon offsets** – for which farmers transfer the rights to KENAFF by signing a clause in their contract.
2. **Input providers to the farm system, including:**
    a. **Masons** who provide and install the domestic biogas technology.
    b. **Cattle inputs and genetics**, including public and private sector (eg Livestock Genetic Society and dairy companies such as Brookside, Spin-it and KCC) working together to provide services that ensure the health and viability of the herd.
    c. **Agricultural inputs**, including seeds and farming equipment. The introduction of biogas (and bioslurry) into the system eliminates most or all need for firewood and fertilisers within the family farm and household.

7. The new biodigester supply chain is expected to provide jobs for nearly 400 people as masons, field supervisors, etc. Also, the programme is expected to avoid emissions of 73,623 tonnes CO_2 equivalent, which includes various sources including a reduction in both firewood demand and charcoal valued at approximately €1.9m and €2.4m respectively. Cleaner energy technology is expected to benefit over 15,000 women and men, and 38,800 children, with time saved from fetching firewood estimated to be 15–18 million hours per year, which can now be used to invest in the rest of the household or for children to study.

d. **Financial services**, including local savings and credit cooperative organisations (SACCOs), non-governmental organisations (NGOs), community-based organisations (CBOs), government departments, and special smallholder programmes such as 4S@Scale.[8]

e. **Technical and extension service providers** for the agricultural enterprise (such as Ecom Agroindustrial Corporation for coffee)[9] and for bioslurry/biogas/carbon (including KENDBIP, the African Biogas Partnership Programme, Hivos and SNV).

3. **Main market outlets, including:**

a. **Formal and informal markets** for conventional produce like horticulture, milk, and coffee.

b. **Carbon markets**: although the carbon offset is 'created' at the farm level, the commodification and trading process takes place off the farm through other stakeholders (KENAFF, Hivos/SNV, Gold Standard). Consultant groups like Climate Focus provide additional technical support.

Figure 7 presents the value chain, prepared after meetings with key experts in Kenya. Figure 8 presents a summary of the main relations from the point of view of the farmer, as well as the key opportunities and bottlenecks that the analysis highlighted. Figure 9 summarises the main opportunities and bottlenecks from the point of view of the project developer. In-depth analysis of each project included in the research is presented in the respective project reports.

Key opportunities for carbon and domestic biogas include:

- Domestic biogas has clear benefits for the household. It increases the value of cows and the dairy component within the household and creates an opportunity to work with dairy buyers (such as Nestlé in Indonesia) who can provide technical support or co-funding for installing the biodigesters.
- The masons who construct the biodigesters and those who supply them are an emerging sector with potential to make the biodigester technology accessible, and provide long-term, in-country support.
- Neighbour-to-neighbour training is potentially useful for expanding domestic biogas, but needs to be coordinated.
- From the household perspective, there are clear benefits of biogas and bioslurry once the digester is installed.
- Carbon funding can be used to provide long-term maintenance and technical support.

Key bottlenecks for carbon and domestic biogas include:

- Carbon price: In general, the true social and environmental cost of climate change is still not reflected in buyers' willingness to pay for carbon offsets. While internal carbon estimates at company and country level are relatively high (Kossoy *et al.,* 2014), existing prices paid in markets are a fraction of these values – and the downward trend of carbon offsets is a concern, in terms of the benefits

8. See: www.hivos.org/activity/sustainable-and-secure-smallholder-systems-scale

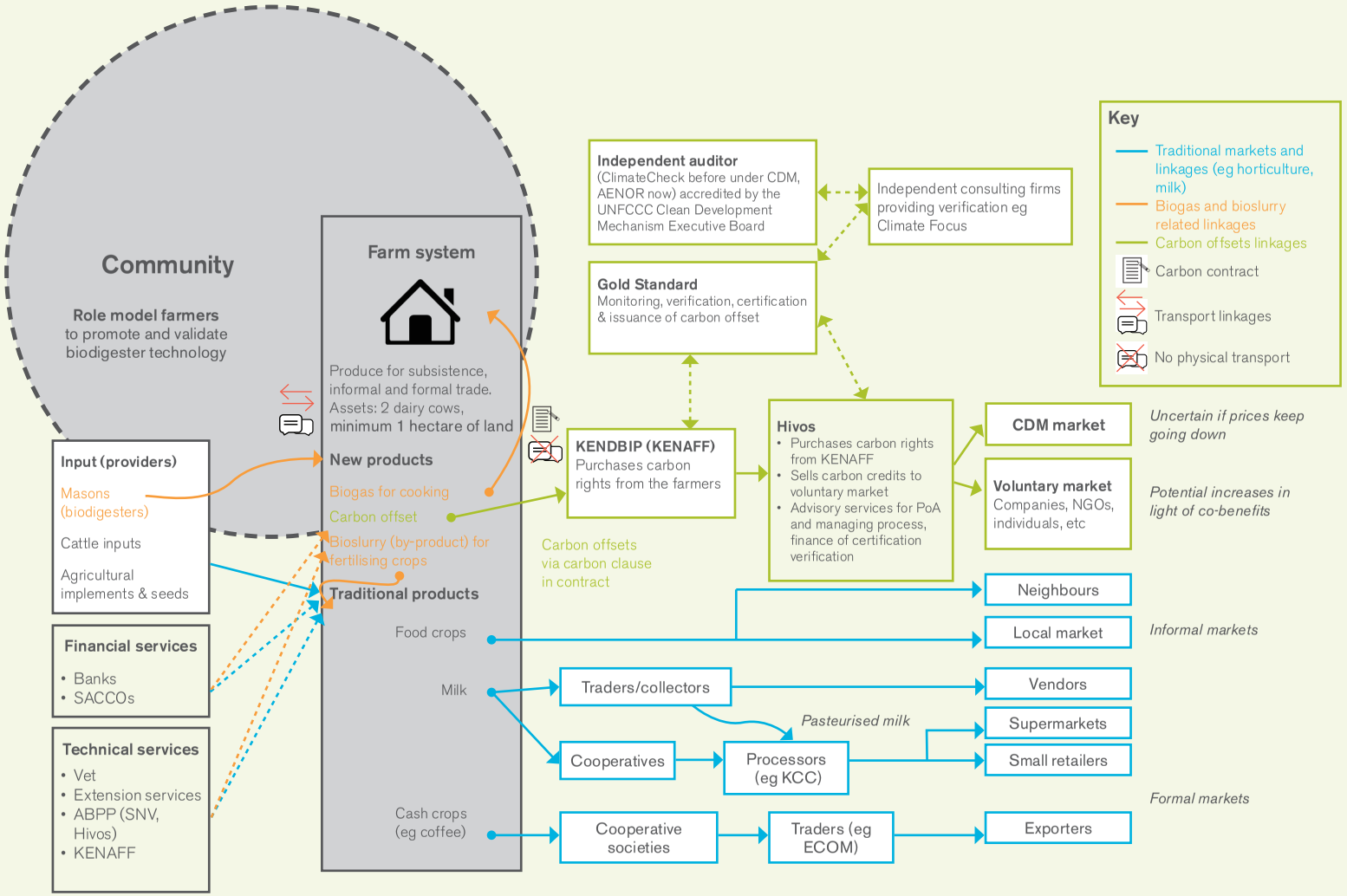
9. See: www.ecomtrading.com/en/about-ecom.html

compared to the cost of accessing them. In Kenya the project was initially set to enter the Certified Emission Reduction (CER) market but the dramatic decline in prices (€20–30 in 2007–2010 to below €1 in 2013–2015) has prompted a move to the voluntary offset market (see also glossary).

- Low carbon generation per biodigester – coupled with low prices – means the carbon potential per household is also low.
- Lack of transparency about the benefits from carbon/PES at the onset of the project. It is still not clear how carbon revenues will benefit farmers.
- In terms of biogas technology there is still a relatively high entry cost for installing digesters and the zero-grazing buildings needed to house the cattle.
- Difficulties accessing ex-ante funding through carbon (selling offsets based on future activities). The Gold Standard and the International Carbon Reduction and Offset Alliance (ICROA) only accept ex-post (or performance-based) payments of carbon credits. This means that biodigesters need to be paid for by donor funding, public subsidies or by farmers (which Kenya is now moving towards), through loans mostly from banks rather than SACCOs. This excludes many farmers who are not able to access additional/alternative funding. In addition the Indonesia biogas programme demonstrated that a 100 per cent subsidy for poor farmers has negative impacts in terms of distorting private markets.
- While we did not analyse the impact on numbers of participating farmers, it is highly likely that eliminating the subsidy will exclude even more farmers, making the technology most accessible to relatively wealthy farmers.

A farmer planting trees in Peru © Norandino

FIGURE 7. VALUE CHAIN EXAMPLE: DOMESTIC BIOGAS IN SMALLHOLDER AGRICULTURE IN KENYA



Notes: ABPP – African Biogas Partnership Programme; AENOR – Spanish Association for Standardisation and Certification; CDM – Clean Development Mechanism; KCC – Kenya Cooperatives Creameries; KENAFF – Kenyan National Farmers Federation; PoA – Program of Activities, a modality of project development under the Clean Development Mechanism; UNFCCC – United Nations Framework Convention on Climate Change.
Source: Value chain constructed following interviews with key informants from KENAFF, Hivos and Climate Focus.

FIGURE 8. OPPORTUNITIES AND BOTTLENECKS: CARBON AND DOMESTIC BIOGAS FOR SMALLHOLDER FARMERS IN KENYA

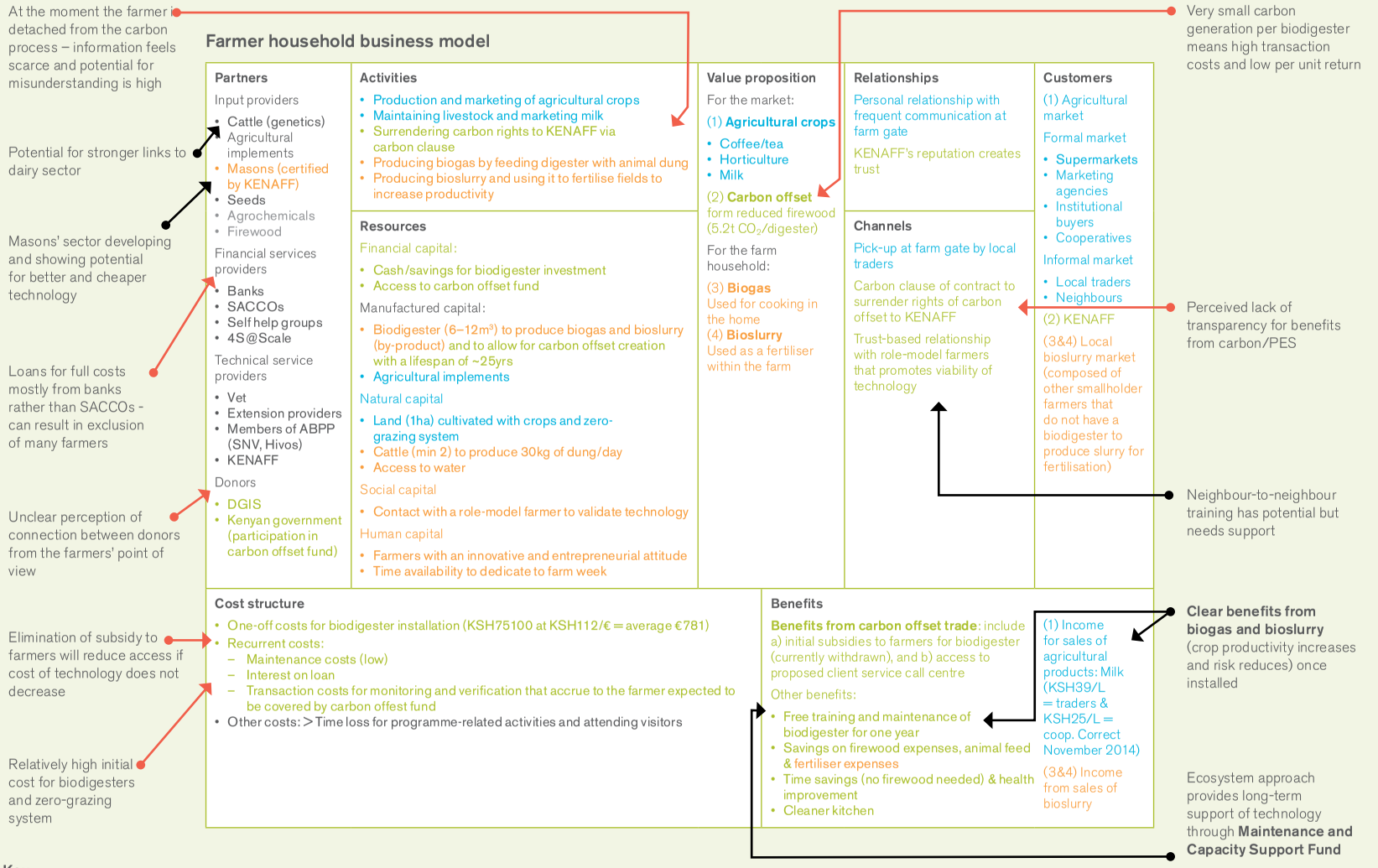
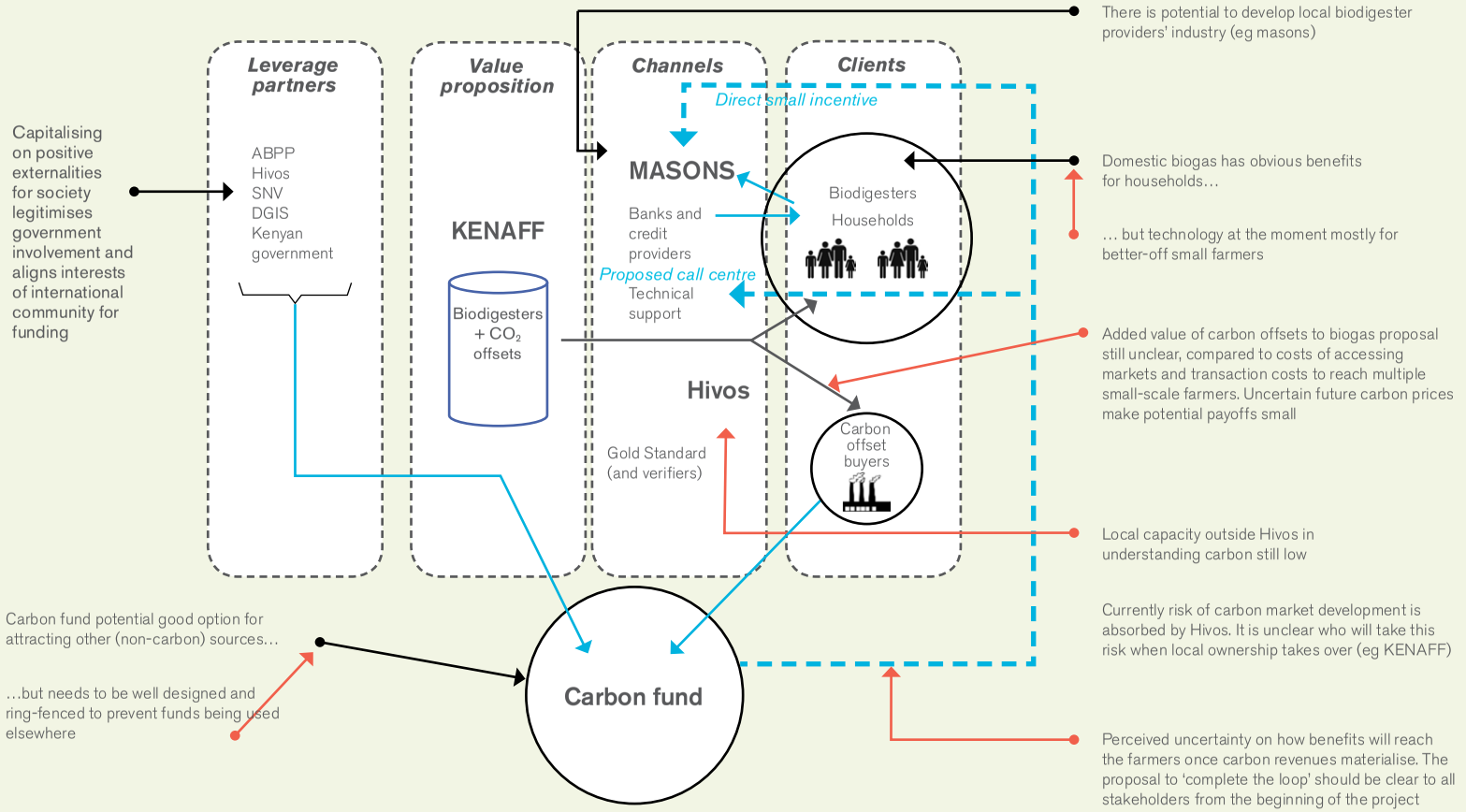


FIGURE 9. OPPORTUNITIES AND BOTTLENECKS: CARBON AND DOMESTIC BIOGAS FOR THE PROJECT DEVELOPER IN KENYA



Notes: DGIS – Ministry of Foreign Affairs of the Netherlands; KENAFF – Kenyan National Farmers Federation.

FOUR
KEY INSIGHTS FROM THE HIVOS-IIED LEARNING TRAJECTORY

We set out to learn whether PES offers a viable financing strategy for smallholder agriculture. Our short answer is: yes, but it depends on how well PES fits within the smallholder enterprise and the state of the carbon markets.

While significantly different in geographic location and scale, our partner projects have helped to shed substantial light on these issues, which are explored in detail in each of the project reports in this series. In this section we highlight some of the main lessons across the wide range of experiences on how PES fits within the smallholder agriculture enterprise.

4.1 CARBON PROJECTS SHOULD BE TREATED AS ENTERPRISES

4.1.1 The Business Model Canvas as a methodological approach

We found business models and value chains useful for providing a 'health check' of the project, and a graphical representation of what it means to enter carbon markets. The Business Model Canvas 'bite-size' approach of **what**, **how**, **who**, and **how much?** helps to compartmentalise issues and seek targeted solutions, while still maintaining the bigger picture. While a PES analysis can be done without reference to existing value chains, like coffee, by making these explicit the project is better able to identify entry points where the incentive could maximise changes in behaviour. It can also provide a platform for action: by highlighting the gaps it is easier to understand how to tackle them.

We found situations where some stakeholders see carbon as a subsidy and not as a part of a business. However, it is clear from our analysis that the opposite is true and PES must be seen as a value proposition within existing business strategies. Looking at value chains and the business canvas we see the effort and commitment needed to reach these emerging markets. The carbon proposition should be approached as a new component of the enterprise, to avoid unexpected impacts (eg unclear break-even points or unforeseen costs carried by farmers) and maximise potential benefits. Upscaling beyond the pilot stage requires a firmer stance on understanding the business of carbon, from its creation to its marketing.

4.1.2 Insetting has potential within strong value chains

We looked at one case of insetting (in Peru) and two potential insetting cases (coffee in Guatemala and Nicaragua). Insetting (see glossary) takes place when buyers purchase carbon offset credits generated within their own value chain. For example, coffee roasters in Italy can choose to offset their carbon emissions via a coffee cooperative (eg the Promoter of Cooperative Development (PRODECOOP)) in Nicaragua. The money from the offset is re-invested at the base of the supply chain, supporting actions that improve resilience to climate change.

Intercropping provides shade for coffee and beehives in Guatemala © Alexandra Amrein

Insetting can work where there are strong organisations along the value chain of a cash crop, like coffee. It will not work where the bulk of agriculture produce is for subsistence or for local or national markets because these markets are less likely to pay for carbon offsets. In the cases we reviewed, a bottleneck identified is the existence of multiple certification schemes and labels (such as Fairtrade, Organic Crop Improvement Association and BioLatina in the case of PRODECOOP) and in some cases some cooperative members' wariness of proposing another standard to their buyers. In these cases projects may need to: 1) re-assess their existing certifications and look for potential overlaps and complementarities, for example the Fairtrade-Gold Standard Carbon Certification, currently being developed and 2) communicate better to buyers about the benefits of insetting, giving the guarantee that funds will be earmarked for ecosystems that affect their own value chains.

4.1.3 Risk

Similar to agricultural products, prices for carbon offsets are volatile and unpredictable. Ways of mitigating risk, such as budgeting against different price scenarios, sharing costs and diversifying production should be incorporated into the business model from the start, to have a transparent approach to sharing risk, benefits and costs.

4.1.4 Sales

While the projects vary in maturity, we found that they shared weaknesses in marketing capacity. The main exception is Taking Root in Nicaragua, which had a strong marketing component built into the business model from the beginning. Sierra Piura has achieved multiple sales through insetting, with prices significantly above the market average, but has only managed to engage two buyers and needs to expand. We find that for most of the other smallholder projects, however, there are few capacities and/or partnerships being created to ensure continuous sales beyond pilot stages.

4.1.5 Keeping stakeholders interested

Another problem identified is the risk of losing out on initial investment if farmers or cooperatives decide not to continue with the project. Different partners, such as the Educational Corporation for Costa Rican Development (CEDECO) are providing support to farmers, such as technical documents and baselines surveys, to access these carbon markets on the expectation of recouping costs when carbon sales materialise. However, there is no guarantee that communities or local partners will decide to continue beyond a pilot stage and upscale, resulting in the loss of the initial investment.

This is a similar problem to the agricultural 'outgrower' models, where investors provide support with technical inputs, yet farmers may choose to side-sell their produce to buyers outside of the project agreement (in carbon markets farmers may choose not to sell – ie not to participate in the project and sign over carbon rights). We found that knowledge of the break-even point of the projects needs to be known from the beginning by all stakeholders, and that regular efforts need to be made to maintain farmers' interest.

4.2 INTERNATIONAL CARBON PRICES ARE DIVERSE AND VOLATILE

Carbon pricing is a mechanism used to internalise the external cost of climate change into economic decision making. According to Kossoy *et al.* (2014) about 40 national and 20 sub-national jurisdictions are putting a price on carbon, trying to fill the gaps in international carbon regulation with a variety of instruments such as carbon taxes, emissions trading schemes and crediting mechanisms. **The prices that emerge are very diverse** – ranging from US$1 per tonne of CO_2e in Mexico to US$168/t$CO_2e$ in the Swedish carbon tax – **and volatile**, sensitive to sudden and unexpected changes in economic parameters. According to de Mooij *et al.* (2012), carbon pricing should be aligned with environmental damage or climate stabilisation goals, and start at about US$30/t$CO_2e$ at the global level.

This range of prices, however, is not reflected in the actual prices for carbon offsets in international voluntary carbon markets, which we discuss below.

Projects that include activities like reforestation, organic agriculture and cleaner energy technologies are increasing their presence in voluntary global carbon markets. These emerging projects are important for road-testing the economic viability of incentives to tackle climate change, and the potential for incorporating 'co-benefits' – the indirect benefits gained from efforts to reduce greenhouse gas emissions, like community rights or biodiversity protection. The actions of voluntary projects and buyers play an important role in sending signals to project developers, other buyers and governments, and helping to shape and inform global climate talks and policies.

According to Forest Trends, in 2012, buyers committed more than US$523 million to offset 101 million tonnes of greenhouse gas emissions from projects including reforestation, protection of tropical forests and clean cookstoves (Peters-Stanley and Yin, 2013). Their recent publication reports a demand for carbon offsets of 87 tCO_2e in 2014 (Hamrick and Goldstein, 2015).

Currently, the majority of offsets are transacted in large countries (USA, Brazil, India and China) and smallholder projects still play a very small

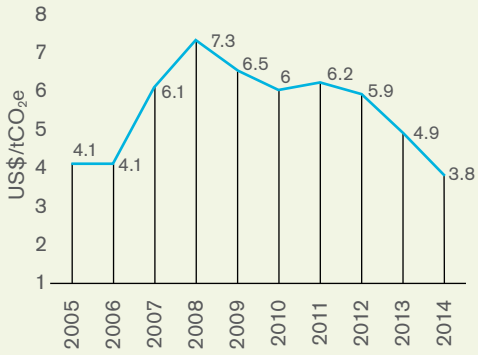
role – with smallholder agriculture just beginning to make an entrance. Government-to-government agreements under REDD+ – reducing emissions from deforestation and forest degradation – have made it the dominant instrument in the forest sector, reaching an all-time high of 25 million tonnes in 2014.

Voluntary offset prices have remained relatively resilient with respect to global carbon offsets but they are decreasing. The average price of voluntary offsets rose to its highest in 2008, but has been declining ever since. At **US$3.80 per tonne of CO_2e it reached its lowest level in 2014** (see Figure 10). Projects that generate co-benefits get, on average, an additional US$2.70/ tCO_2e, and also show significantly more variations in price, depending on the type of project. The downward trend in prices is a concern: many projects need to either adjust their expected payoffs from future carbon sales, or they need to improve their marketing skills to convince buyers to pay more for the co-benefits; and they certainly need to streamline their approach to keep transaction costs competitive. Dropping prices reflects a situation of supply exceeding demand: while certificates representing 76 tonnes of offset CO_2e were sold in 2014, nearly the same amount (63 tCO_2e) remained as unsold stock, either from a lack of buyers or from project developers waiting for better future prices.

The added revenues and investment from an ecosystem service approach in agriculture and forestry can help shield farmers from market volatility, increase producers' yields and promote a long-term approach to sustainability. This demand enables the development of innovative ways to help reduce emissions, and road-tests strategies that can inform policy developments. However, because they are new and have to develop and test methodologies, **these projects bear the brunt of the costs for research and development**, and standard methodologies to provide transparency in the markets still remain very expensive and restrictive in the smallholder context.

FIGURE 10. AVERAGE HISTORIC PRICE OF VOLUNTARY CARBON OFFSETS (US$/T)

Historical average price per tCO_2e



By type of project (US$/$tCO_2$e)

	Cumulative	
	2014	2007–2014
Average voluntary offset price	3.8	5.8
Average additional amount for projects with co-benefits (cookstoves, community sharing, etc)	2.7	NA
Average REDD price	4.3	5.2
Cookstove project offsets (large-scale projects tend to work under CDM only)	5.8	10.2
Afforestation/reforestation	8.9	7.7
Wind projects (bulk offsets)	2.1	4.6

Notes: tCO_2e – tonnes of carbon dioxide equivalent; CDM – Clean Development Mechanism; REDD – reducing emissions from deforestation and forest degradation. Average price of voluntary carbon offsets has been declining since 2008, with a lowest price (US$3.80/t) in 2014. Average REDD prices vary: planned deforestation offsets – like timber or large-scale agriculture conversion – had an average of US$3.10; unplanned deforestation – from smallholder agriculture, informal mining or rural development – held a price of US$5.20.

Source: Hamrick and Goldstein (2015).

4.3 STRUCTURES AND SYSTEMS TO DELIVER CARBON OFFSETS VARY

While smallholder farmers have a number of common attributes (relatively small plots of land, limited access to inputs and lower incomes) they remain highly heterogeneous. Smallholder carbon projects can be very different from each other in the way they create carbon offsets, for example by reducing dependence on firewood; by increasing biomass through reforestation; or by reducing emissions of greenhouse gases like methane and nitrous oxide through improved farm management.

Accounting methodologies affect the amount and timing of offsets. The methodologies used to account for carbon offsets vary. Projects with biodigesters offset 3–5 tCO_2e per year in terms of avoided deforestation from the reduced use of firewood (with an accreditation period of about 20 years, which is roughly the useful life of the digester). Measures of organic agriculture in coffee suggest that over 80 tonnes of carbon per hectare are already sequestered (for existing stock), and on average an additional 5.5 tCO_2e is sequestered per hectare for new activities. Studies of reforestation in degraded lands in Nicaragua suggest a net capture of about 140 tCO_2e/ha over 50 years (roughly the time it takes to transition from degraded land to sustainably managed forest). Crediting standards (like the Gold Standard and Plan Vivo) use these methodologies to estimate the amount of carbon offsets that can be sold.

The Gold Standard only allows ex-post or performance-based accounting. This ensures trust in the market: the offsets sold have actually been created, for example the offsets created at the end of a year from a working biodigester. It does not allow for existing stocks of carbon to be included in the calculations, which was perceived by several stakeholders in Central America as a disincentive for existing good practices.[10] The Plan Vivo Standard, on the other hand, allows for ex-ante accreditation: some projects that fulfil their criteria are allowed to sell offsets based on future tree growth. Ex-ante accreditation is contentious, however – overall governing bodies like ICROA (see glossary) do not allow this method because of the risk of non-delivery. Yet for smallholder projects, the access to start-up capital from ex-ante accreditation can be decisive in determining whether or not they enter the carbon markets.

High start-up and transaction costs. Because carbon is a relatively new concept in smallholder agriculture there are many costs involved in market discovery (market creation and barriers to entry/exit). Across the range of projects described in this series, we find heavy initial transaction costs, linked to reaching smallholders, but especially with regards to the process of obtaining accreditation. Most international certification bodies are currently not designed for smallholder projects and the administrative burden can be significant. In several of these projects large amounts of resources – some from ODA and/or from local groups like NGOs – have

10. The market component of PES can appear to penalise existing good behaviour by focusing only on 'additionality' (requiring additional emission reductions to what would have occurred in the absence of project activities). The CamBio2 methodology, promoted in coffee farms in Guatemala and Nicaragua to account for stocks of carbon, has clashed with the Gold Standard over this question.

Demonstration plot for organic coffee in Guatemala © Alexandra Amrein

been spent on creating the extra 'arm' needed to reach international carbon markets: auditors, the certification process, and so on.

Ex-ante accreditation or forward sales to raise start-up capital. For smallholder projects ex-ante accreditation, or forward sales of carbon credits (similar to agricultural commodities) can be a way to allow project managers to raise seed capital. Although increasingly recognised as a possible solution to initial funding, ex-ante accreditation has several hurdles to overcome to be accepted by the more recognised carbon standards, like the Gold Standard, and the governing bodies like ICROA. Ex-ante accreditation requires long-term commitment and a guarantee of permanence, and small farmers that are members of groups with long-established legal status have an advantage over newly created groups. For example, ex-ante accreditation, or ex-ante sales of carbon, may be easier in insetting projects (such as coffee projects already in place in Peru, and potentially in Nicaragua, Guatemala and Kenya, and through the dairy industry in Indonesia) where companies and stakeholders already operate in tested channels (such as cooperatives and intermediaries).

4.4 MONITORING AND EVALUATION FOR PES NEED TO BE USEFUL AND AFFORDABLE

At the moment, monitoring and evaluation (M&E) tends to be 'extractive': a time-consuming process in which farmers feel evaluated for the single purpose of complying with the standards' requirements. As such, M&E is seen as a requirement to convey legitimacy of actions and transactions to **buyers**, but can fail to provide legitimacy of actions and benefits to **farmers**. This is a bigger problem when there is little expectation of a meaningful payoff to farmers from offset sales.

However, M&E from PES can have many benefits beyond being a requirement for certification. For the farmer, it can provide feedback on the quality

of their management strategies for their new technologies, allowing them to make adjustments if required and extending the useful life of their investment. For example, CamBio2 places high importance on soil nutrients – and helping farmers who are in default or underperforming. This methodology is still very expensive in relation to revenues from carbon markets, and costs either need to be further reduced (perhaps by evaluating a smaller sample of farmers and reducing the number of variables monitored) or to ensure access to other (non-carbon) streams of funding for its implementation.

The eventual creation of a client call centre in Kenya's domestic biogas programme will also provide direct access to problem-solving for farmers, who will be better able to address problems with their biodigesters – and, importantly, learn how to improve the benefits of using bioslurry on the farm (from wet/dry to composting). This support from M&E could happen over the long term, benefitting farmers' technology longer than traditional projects would.

However, feedback channels would need to be in place: 1) from the sample to the population, so that results from monitoring are communicated back to other participants, and 2) from the project developers to the farmers, in order to propose a solution to an identified problem. There is a significant trade-off faced by smallholder carbon projects in delivering co-benefits: aggregating a number of farmers will increase economies of scale, but further reduce the possibility of providing relevant feedback to individual farmers.

4.5 CLEAR BENEFIT SHARING FOR THE FARMER

The projects we reviewed – along with countless other smallholder and community projects – directly target the voluntary carbon markets as ways to ensure higher offset prices. These projects face higher transaction costs from aggregation but importantly they must also **demonstrate that the benefits created from the carbon proposition are reaching the farmers that create these offsets**.

What form do the benefits take? The nature and timing of the benefits are linked to the accounting methodology, the accreditation allowed (whether ex-ante or ex-post) and the offset prices.

We found that some projects are better than others at outlining the nature of the benefit from the carbon proposition.[11] For the coffee cooperatives the benefits are (or will be) divided between the first- and second-level cooperatives: one as project developer and the other as a direct link to the farmers. Carbon revenues will go towards providing technical support and group investments (for organic compost facilities, drip irrigation) but without cash payments to the farmer. Reforestation projects use a cash payment alongside technical support: Taking Root makes payments to farmers during the first ten years of reforestation and Sierra Piura makes a small one-off payment per tree.

In Kenya, the benefits of having the biodigester – and the bioslurry generated through the process – are clear. But we found little evidence of a clear proposal of how the carbon revenues (when and if eventually available) will benefit farmers

11. While all standards require the presence of co-benefits, Plan Vivo places a strong emphasis on how they are distributed (eg 60 per cent of carbon revenues must be allocated to farmers, and it strongly encourages the use of cash payments).

individually, because the amount of carbon captured by each biodigester is very small. One proposal in Kenya is to pool the revenues from carbon sales to fund a call centre, which will provide a collective benefit in the form of long-term technical support. Others suggest using these funds to upscale the dissemination of biodigesters (which are paid for with funds from non-carbon sources including private loans).

Smallholder projects rely on aggregation to achieve economies of scale to generate carbon offsets and raise finance for meaningful investments. However, aggregating the payment at one level away from farmers (such as to cooperatives or client call centres) can result in lower levels of farmer involvement, accountability, transparency and benefit sharing if farmers do not see how they benefit from carbon offsets 'produced' at farm level.

We found that some projects are still not transparent about the nature of 'payment trails'. Contracts need to be written – rather than verbally communicated – and information needs to flow better between organisations. Agreements should be clear on what to do with future benefits and ways to recognise how much, and to whom, they should pay. When they materialise, payments could seriously erode trust if a written agreement is not in place. Again, this is a very difficult issue: how to balance transparency and manage expectations in a highly volatile carbon market.

Ring-fencing PES revenues for climate adaptation. Earmarking payments or rewards for activities that improve sustainable agriculture is the most direct route to ensure 'conditionality' (eg agreed activities take place) and the long-term permanence of these activities, especially in ex-ante projects. However, ring-fencing could also be perceived as undemocratic and/or paternalistic, rather than farmers or cooperatives choosing the best way to invest their carbon revenue. Performance-based (or ex-post) payments on the other hand are not limited by the conditionality issue: only offsets that are already created are sold.

We also found cases where some costs remain unknown or unclear among all the participants. For example, while the biogas project is relatively clear on the costs to farmers of taking part (for example how much the technology and the zero-grazing cattle housing facilities cost), in other projects it was not always clear what the costs were for converting from conventional to organic farming. The information exists, but the channels to communicate it to farmers have not been fully put in place. This misunderstanding of costs, and the expected payoffs, can lead to unrealistic expectations.

PES can exacerbate gender imbalances if no measures are taken. In our analysis we did not set out to answer questions regarding **gender** issues. However, we feel it necessary to make some observations. The literature on smallholding agriculture warns that men traditionally tend to appropriate revenues from cash crops. The introduction of PES therefore increases the risk of women being excluded from PES projects. With a few exceptions, almost all the experts and informants we spoke to during the fieldwork were men. However, we found examples of gender being incorporated in the design of the projects. For instance, tree nurseries (which require flexible labour time) are managed by women; and projects like Taking Root in Nicaragua and Ecotrust in Uganda have women technicians in their workforce to reinforce the image of empowered women in the villages where they work.

Domestic biogas has direct benefits for women in terms of reduced labour, time fetching or buying wood, and health benefits from less smoke in kitchens. But the bioslurry component – key to maximising profits in the farm enterprise, and possibly the leading factor in the Indonesia example – requires the availability of labour, either from the household or hired in. Women-headed households tend to lack this extra labour, and poorer women would not be able to hire extra labour. The participation of women in PES projects would increase if a cash payment to hire extra labour were included, but may be reduced if extra physical labour is required.

Pro-poor. From the outset our target group for analysis has been smallholder farmers. They have access to land, and are linked to cooperatives or groups. Although relatively poor, they are not as poor as landless farmers. We consider smallholders an important group to help identify the safety measures necessary to prevent them becoming poor or poorer, or to provide lessons that can help poorer farmers escape from poverty. For example, the project in Sierra Piura, Peru, extends the benefits of carbon revenues from insetting to poorer subsistence farmers as well as coffee farmers.

Within the projects we looked at we found that, if not carefully designed, new technologies for sustainable agriculture may be accessible only to wealthier smallholders who can pay (or have access to finance or good partnerships). PES can be designed to help less-wealthy farmers, for example by providing a partial subsidy to access the technology or at least providing technical support. In some national biogas programmes, government or donor subsidies (ie payments not from carbon revenues) are designed to be a flat rate (a set amount for biodigesters sized from 4 to 12 cubic metres, ie the price is the same, regardless of their size) which is considered a mechanism to favour less-wealthy farmers. But of course, this does not work for households without cattle (who already tend to be less wealthy than those who own livestock). In Cambodia the programme is working on a 'pro-poor' design, including a two cubic metre digester for households with one cow, potentially doubling the target group.

Selecting forest seedlings to plant in the field in Peru © Norandino

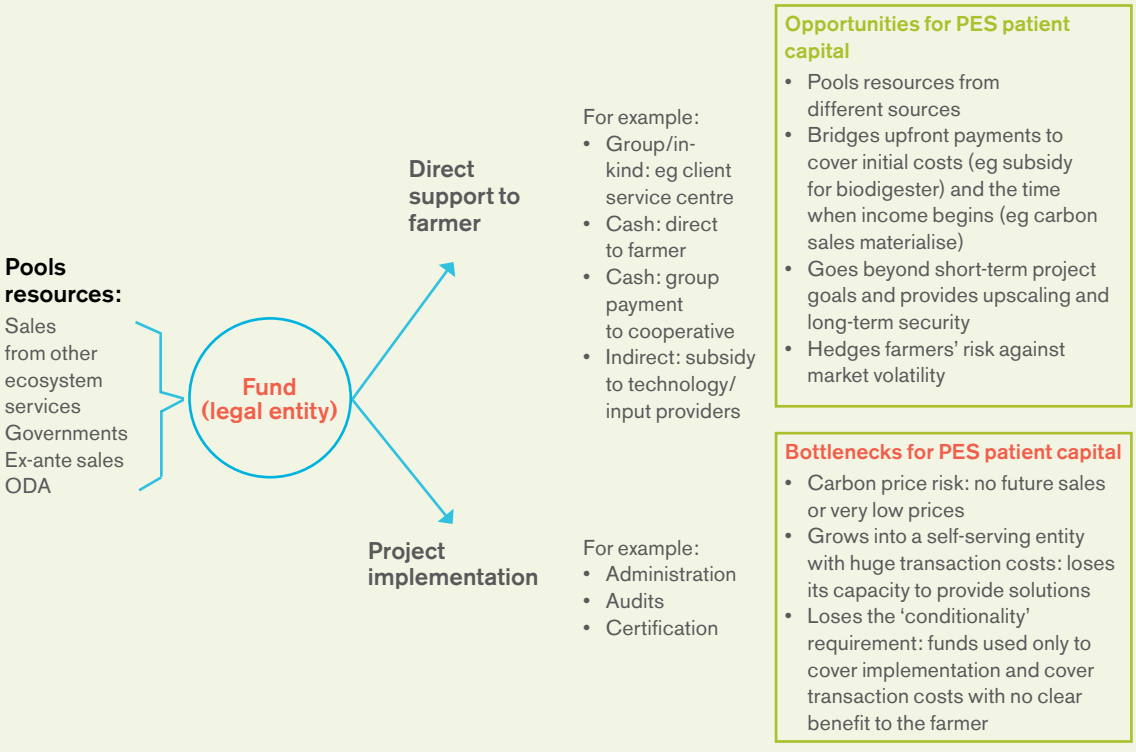
4.6 LONG-TERM 'PATIENT' CAPITAL FOR SUPPORTING CARBON MARKET CREATION

'Patient' capital – investments where the investor has no expectation of obtaining an immediate profit, in anticipation of more substantial returns in the future – can help provide meaningful funding for upscaling projects and ensuring long-term sustainability (see Figure 11).

Rather than passing the risk to smallholders, projects can create a legal structure in the form of a legal trust that will pool different sources of revenue, absorb risk, and aggregate future offsets, for example through ex-ante accreditation, or future carbon sales. This can help act as a bridge between up-front payments to farmers (for example a subsidy for digester installation) and the eventual payment from selling carbon offsets in markets. It can pool revenues from other sources (ODA, governments) to create 'levelling payments' that reward existing good behaviour at the moment of signing contracts, as well as new activities that generate carbon offsets sold through markets using performance-based or results-based accounting. It can also support the technical requirements and support on-farm activities.

A 'carbon fund' like this will have to go beyond 'projectification' (a short-term focus on individual projects) and changes in donor policies, government structures and so on, providing a long-term vision required to establish practices that will have a significant and lasting impact on ecosystems. There are, however, several risks attached to the creation of a carbon fund that need to be tackled: 1) the fund could become an excessively large, self-serving entity without real benefits for farmers; 2) money from the fund could be used only as rent-extraction to cover the technical costs of the carbon market (such as certification and audits) rather than helping activities on the farm; and 3) the market could become so risky that carbon payoffs do not materialise.

FIGURE 11. 'PATIENT' CAPITAL IN THE PES CONTEXT



Note: Patient capital is promoted as the most effective means of kick-starting sustainable commercial agriculture in Africa and delivering major benefits for smallholder farmers. See Palmer (2010) for more information.

FIVE
CONCLUSIONS

The lessons from our Payments for Ecosystem Services in Smallholder Agriculture series show that PES – and more specifically, carbon finance – can help increase sustainable agriculture, but some key considerations are relevant:

Carbon in smallholder agriculture is new and we are still learning. Market-based instruments for ecosystem services, including PES, have existed for some time, especially in the forest sector. However, experiences in the agriculture sector involving smallholders and communities are relatively new and involve a steep learning curve.

There need to be realistic expectations of carbon prices. There is a strong disassociation between the cost of climate change and adaptation, and the prices that buyers are willing to pay for carbon offsets especially in the short term. Sharply declining prices can affect the economic viability of a project, and this volatility needs to be incorporated in the carbon value proposition.

The share of costs and benefits across the value chain needs to be clearer. This should include the role of risk in carbon projects, to manage expectations.

Projects need to sell more offsets. We found that demonstrating the co-benefits of emission-reducing activities results in a higher, and relatively more stable, price of carbon for projects. The stagnation in carbon sales at project level is the result of a slowing down in international markets; but also highlights that local project managers need to improve their marketing to move beyond one-off deals. Although most of the projects discussed in this series are new, it is clear that efforts to sell more offsets need to be increased.

Transaction costs need to decrease. The role of project developers is key to ensure that upscaling takes place, by linking to other stakeholders – especially the private sector and/or local government bodies – where they exist. Mapping value chains is a useful exercise to highlight who these strategic partners could be to help deliver services while keeping down costs. Projects that use ICT systems to manage farmers and contracts and to monitor and allocate payments, are better placed to keep down transaction costs than those without ICT systems.

Overall, we find that while carbon revenues can and do offer an incentive that can be built into agriculture, the process is long and remains difficult for smallholders to engage in. Sharp declines and volatility in carbon prices make risk a key consideration, and the trade-offs between satisfying requirements to access markets need to be balanced against food security at farm level. None of these issues, though, are inherent to carbon markets and much can be learnt from treating carbon as a value proposition – rather than a subsidy – within smallholder farming systems.

REFERENCES

BIF (2011) What is 'inclusive business'? Briefing Note 1, Business Innovation Facility (BIF) and Innovations Against Poverty (IAP). See: http://tinyurl.com/bif-2011-inclusive-business

CIAT (2012) LINKing smallholders: a guide on inclusive business models. See: http://dapa.ciat.cgiar.org/linking-smallholders-a-guide-on-inclusive-business-models

Coase, RH (1960) The problem of social cost. *Journal of Law and Economics* 3, 1–44.

de Mooij, RA, Keen, M and Parry, IWH (2012) Fiscal policy to mitigate climate change: a guide for policymakers. International Monetary Fund, Washington DC. See: www.imf.org/external/pubs/cat/longres.aspx?sk=25864.0

Elkington, J (1994) Enter the triple bottom line. In: Richardson, AHJ (ed.) *The triple bottom line: does it all add up? Assessing the sustainability of business and CSR*. London, Earthscan.

Ferraro, PJ (2009) Regional review of payments for watershed services: sub-Saharan Africa regional review of payments for watershed services. *Journal of Sustainable Forestry* 28, 525–550. See: www.fao.org/fileadmin/user_upload/kagera/resource/Ferraro PES.pdf

Global Value Chains Initiative (2014) Concept and tools. See: https://globalvaluechains.org/concept-tools

Hamrick, K and Goldstein, A (2015) Ahead of the curve: state of the voluntary carbon markets 2015. Ecosystem Marketplace Forest Trends, Washington DC.

Henderson, C (2014) Insetting: a user guide. Plan Vivo Foundation, Edinburgh, UK. See: http://planvivo.org/insetting/wp-content/uploads/2014/12/InteractiveManual.pdf

Kossoy, A, Oppermann, K, Platanova-Oquab, A and Suphachalasai, S (2014) State and trends of carbon pricing. World Bank Group, Climate Change, Washington DC. See http://documents.worldbank.org/curated/en/2014/05/19572833/state-trends-carbon-pricing-2014

Lundy, M, Becx, G, Zamierowski, N, Amrein, A, Hurtado, JJ, Mosquera, EE, Rodríguez, F (2012) LINK methodology: a participatory guide to business models that link smallholders to markets. International Center for Tropical Agriculture (CIAT), Cali, Colombia. See: http://dapa.ciat.cgiar.org/wp-content/uploads/big-files/2012/LINK_Methodology.pdf

MEA (2005) Ecosystems and human well-being: biodiversity synthesis. Millennium Ecosystem Assessment, Washington DC. See: www.unep.org/maweb/documents/document.354.aspx.pdf

Nagayets, O (2005) Small farms: current status and key trends. Background paper prepared for the Research Workshop on the Future of Small Farms, Wye, UK: IFPRI, Imperial College and the Overseas Development Institute.

Pagiola, S and Bosquet, B (2009) Estimating the costs of REDD at the country level. Forest Carbon Partnership Facility, World Bank. See: http://mpra.ub.uni-muenchen.de/18062/1/MPRA_paper_18062.pdf

Palmer, K (2010) Agricultural growth and poverty reduction in Africa: the case for patient capital. AgDevCo, London. See: www.keithpalmer.org/pdfs/The_Case_for_patient_capital.pdf

Pattanayak, SK, Wunder, S and Ferraro, P (2010) Show me the money: do payments supply environmental services in developing countries? *Review of Environmental Economics and Policy*, 1–21. See: www2.gsu.edu/~wwwcec/docs/Pattanayak%20et%20al%20REEP%20Online%202010.pdf

Peters-Stanley, M and Yin, D (2013) Maneuvering the mosaic: state of the voluntary carbon markets 2013. Ecosystem Marketplace and Bloomberg New Energy Finance. See: www.forest-trends.org/vcm2013.php

Pigou, AC (1920) The economics of welfare. MacMillan and Co, London. See: https://archive.org/details/economicsofwelfa00pigouoft

Porras, P, Grieg-Gran, M and Neves, N (2008) All that glitters: a review of payments for watershed services in developing countries. IIED, London. See: http://pubs.iied.org/13542IIED.html

Porras, I and Nhantumbo, I (2015) Linking smallholders to PES and REDD+: intermediaries and ecosystem services markets. IIED, London. See: http://pubs.iied.org/16581IIED.html

Suich, H (2012) Conceptual framework: poverty. London: ESPA, DFID, ESRC, NERC. See: www.espa.ac.uk/files/espa/ESPA-Poverty-Framework.pdf

Suyanto, S, Muharrom, E and van Noordwijk, M (2009) Fair and efficient REDD value chain allocation: lessons from Indonesia. World Agroforestry Centre (ICRAF), Bogor, Indonesia.

Swallow, BM and Goddard, TW (2013) Value chains for bio-carbon sequestration services: lessons from contrasting cases in Canada, Kenya and Mozambique. *Land Use Policy* 31, 81–89.

von Geibler, J, Kristof, K and Bienge, K (2010) Sustainability assessment of entire forest value chains: integrating stakeholder perspectives and indicators in decision support tools. *Ecological Modelling* 221, 2206–2214.

Vorley, B, Ferris, S, Seville, D and Lundy, M (2009) Linking worlds: New Business Models for Sustainable Trading Relations between Smallholders and Formalized Markets. IIED, London.

Vorley, B, Porras, I and Amrein, A (2015) Indonesia Domestic Biogas Programme (IDBP): can carbon financing promote sustainable agriculture? IIED and Hivos. See http://pubs.iied.org/16597IIED

World Bank (2008) Agriculture for development: world development report. The World Bank, Washington DC. See: http://siteresources.worldbank.org/INTWDR2008/Resources/WDR_00_book.pdf

PAYMENTS FOR ECOSYSTEM SERVICES IN SMALLHOLDER AGRICULTURE SERIES

In this series of research reports, IIED and Hivos explore the feasibility of payments for ecosystem services (PES) as incentives to promote a shift to sustainable smallholder agriculture. The reports are free to download.

Porras, I, Vorley, B, Amrein, A, Douma, W and Clemens, H (2015) Payments for ecosystem services in smallholder agriculture: lessons from the Hivos-IIED learning trajectory. IIED and Hivos.
See: http://pubs.iied.org/16598IIED
ISBN: 978-1-78431-221-3

Amrein, A, Porras, I and Vorley, B (2015) Organic coffee production and carbon sequestration in Guatemala: can carbon financing promote sustainable agriculture? IIED and Hivos.
See: http://pubs.iied.org/16600IIED
ISBN: 978-1-78431-223-7

Amrein, A, Porras, I and Vorley, B (2015) Reforestation, coffee and carbon in Sierra Piura, Peru: can carbon financing promote sustainable agriculture? IIED and Hivos.
See: http://pubs.iied.org/16602IIED
ISBN: 978-1-78431-225-1

Porras, I, Amrein, A and Vorley, B (2015) Coffee and carbon offsets for smallholders: can carbon financing promote cleaner coffee in Nicaragua? IIED and Hivos.
See: http://pubs.iied.org/16599IIED
ISBN: 978-1-78431-222-0

Porras, I, Vorley, B and Amrein, A (2015) The Kenya National Domestic Biogas Programme: can carbon financing promote sustainable agriculture? IIED and Hivos.
See: http://pubs.iied.org/16588IIED
ISBN: 978-1-78431-170-4

Porras, I, Amrein, A and Vorley, B (2015) Reforestation, carbon sequestration and agriculture: can carbon financing promote sustainable smallholder activities in Nicaragua? IIED and Hivos.
See: http://pubs.iied.org/16601IIED
ISBN: 978-1-78431-224-4

Vorley, B, Porras, I and Amrein, A (2015) The Indonesia Domestic Biogas Programme: can carbon financing promote sustainable agriculture? IIED and Hivos.
See: http://pubs.iied.org/16597IIED
ISBN: 978-1-78431-220-6

PAYMENTS FOR ECOSYSTEM SERVICES IN SMALLHOLDER AGRICULTURE

LESSONS FROM THE HIVOS-IIED LEARNING TRAJECTORY

This synthesis report presents highlights from six projects which are part of the joint Hivos-IIED PES Learning Trajectory Programme in five countries – Guatemala, Indonesia, Kenya, Nicaragua and Peru – that are exploring the use of carbon projects in smallholder farming. Through this research IIED and Hivos explore the feasibility of payments for ecosystem services (PES) as incentives to promote a shift to sustainable smallholder agriculture. Results from this research are published in the Payments for Ecosystem Services in Smallholder Agriculture series.

We focus on practical learning from existing smallholder and community PES projects linked to energy and agroforestry activities. Working with local partners and project practitioners, we analyse the opportunities, challenges, strategies and potential 'no-go' areas in a pre-selected group of smallholder projects and analyse them within the global context of wider learning on what works and what does not in PES. Based directly on lessons drawn from our partner studies, we adapt the LINK methodology tools developed by the International Center for Tropical Agriculture (CIAT), to understand if and how PES and carbon approaches can help smallholders successfully enter and benefit from existing markets.

iied

The International Institute for Environment and Development is one of the world's top policy research organisations working in the field of sustainable development. With its broadbased network of partners, IIED is helping to tackle the biggest issues of our times – from climate change and cities to the pressures on natural resources and the forces shaping global markets.

International Institute for Environment and Development
80–86 Gray's Inn Road
London, England
WC1X 8NH
Tel: +44 (0)20 3463 7399
Fax: +44 (0)20 3514 9055
email: info@iied.org
www.iied.org