ORGANIC COFFEE PRODUCTION AND CARBON SEQUESTRATION IN GUATEMALA

Can carbon financing promote sustainable agriculture?

ALEXANDRA AMREIN, INA PORRAS AND BILL VORLEY – 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

http://pubs.iied.org/16600IIED
ISBN: 978-1-78431-223-7

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
Amrein, A, Porras, I and Vorley, B (2015a) Organic coffee production and carbon sequestration in Guatemala: can carbon financing promote sustainable agriculture? IIED and Hivos.

Designed by
SteersMcGillanEves
01225 465546

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

Cover photo credit
Women coffee producers in Guatemala © Alexandra Amrein

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 America, including Ligia Marchena, Manuel Amador, Gabriel Rodríguez Benavides and Tony Nello from CEDECO; Pablo Alvarez from the Hivos office in Costa Rica. We would like to especially thank Juan Choc, Director of Cooperativa Nahualá and Vera Arreaga, Director of PRODECOOP, for their support during our field visit. We thank Willy Douma and Harry Clemens from Hivos, as well as all other partners of the PES Learning Trajectory Programme. 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
Alexandra Amrein is a consultant for inclusive business models at the International Center for Tropical Agriculture (CIAT). She is co-author of the LINK methodology and contributed to its implementation and capacity building with different stakeholders.

Dr Ina Porras is a researcher at the International Institute for Environment and Development (IIED), with long-standing experience in markets for environmental services to tackle rural poverty in developing countries. ina.porras@iied.org

Dr Bill Vorley is a senior researcher at IIED with over 30 years' experience of sustainability in agriculture and food markets.

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 case 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.

ORGANIC COFFEE PRODUCTION AND CARBON SEQUESTRATION IN GUATEMALA

Can carbon financing promote sustainable agriculture?

ALEXANDRA AMREIN, INA PORRAS AND BILL VORLEY – 2015

BOXES

FIGURES

TABLES

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

CEDECO	Educational Corporation for Costa Rican Development
ECODES	Ecology and Development Foundation
FECCEG	Specialty Coffee Trade Federation of Guatemala
FOB	Free on board prices
M&E	Monitoring and evaluation
PRODECOOP	Promoter of Cooperative Development, Nicaragua

SUMMARY

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 case 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.

In Guatemala we study a coffee project which earns carbon credits through its organic practices. Compared to conventional large-scale coffee production, the organic practices of smallholder farmers in the north of Guatemala provide a number of environmental benefits by capturing and storing carbon dioxide in biomass and soils. Additionally, these practices save on conventional fertiliser use and increase energy efficiency on the farm.

In this study, we focus on two local coffee cooperatives in Guatemala: **Cooperativa Nahualá** and **Cooperativa Renacimiento**, which both took part in the payment for ecosystem services pilot project with the Educational Corporation for Costa Rican Development (CEDECO) and Hivos in 2013. CEDECO facilitates the project, currently still in its pilot phase, and has created the CamBio2 methodology to quantify the carbon dioxide captured in soil and biomass and issue credits. The methodology claims carbon credits for farmers' retrospective good practices in agriculture; this approach is taken in order to break the paradigm – predominant in PES schemes – of rewarding the heaviest polluter for improving their practices, rather than rewarding those who had not contributed to pollution in the first place. Nearly 4,000 tonnes of carbon dioxide equivalent (CO_2e) greenhouse gases were fixed by 40 farmers on 8.13 hectares of land.

This project is very similar to the Nicaraguan PASCAFEN case study (Porras *et al*., 2015), also included in the Payments for Ecosystem Services in Smallholder Agriculture series under Shaping Sustainable Markets; the agricultural and carbon component of the business models analysed in both these cases are deeply intertwined. To date, CEDECO have only carried out one carbon market transaction, via the Spanish trading platform CeroC02. The main limitation is that CamBio2 is not well recognised on an international level to attract more buyers. CEDECO is currently in negotiations with the Gold Standard Foundation about validating their methodology and to certify the project's carbon credits under their Standard.

The project provides a good illustration of the potential of combining organic coffee in smallholder agriculture with carbon markets. However, the costs involved in developing these markets are still too high given the uncertainty of payments. The initial funding stream has been allocated mostly towards short-term needs for the cooperatives – like fertilisers – and it is not clear how (or if) future revenues will be used to promote organic agriculture beyond the pilot.

To upscale, the project needs to resolve three key challenges:

- **A methodology for carbon measurement and certification** that is accepted by buyers and is useful to farmers,
- **Implementation costs** that are manageable, and
- **A clear benefit-sharing strategy** that will bring benefits as close to the farm as possible, but will also allow the project to grow.

ONE
INTRODUCTION – PES AND COFFEE IN SMALLHOLDER AGRICULTURE

Although the science is still developing, there is an agreement that better agricultural practices can help protect, enhance, or reverse degradation patterns in the provision of 'ecosystem services', such as capturing and storing atmospheric carbon, conserving biodiversity and protecting water quantity and quality (MEA, 2005). There is growing interest in developing financing mechanisms that try to **bring these ecosystem services into markets**, creating new incentives to promote behavioural changes towards more sustainable practices.

Payments for ecosystem services (PES) are one of these mechanisms. They are proposed as methods to provide extra funding either to 'tip the balance' in terms of cost-recovery from switching to better practices at farm level, or as co-funding for upscaling good practices.

1.1 PES AND THE GREEN ENTREPRENEURSHIP PROGRAMME

Hivos has been looking into possibilities for providing market-based incentives to smallholders that will allow them to build more environmentally sustainable production systems. In conjunction with IIED, Hivos is examining the potential of payments for ecosystem services (PES) to boost provision of ecosystem services within smallholder agriculture in developing countries. In this project we look at the role, benefits and costs for key stakeholders involved in existing or proposed PES-type projects, though our main focus remains on the smallholder farmer.

This study will help local partners map their business strategy in relation to the ecosystem services, and gain a different viewpoint of the incentives for sustainable practices. The learning from this study forms part of a larger portfolio of ongoing PES initiatives, which will feed into the Hivos Green Entrepreneurship Programme.

1.2 THE COFFEE–CARBON PROPOSAL

In this document we focus on how carbon offsets can complement the sustainable management of high-value cash crops in smallholder economies.

Smallholder coffee is one of the most important cash crops in many developing countries. According to Panhuysen and Joost (2014), over 70 per cent of coffee is produced by small-scale farmers in Central and South America, Southeast Asia and Africa. For many developing countries, coffee production makes a significant contribution to national economies. In Nicaragua and Honduras, for example, coffee represents 20–25 per cent of export revenues. Coffee plays a key role as a cash crop in the highlands of Guatemala, where 76 per cent of the population is considered poor (Läderach *et al*., 2013).

However, coffee production has been increasingly affected by environmental challenges. Climate change is making extreme events like droughts and floods more common; seasons are changing and becoming less predictable, affecting harvesting , and local temperatures – which affect the quality of the coffee bean – are changing, opening the way to plant disease like rust (Panhuysen and Joost, 2014). The vulnerability of the crop – and by default, those who produce it – will increase with climate change (Läderach *et al*., 2013). Adapting to climate change will require an

Smallholder organic shade coffee in Guatemala. 'Intercropping' – combining coffee cultivation with forestry – is the most common form of coffee production in the cooperatives. Besides providing shade and other biodiversity benefits, trees provide direct benefits to the farmer in the form of food, firewood, space for beehives, and timber © Alexandra Amrein

effective combination of policies, incentives and support on multiple fronts, including a stronger commitment from the private sector to invest at the base of the value chain.

In this study, we focus on two 'first-level'[1] local cooperatives: **Cooperativa Nahualá** and **Cooperativa Renacimiento**, who took part in the payment for ecosystem services pilot project with the Educational Corporation for Costa Rican Development (CEDECO), Hivos and We Effect (Swedish Cooperative Centre) in 2013. Both cooperatives are located in the department of Sololá in northern Guatemala and have received organic and Fairtrade certification. They are part of FECCEG[2] – Specialty Coffee Trade Federation of Guatemala (Federación de Café Comercializadora Especial de Guatemala) – a second-level cooperative that brings together small-scale producers of organic and Fairtrade coffee.

According to FECCEG, while smallholder agriculture is suffering the consequences of climate change, it can also play an important role in reducing greenhouse emissions. The agriculture sector releases greenhouse gases such as methane from rice and animal production, and nitrous oxide from the use of nitrogen-based fertilisers. Improved agriculture practices can reduce the emissions of these gases, and using agroforestry systems can capture atmospheric carbon dioxide. The FECCEG proposal – which we review in this document – is to capitalise on the agroforestry systems implemented during the pilot project, incentivising early adopters to carry on, and scale up by recruiting new participants. Funding for this stage will be in the form of certified carbon offsets as a form of payments for ecosystem services (PES), sold to voluntary markets – some associated with the coffee supply chain.

1. First-level cooperatives are legal entities whose members are the local coffee farmers and elect the board. Membership of second-level cooperatives consists of other cooperatives and institutions.

2. See: http://fecceg.com

1.3 METHODOLOGY

We present a brief value chain map and description of the basic business model underlying the coffee–carbon proposition. We use a combination of desk-based analysis, virtual meetings with experts, and a field visit to Guatemala and to CEDECO/Hivos in Costa Rica.

1.3.1 Value chain mapping

We use the LINK methodology to explore the advantages and disadvantages that the new carbon markets offer to coffee farmers and how both business components complement each other. This requires clarity of the actors involved along the coffee value chains. This includes, for example, input providers, those dealing with the processing and wholesale coffee commercialization, as well as those associated with the newly created carbon link. At the start of the chain, the potential for carbon revenues to promote participation of small-scale coffee farmers (our target group) will depend on the different actors' business models, and their capacity for and resistance to change. This includes, for example, insights into what costs can or cannot be handled by the value chain (see Box 1).

BOX 1. 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)

1.3.2 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 understand 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.

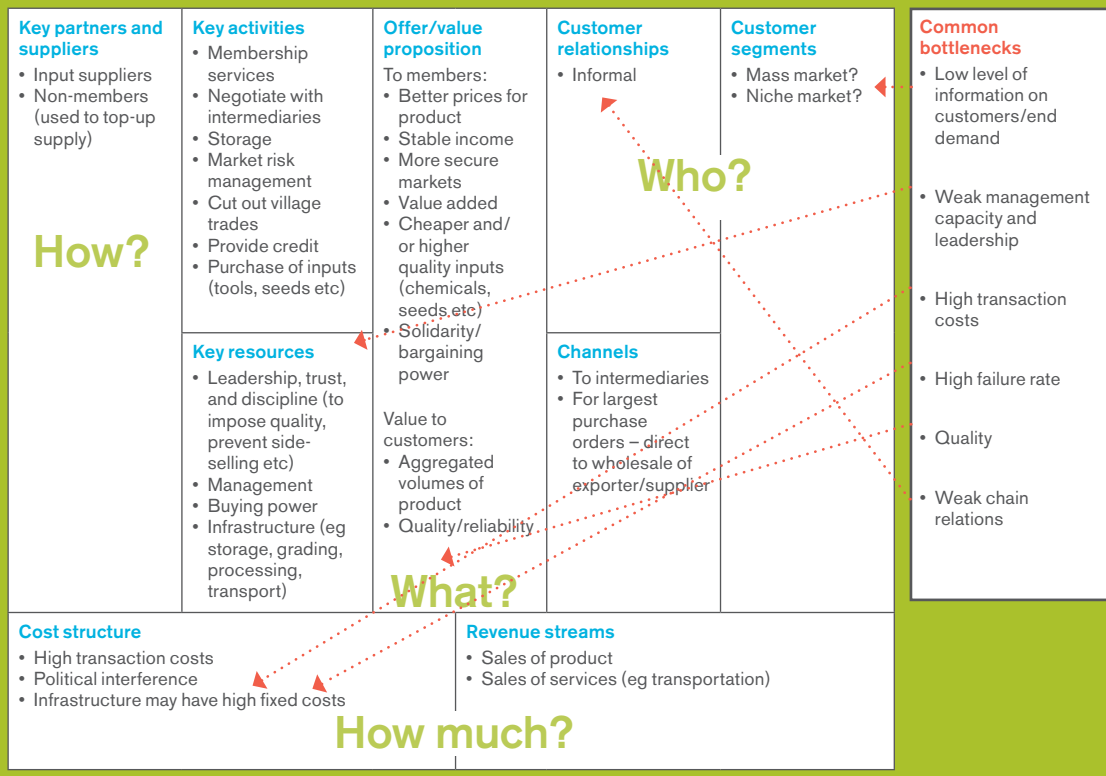
BOX 2. WHAT IS A BUSINESS MODEL CANVAS?

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).



TWO
THE COFFEE–CARBON VALUE CHAIN

In this section we describe the main value chains associated with smallholder coffee production in the area, concentrating on the value chains that affect the farm enterprise. We use the methodology presented in Section 1.3.1.

2.1 THE COFFEE PROCESS

Coffee production, from the farm to the cup, requires a carefully organised series of steps to guarantee quality along the chain. Figure 1 shows a basic description of how the smallholder coffee system works in the project. Further details can be found under 'key activities' in the farmers' business model.

2.2 KEY STAKEHOLDERS

We look at the key stakeholders in 1) the production stage (planting, processing, milling); 2) processing (roasting) and marketing (trading); 3) various supporting roles (capacity building, technological support, financial resources). Their interactions are depicted in Figure 2. For the purpose of this study we concentrate on coffee and carbon.

2.2.1 Key stakeholders at production stage

The actors directly participating in the coffee and carbon chain are:

- Individual farmers who are members of the cooperatives.
- First-level cooperatives, working directly with the farmers. We focus on the Renacimiento and Nahualá cooperatives, located in northern Guatemala, which took part in the PES pilot project with CEDECO, Hivos and We Effect in 2013.
- FECCEG, a second-level organisation which not only trades coffee and provides hulling services but also channels the carbon credits.
- Market outlets for both coffee and carbon.
- Stakeholders who provide facilitation and ancillary services, like CEDECO, Hivos, We Effect and BCS Ökogarantie.

We now analyse these actors in turn.

2.2.2 Individual farmers

We focus on FECCEG's small-scale farmer members, nearly 2,000 in total (of which 27 per cent are women), located in Guatemala's western highlands (*altiplano occidental*); including Chimaltenango, Huehuetenango, Quiché, Sololá, San Marcos and Quetzaltenango. These farmers are already involved in a series of improved agro-ecological practices, including gender equality and food security. Coffee is the main cash product within the family farming system. Farmers are certified according to organic and/or Fairtrade standards and work in a coffee-based agroforestry system, which provides a number of environmental benefits, as opposed to monoculture production (which is used as a baseline for calculating carbon sequestration (the capture and storage of atmospheric carbon dioxide) for instance by plant growth). Farmers also produce other products like honey and maize, mostly for subsistence purposes.

FIGURE 1. UNDERSTANDING THE COFFEE PROCESS

Planting	Processing	Milling	Storage	Roasting	Trading	Final consumer
 Coffee is planted following an agreed plan eg natural control of pests and diseases for organic farming and carbon storage in soils. Red coffee cherries are harvested once a year.	**Dry process**  The cherries are sorted and dried in the sun. Outer layers are removed after. **Wet process**  The fruit covering the seeds/beans is removed by washing before they are dried in the sun.	 The last layers of dry skin and remaining fruit residue are removed from the now dry beans (hulling), then polished, cleaned, sorted, and graded.	 Special areas need to be designed if storage is required for green beans to ensure quality.	 Beans are roasted to light, medium, medium-dark and dark.	 	

The coffee process: from the raw fruit of the coffee plant to the finished coffee ready for national and international markets.

The idea behind generating **carbon credits at the farm level** is to incentivise early adopters of agro-ecological practices, such as organic and shade agriculture, to continue these practices. This means that carbon credits are created 'ex-post' (based on past performance) for soil carbon and avoided nitrogenous emissions (see Box 3). The 40 farmers (18 from Renacimiento and 22 from Nahualá) who participated in the pilot study account for a total carbon stock of 2,896.54 tonnes of carbon dioxide equivalent (CO_2e; see glossary).

2.2.3 First-level cooperatives

Renacimiento Cooperative – a first-level member of FECCEG – has 56 active coffee producers. The majority of these farmers have a small pulping machine that allows them to provide dry or semi-dried coffee. Coffee cherries (the raw fruit of the coffee plant) that do not meet the required humidity level continue the drying process at the cooperative's installations, either in the sun or by using an electric dryer. Renacimiento subsequently transports and sells the packaged coffee to FECCEG.

Nahualá Cooperative – another first-level member of FECCEG – was founded in 1964 and currently has 183 members (88 men and 95 women). Farmers sell coffee to the cooperative, mostly as raw cherries, though some are sold after the wet process (see Figure 1). Nahualá is autonomous, in charge of all sales transactions; and only interacts with FECCEG for the milling process, for which Nahualá pays a separate fee. Women's participation is an important element in Nahualá – since 2004 women have exported coffee under the Café Femenino branch of the Organic Products Trading Company.

2.2.4 Second-level cooperative

FECCEG is a second-level producer organisation, responsible for milling and exporting coffee bought from first-level member organisations. The carbon rights are transferred from the farmers to FECCEG. Separately, FECCEG also provides milling services (in the case of Nahualá). It is located in Quetzaltenango, Guatemala's second most important city.

2.2.5 Key stakeholders for carbon sales

The following key stakeholders support the carbon–coffee chain.

- **CEDECO**[3] supports smallholder farmers in Latin America in improving the environmental management of their farms and energy efficiency, and promoting carbon sequestration and accounting. CEDECO, together with Hivos, developed CamBio2 as a niche methodology to look at the positive impact of organic agriculture on climate change, and to help smallholder farmers access carbon markets by recognising past carbon stocks and future flows in four areas: 1) carbon in soil; 2) carbon in biomass; 3) the reduction of fertiliser use; and 4) on-farm energy efficiency. CEDECO supports FECCEG to access international markets. According to field interviews, CEDECO does not take ownership of the carbon credits, although it plays an active role in facilitating and supervising the transaction.
- **Hivos**,[4] through their local office in Latin America and head office in the Netherlands, has been supporting smallholder farming projects for many years in climate change adaptation (including support for the development of CamBio2 methodology) and more recently helping to establish links between the project, Gold Standard, and the development of the Fairtrade Carbon Standard.
- **CeroCO$_2$**[5] is a group based in Spain that promotes practical action to reduce greenhouse gas emissions. They sell offsets from several projects, including FECCEG in Guatemala, PASCAFEN in Nicaragua and Madre de Dios in Peru (all cases included in the Payments for Ecosystem Services for Smallholder Agriculture series).
- **BCS** Ökogarantie[6] acts as the external verifier, both for organic agriculture and for the CamBio2 standard.

Funds from sales are transferred from CeroCO$_2$ to CEDECO, which then transfers the pre-agreed payments to the respective cooperatives: 20 per cent to FECCEG and 40 per cent to each first-level cooperative. There are no direct cash payments to farmers, who instead benefit indirectly from investments in group benefits, such as new equipment to increase coffee quality, access to organic fertiliser and coffee plants renewal plans (Rodríguez, 2015).

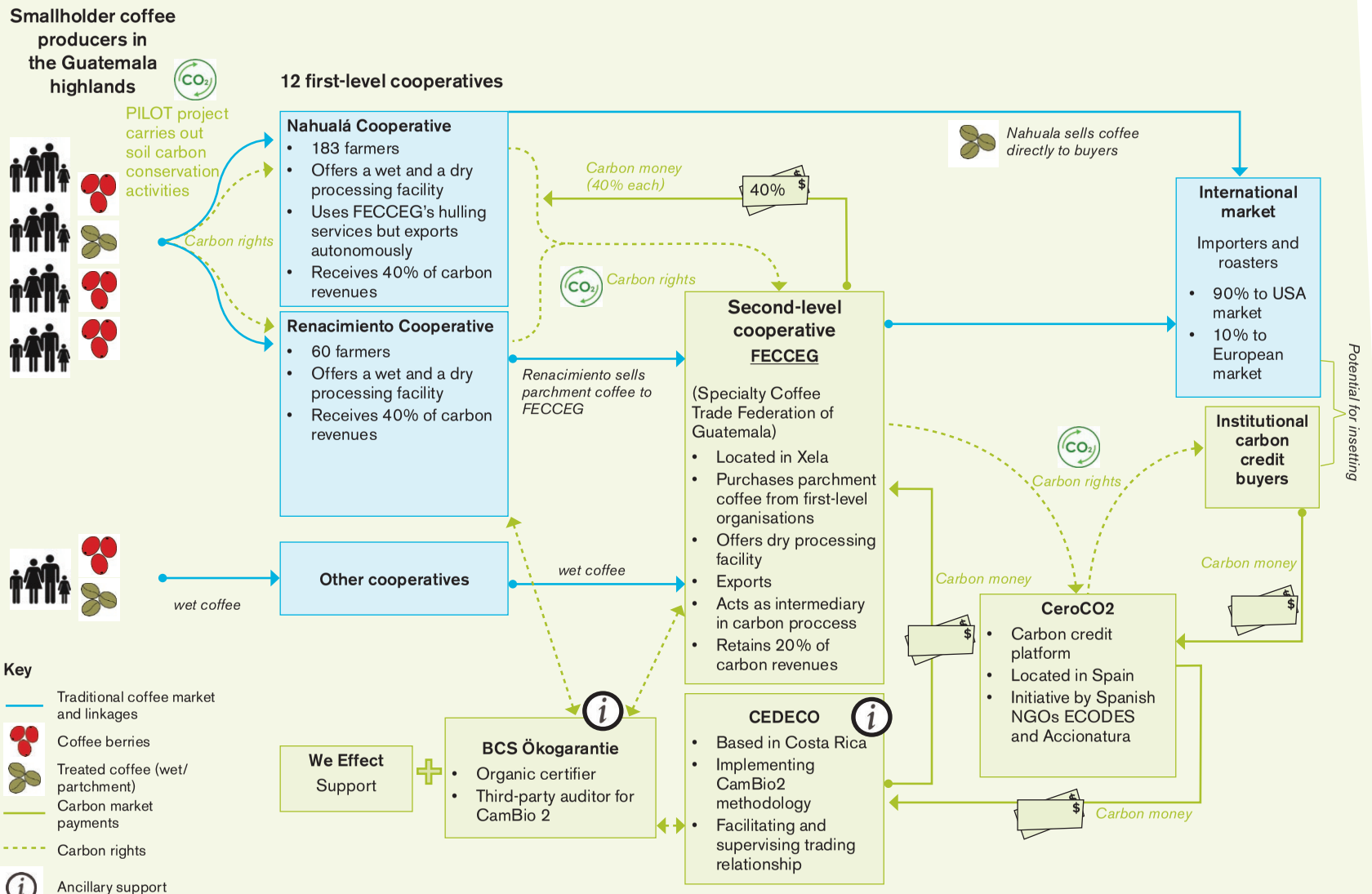
3. See www.cedeco.or.cr and http://cambio2.com for CamBio2.

4. See https://central-america.hivos.org

5. www.ceroco2.org. For the project in Guatemala see www.ceroco2.org/index.php?option=com_proyecto&view=detalle&proyecto=16&Itemid=54

6. See: www.bcs-oeko.com

FIGURE 2. PRODECOOP COFFEE AND THE CARBON VALUE CHAIN



THREE
THE BUSINESS MODEL

We now focus on two key actors in the value chain: the farmers, and FECCEG as project developer. We follow the methodology described in Section 1.3.2. Using the canvas can help us to understand how PES can aid or complement the main agricultural business model, or not, and develop a clearer idea of how business processes can support social development and the provision of ecosystem services.

We present the analysis from two points of view: from the farmer, in charge of implementing the activities that will result in reduced greenhouse gas emissions (Figure 4) and from the point of view of the key project developer – in this case FECCEG – whose role is to upscale the project and make it a viable business proposition (Figure 5). This information is used as a basis for discussing the opportunities and potential bottlenecks, presented in Figure 6 in Section 4.

3.1 FECCEG'S BUSINESS MODEL AS PROJECT DEVELOPER

FECCEG's business model is built around three components: coffee, honey and carbon credits. Coffee is the primary segment, complemented by the latter two. We concentrate on how carbon interacts with coffee.

3.1.1 What is the value proposition and who are the customers?

FECCEG's business model is centred on speciality coffee (Fairtrade, organic) with carbon sequestration as a sideline activity. In 2013 they sold a total of 10,300 quintals[7] of coffee. Coffee is mainly exported to the USA market (90 per cent) and a smaller amount to the European market. Honey was more recently introduced as an alternative cash source for smallholder coffee farmers, contributing to a diversified livelihood strategy and thereby increasing resilience to climate change-induced production losses. While only a small number of coffee farmers produce honey at present, there is a lot of interest in upscaling.

Carbon credits are generated through organic coffee production in an agroforestry system. This practice enhances carbon dioxide fixation in the soil, and reduces nitrogen emissions by avoiding the use of conventional fertilisers. In March 2013, CEDECO quantified the carbon stock on land owned by 40 farmers participating in the pilot project, using their CamBio2 methodology. They found that the total carbon stock was 2,897 tonnes of CO_2 equivalent (tCO_2e) – see Table 1. As explained above, the numbers in this report correspond to the initial pilot project, and are used as reference for potential upscaling.

7. Quintales or qq is the traditional measure used for coffee in Latin America. While in theory it is based on a metric scale, the equivalent weight in kilograms will vary depending on the stage of production. For example, 1qq of coffee berries is 250kg; 1qq of parchment coffee is 57kg; gold coffee is 46kg and roasted coffee is 37kg. In Spain, 1qq is equivalent to 100lbs in weight.

Speciality coffee ready to export. FECCEG collects, processes and distributes speciality smallholder coffee to international markets© Alexandra Amrein

3.1.2 How is value created?

FECCEG's value proposition depends on a set of **key resources** such as the warehouse and the mill, technical and administrative staff including the director, and other governing staff members. **Key activities** include a range of steps related to coffee processing, such as: receiving parchment coffee[8] from first-level organisations, quality control (such as checking the humidity content), weighing, hulling, cupping, packaging and loading the containers. In addition, there are a range of administrative activities, such as client negotiations, managing export formalities, and making payments to farmers. FECCEG also offers milling services to first-level organisations that are trading autonomously but do not possess a coffee mill to transform parchment coffee into green coffee,[9] and therefore use FECCEG's processing facilities.

There are no particular key resources or activities relating to the carbon credits, as the carbon component is embedded within the agricultural component and does not require any additional efforts.

FECCEG's **key partners** are: 1) coffee suppliers, including eight first-level organisations who sell their coffee to FECCEG (such as Renacimiento Cooperative), and four first-level organisations who use FECCEG's processing facilities to mill the coffee but export it autonomously (such as the Nahualá cooperative); 2) a range of support partners such as the certifying bodies FLO, for Fairtrade, and BCS Ökogarantie, both for organic practices and carbon sequestration. Another partner is CEDECO, who was responsible for conducting the carbon dioxide study under their CamBio2 methodology in 2013 and currently also acts as an intermediary for carbon credit sales (on a temporary basis).

8. Parchment coffee beans have been dried but not hulled, with the parchment-like outer covering still attached.

9. Green beans have been hulled but not roasted.

3.1.3 How much? Benefits and costs

FECCEG's principal **income stream** originates from coffee sales. In 2013, a total of 10,300qq of coffee were sold. FECCEG's coffee is sold for higher prices on the international market than conventional coffee due to its organic and Fairtrade certification, which allow for a price premium of US$30 per quintal for organic and US$20 per quintal for Fairtrade. Milling services to other cooperatives generates US$14–17 per quintal of processed coffee. FECCEG's **costs** are dominated by purchasing parchment coffee from first-level organisations.

In terms of the carbon component, the first carbon transaction took place in 2014 through the reseller CeroC02. Two Spanish companies bought 1,159 tonnes of carbon offsets (about 40 per cent of the total amount 2,897.5 tonnes CO_2e) at €7.20 per ton, generating an income of €7,900 (after bank fees) which is split between FECCEG (20 per cent) and the two participating cooperatives (Renacimiento and Nahualá cooperatives), which received 40 per cent each. Similarly to how the Fairtrade system is designed with regards to the Fairtrade premium, each cooperative decides how to use the carbon funds following their own internal decision-making processes and procedures. Neither of them has proposed direct cash payments to the farmers; instead they are planning to use the funds for:

- **Research**: FECCEG aims to conduct further soil analysis in order to provide fertilising plans tailored to specific nutrient deficiencies.
- **Co-funding for a processing plant**: Renacimiento proposes to contribute to a required contribution of 20-per-cent matching funds for a project funding processing equipment by the Guatemalan Ministry of Economy.
- **Buying production inputs**: Nahualá aims to buy organic solid fertilisers for the participating farmers.

In the long term – that is, for project upscaling – FECCEG is meant to assume the costs for independent auditing, which is currently undertaken by BCS Ökogarantie on a yearly basis, and has so far been heavily subsidised by the pilot project. The external audit can be conducted at longer intervals and mainly depends on the preference of the carbon credit buyer. Currently, verification costs amount to approximately US$2,500 per year. CEDECO also covered the expenses for the quantification study of the carbon balances, at approximately US$48,000.

Table 1 presents some of the main costs and revenues linked to the carbon proposition. The quantification costs have been subsidised by CEDECO, but need to be taken into account to see the potential for expansion. The initial transaction costs in any project requiring research and development are high, and this project is no exception: the average expected revenue **per plot** in terms of carbon is roughly US$82, compared to an average cost for quantification of US$375 per plot – and this is already assuming that the cost is reduced through upscaling. According to Gabriel Rodríguez of CEDECO, the project will break even if they manage to sell 2,897 tCO_2e, and they are currently exploring options to reduce the cost of quantification. Significant efforts will be needed to further reduce these transaction costs if the proposition is to be self-sustaining in the long term.

TABLE 1. CARBON REVENUES AND COSTS FOR THE PILOT PROJECT

ITEM	VALUE
Land description	40 plots, 5.5 hectares on average; total land in pilot project 220ha
Potential carbon capture (tCO_2e)	Average capture per plot 13.17 tonnes; total capture in pilot 2,897t
Potential gross returns at US$7.90 (€7) per tCO_2e	Average return per plot US$82; total expected return in pilot area US$3,274.2
Carbon quantification study costs*	US$48,590 for the pilot study; US$15,000 per 40 farmers suggests an average of US$375 per plot
Independent audit by BCS Ökogarantie costs**	US$2,500 per year

*It is difficult to separate all the costs for carbon quantification. CEDECO has been developing CamBio2 as a new methodology, tested in this project and PASCAFEN in Nicaragua, and the research and development costs have been high as a consequence. According to Gabriel Rodriguez (May 2015) CEDECO is currently exploring different avenues to reduce costs and make the technology more user-friendly. **From the information obtained, the difference in cost between coffee certification and carbon certification is unclear.

3.2 THE FARMERS' BUSINESS MODEL

3.2.1 What is the value proposition and who are the farmers' customers?

The primary value proposition of the farmers' business model is organic and Fairtrade-certified speciality coffee, of the Catuai variety, in the form of berries or semi-dried pulped beans.

The secondary value proposition relates to the farmers' ability to increase carbon dioxide sequestration in biomass (plants) and soil, through organic agricultural practices. Carbon is captured through aerial biomass (trees in the coffee agroforestry system) and soil carbon biomass through composting; and nitrogen emissions are avoided by the use of organic fertilisers. At this stage of the chain, the carbon offsets are not yet commoditised and are a very small component of the agricultural practices that farmers implement. In the long term, as the project scales up beyond the pilot stage, the carbon funding is expected to generate incentives for more farmers who are still implementing conventional practices to switch to organic agricultural practices, and for organic farmers not to return to conventional agriculture.

The offsets are not commoditised until formally accredited by BCS Ökogarantie, which takes place mostly under FECCEG with financial support from CEDECO.

Renacimiento Cooperative is the physical channel where the coffee is pulped (if delivered in the form of cherries), dried, controlled for quality requirements, packaged and finally transported to FECCEG. For carbon credits, the cooperative acts as a link between the producers and FECCEG. The interaction between all parties is regulated in a contract transferring carbon credit rights quantified under the CamBio2 methodology to CEDECO, in order to manage the negotiations and subsequent transactions. Since 2014 all stakeholders have signed formal contracts, specifying the actions of each party and the distribution of benefits.

3.2.2 How is value created at the farm level?

Value is created through a number of key resources and related key activities. The **key resources** are, most importantly, the land and the coffee trees cultivated in the agroforestry systems. Another resource is the labour that farmers require during harvest time; usually this can be sourced from nearby communities. Other key resources consist of the organic and Fairtrade certifications, as well as farmers' knowledge of ecological agricultural practices.

The farmer's business model includes the following **key activities**: selecting seeds; growing seedlings; preparing the land for sowing; producing and applying organic fertiliser; harvesting the coffee; and finally transporting it to the cooperative or nearest recollection centre. If

the farmer has a wet processing facility, the coffee is pulped on the farm and delivered in the form of semi-dried coffee beans. Otherwise, the coffee cherries are supplied and pulping takes place at the cooperative. It seems that the price difference between coffee cherries and pulping is not significant, and there is therefore little incentive for farmers to deliver pulped coffee beans.

These key resources and activities do not have a clear carbon component at the farm level. The activities required to generate carbon offsets are the same activities that farmers carry out as organic practices on their plots. Carbon revenues are expected to provide an additional incentive to help expand the adoption of organic practices to other farmers in the region. The **key partners** for the functioning of the business model's coffee component are the other associated farmers, who are important to aggregate individual coffee deliveries, and the first-level organisation, Renacimiento. CEDECO is a key partner, and is particularly important for the carbon component through the provision of the CamBio2 methodology, as well as the technical and financial support it provides – subsidising the full costs so far to quantify carbon and access markets.

3.2.3 How much? Benefits and costs

We were unable to obtain exact numbers regarding production costs and overall income through the interviews conducted with farmers and cooperative members. Instead we provide a basic sketch of the key elements included in the cost/income analysis.

Organic fertilisers for coffee production. The soil profiles obtained from CamBio2 allow the farmers to check their requirements for using organic fertilisers to ensure the quality of the coffee. First-level cooperatives help local farmers access these resources © Alexandra Amrein

BOX 3. ESTIMATING CARBON OFFSETS IN ORGANIC AGRICULTURE

The Promoter of Cooperative Development (PRODECOOP) project in Nicaragua and FECCEG in Guatemala illustrate how the CamBio2 methodology is used within the smallholder coffee plot. Developed by CEDECO with Hivos support, this methodology collects information from sample farms (such as energy efficiency, inputs, socio-economic data; and soil analysis including horizons, organic matter, and chemical soil analysis) to model farm use, and to estimate both the existing carbon stocks and the potential future carbon sequestration rate. Besides informing the carbon design, the methodology also provides the farmers with better information on the health of their farm. For example, the soil profiles present valuable information to farmers, allowing them to improve fertiliser use. The CamBio2 methodology also promotes crop diversification, in order to improve climate change resilience and the family's diet (see Figure 3).

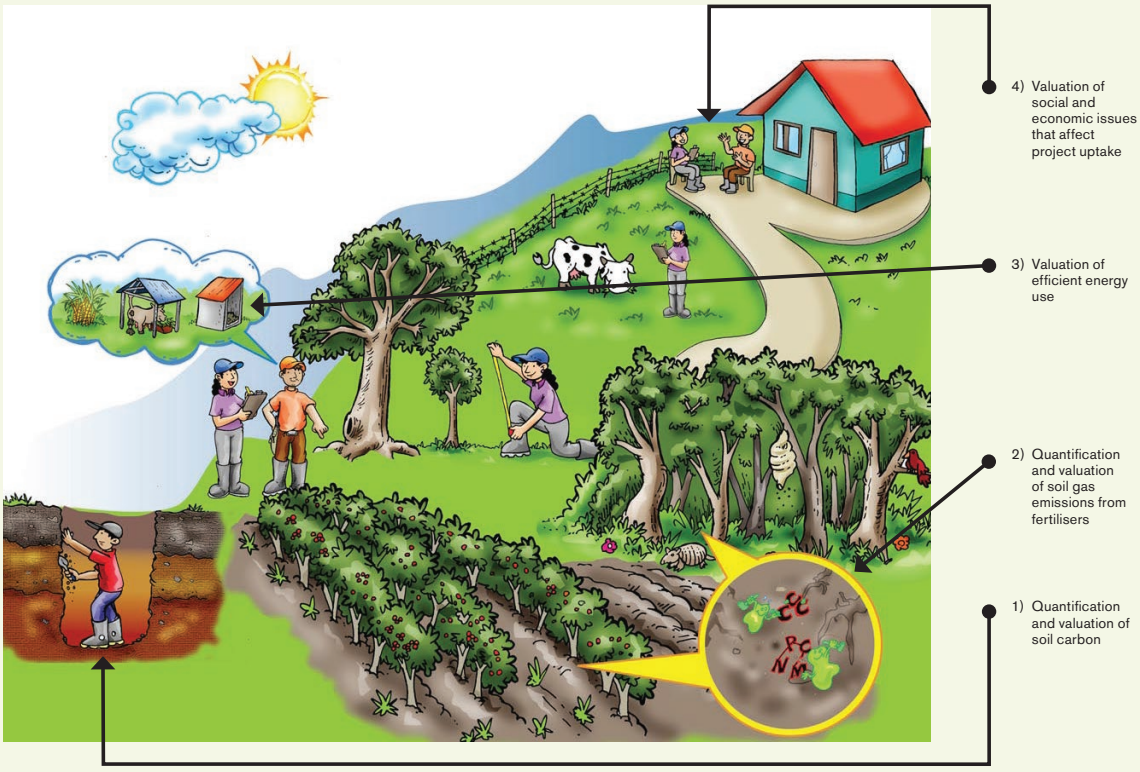
The information obtained through CamBio2 is useful but data and time-intense. Although expensive, this methodology provides useful feedback channels, allowing the farmer to understand how activities on the farm affect the overall health of their plot – for example the nutrient components and its impact on productivity. This on its own is a direct benefit of the ecosystem service approach, when periodic monitoring and evaluation becomes a vehicle to ensure the long-term support of environmentally beneficial activities.

Source: authors' own, based on field information, CEDECO (2010) and CEDECO (2014).

Farmers generate income mainly through the sales of coffee at international market prices, plus organic and Fairtrade premiums as mentioned above. The principal expense for farmers is labour during the coffee harvest season and the purchase of additional fertiliser, because organic matter available on farms is insufficient to supply nutrients for the plantations' needs year round. PRODECOOP in Nicaragua is proposing to invest funding from carbon sales in developing an organic fertiliser facility.

The carbon component does not create income on an individual basis because the funds from PES sales are invested into collective purposes. The investment decision is made democratically by the first-level cooperative's assembly. An important indirect benefit for the farmer of quantifying carbon in soil and biomass is the resulting detailed soil nutrient profile. As described above, this can be used to establish tailored fertiliser plans which in turn may lead to increased productivity and potentially reduced chemical fertiliser use (specific or more targeted

FIGURE 3. THE CAMBIO2 HOLISTIC APPROACH ON THE COFFEE FARM



Source: CEDECO (2010)

as opposed to random application of fertilisers). CEDECO decided to conduct the quantification study in such a way that these nutrient profiles can be obtained – **providing the farmers with useful information beyond carbon** – although it is more costly than a simple analysis that only determines the amount of carbon stored. The carbon component does not currently generate any costs to the farmer, as the quantification study is paid for by CEDECO.

FIGURE 4. BUSINESS MODEL FOR FARMERS IN A FIRST-LEVEL COOPERATIVE

Partners

Coffee

Renacimiento Cooperative and other associated coffee farmers

Carbon

CEDECO

Activities

Coffee

- Selecting seed; growing seedlings; preparing land, producing and applying organic fertiliser; harvesting; transporting coffee to cooperative

Carbon

Farmers continue activities for organic, improved soil detailed by CEDECO for their speciality coffee

Resources

Coffee

- Fertile land and healthy coffee trees nested in agroforestry system (with banana trees) (average size/number of trees)
- External labour during harvest
- Organic and Fairtrade certification
- Knowledge of organic agricultural practices

Carbon

- Farmers require the same resources that they already use for organic agriculture

Value proposition

Coffee

Organic and Fairtrade Arabica coffee (Cataui) in the form of cherries or semi-dried pulped beans

Carbon credits

Carbon sequestration through organic agricultural practices:

- allowing increased carbon dioxide fixing in biomass and soil
- reducing emissions from avoided conventional fertiliser use

Relationships

Coffee

Personal, long-term relationships based on trust and sense of community

Carbon

Carbon activities are attached to existing coffee linkages with first-level cooperatives

Channels

Coffee

Coffee is sold via Renacimiento Co-op, which is in charge of the drying process, quality control, packaging and transporting

Carbon

Informal agreement to transfer ownership of carbon rights before 2014. Contracts signed from 2014

Customers

Coffee

Customers reach FECCEG through the first-level cooperatives

Carbon

Rights transferred to FECCEG/CEDECO

Cost structure

Coffee

Fertilisers, family labour and hired labour during harvest

Carbon

No costs fall on farmer – all costs currently subsidised

Income sources/benefits

Coffee

Income from coffee sales (average amount and sales price). Price premiums: Fairtrade: US$20/quintal (to be invested for collective benefit at cooperative level); organic: US$30/quintal (goes directly to farmers)

Carbon

- No direct income from sales of carbon credits. Returns are invested for collective benefit at cooperative level. (First payment to be invested in purchasing organic fertiliser for cooperative members)
- Indirect benefit: quantifying carbon stocks also establishes a soil nutrition profile, allowing the farmer to make a more tailored application of fertilisers. As a consequence, fertiliser use may drop, resulting in increased emissions savings

Traditional coffee market and linkages Carbon market

Source: authors' own, based on Renacimiento Cooperative.

FIGURE 5. BUSINESS MODEL FOR A SECOND-LEVEL COOPERATIVE (FECCEG)

Partners

Coffee

Coffee suppliers:
- Eight first-level cooperatives supply parchment coffee (ie Renacimiento)
- Four first-level level co-ops utilise milling facilities (ie Nahualá)

Support partners:
- BCS Ökogarantie (organic certifier)
- FLOCERT (Fairtrade certifier)

Carbon

Carbon credit suppliers:
- 40 coffee farmers participated in pilot with a total of 8.13 hectares

Support partners:
- CEDECO
- We Effect
- BCS Ökogarantie (third-party verifier for CamBio2)

Activities

Coffee
- Quality control
- Milling
- Packing
- Cupping
- Sales and customer correspondence
- Transport to port (FOB)

Carbon

Participating in M&E procedure by BCS Ökogarantie

Resources

Coffee
- Warehouse and mill
- Administrative and technical staff
- Organic and Fairtrade certification
-

Carbon
- Process documentation

Value proposition

Coffee
- Green speciality coffee (Catuai variety)
- Certified organic and Fairtrade

Milling service

For first-level organisations

Carbon credits

2,896.54 tCO_2e through sequestration of carbon dioxide in soil and biomass, and reduced emissions through organic agricultural practices

Relationships

Coffee
- Relationships are based on reputation
- Important marketing platforms are international coffee and organic fairs

Carbon
- Initial informal relations with farmers and first-level cooperatives, later formalised through contracts

Channels

Coffee

Coffee is placed in containers at FECCEG and transported by truck to the port

Carbon

Carbon credits are sold using CEDECO's CamBio2 standard, which is audited by BCS Ökogarantie

Customers

Coffee

International coffee roasters and importers
- 90% USA market
- 10% European market

Carbon
- $CeroCO_2$
- (carbon platform)

Cost structure

Coffee
- Coffee purchase (price)
- Administrative and technical staff: (number)
-

Carbon
- Costs for quantifying carbon sequestration: $48,590 (paid by CEDECO)
- Estimated costs for extending the study: $15,000 (for every 40 farmers that follow)
- Monitoring costs: $2,500/year (currently paid by CEDECO, to be assumed by FECCEG in the future)

Income sources/benefits

Coffee

Income from coffee sales
- 10,300 quintals (qq) sold (2014/15 harvest)
- Price premiums:
  - Fairtrade: US$20/qq (to be invested for collective benefit at cooperative level)
  - Organic: US$30/qq

Income from milling service to first-level organisations
- US$14-17/qq

Carbon credit sales

To date, 1,158 (40%) of created carbon credits sold
- Payment received in 2014: For FECCEG €1,580 (=20% of total carbon sales). 40% (€3,160) each for Renacimiento and Nahualá cooperatives
- Projected carbon sales 2015: €12,513 (excluding transfer fees)

Traditional coffee market and linkages Carbon market

FIGURE 6. OPPORTUNITIES AND BOTTLENECKS IN THE FECCEG COFFEE–CARBON PROPOSITION

Established and mature channels already in place linking smallholders to coffee production, which can be used for monitoring, transaction costs etc., linked to carbon markets

But added costs linked to accessing carbon markets may be too costly to justify investment

Potential overloading of certification paperwork, given that cooperatives already comply with organic and Fairtrade standards.

High-value cash crop with existing access to international markets and opportunities for insetting

But high climate variability in the region may affect long-term permanence and economic viability of coffee (organic and conventional)

Farmers

First-level cooperatives

Partners	Activities	Value proposition	Relationships	Customers
	Resources		Channels	
Cost structure		Income sources/benefits		

Second-level cooperative / project developer (FECCEG)

Partners
Coffee
Coffee suppliers:
- Eight first-level cooperatives supply parchment coffee (ie Renacimiento)
- Four first-level level co-ops utilise milling facilities (ie Nahuala)

Support partners:
- BCS Ökogarantie (organic certifier)
- FLOCERT (Fairtrade certifier)

Carbon
Carbon credit suppliers:
- 40 coffee farmers participated in pilot with a total of 8.13 hectares

Support partners:
- CEDECO
- We Effect
- BCS Ökogarantie (third-party verifier for CamBio2)

Activities
Coffee
- Quality control
- Milling
- Packing
- Cupping
- Sales and customer correspondence
- Transport to port (FOB)

Carbon
Participating in M&E procedure by BCS Ökogarantie

Resources
Coffee
- Warehouse and mill
- Administrative and technical staff
- Organic and Fairtrade certification
-
- Process documentation

Carbon

Value proposition
Coffee
- Given speciality coffee (Catuai variety)
- Certified organic and Fairtrade

Milling service
For first-level organisations

Carbon credits
2,896.54 tCO$_2$e through sequestration of carbon dioxide in soil and biomass, and reduced emissions through organic agricultural practices

Relationships
Coffee
- Relationships are based on reputation
- Important marketing platforms are international coffee and organic fairs

Carbon
- Initial informal relations with farmers and first-level cooperatives, later formalised through contracts

Channels
Coffee
Coffee is placed in containers at FECCEG and transported by truck to the port

Carbon
Carbon credits are sold using CEDECO's CamBio2 standard, which is audited by BCS Ökogarantie

Customers
Coffee
International coffee roasters and importers
- 90% USA market
- 10% European market

Carbon
- CeroCO$_2$
- (carbon platform)

Cost structure
Coffee
- Coffee purchase (price)
- Administrative and technical staff: (number)
-

Carbon
- Costs for quantifying carbon sequestration: $48,590 (paid by CEDECO)
- Estimated costs for extending the study: $15,000 (for every 40 farmers that follow)
- Monitoring costs: $2,500/year (currently paid by CEDECO, to be assumed by FECCEG in the future)

Income sources/benefits
Coffee
Income from coffee sales
- 10,300 quintals (qq) sold (2014/15 harvest)
- Price premiums:
  - Fairtrade: US$20/qq (to be invested for collective benefit at cooperative level)
  - Organic: US$30/qq

Income from milling service to first-level organisations
- US$14-17/qq

Carbon credit sales
To date, 1,158 (40%) of created carbon credits sold
- Payment received in 2014: For FECCEG €1,580 (=20% of total carbon sales). 40% (€3,160) each for Renacimiento and Nahuala cooperatives
- Projected carbon sales 2015: €12,513 (excluding transfer fees)

Traditional coffee market and linkages Carbon market

Partners
Coffee
Renacimiento Cooperative and other associated coffee farmers

Carbon
CEDECO

Activities
Coffee
- Selecting seed; growing seedlings; preparing land, producing and applying organic fertiliser; harvesting; transporting coffee to cooperative

Carbon
Farmers continue activities for organic, improved soil detailed by CEDECO for their speciality coffee

Resources
Coffee
- Fertile land and healthy coffee trees nested in agroforestry system (with banana trees) (average size/number of trees)
- External labour during harvest
- Organic and Fairtrade certification
- Knowledge of organic agricultural practices

Carbon
- Farmers require the same resources that they already use for organic agriculture

Value proposition
Coffee
Organic and Fairtrade Arabica coffee (Catuaí in the form of cherries or semi-dried pulped beans

Carbon credits
Carbon sequestration through organic agricultural practices:
- allowing increased carbon dioxide fixing in biomass and soil
- reducing emissions from avoided conventional fertiliser use

Relationships
Coffee
Personal, long-term relationships based on trust and sense of community

Carbon
Carbon activities are attached to existing coffee linkages with first-level cooperatives

Channels
Coffee
Coffee is sold via Renacimiento Co-op, which is in charge of the drying process, quality control, packaging and transporting

Carbon
Informal agreement to transfer ownership of carbon rights before 2014. Contracts signed from 2014

Customers
Coffee
Customers reach FECCEG through the first-level cooperatives

Carbon
Rights transferred to FECCEG/CEDECO

Cost structure
Coffee
Fertilisers, family labour and hired labour during harvest

Carbon
No costs fall on farmer – all costs currently subsidised

Income sources/benefits
Coffee
Income from coffee sales (average amount and sales price). Price premiums: Fairtrade: US$ 20/quintal (to be invested for collective benefit at cooperative level); organic: US$30/quintal (goes directly to farmers)

Carbon
- No direct income from sales of carbon credits. Returns are invested for collective benefit at cooperative level. (First payment to be invested in purchasing organic fertiliser for cooperative members)
- Indirect benefit: quantifying carbon stocks also establishes a soil nutrition profile, allowing the farmer to make a more tailored application of fertilisers. As a consequence, fertiliser use may drop, resulting in increased emissions savings

Traditional coffee market and linkages Carbon market

Clear benefit-share from carbon revenues between first and second-level cooperatives **needs to be in place from the start**

Upscaling is the only way to recoup investment in carbon methodologies

The process between quantification and revenues from carbon are perceived as long, and information flows are limited. Risk of 'red-tape fatigue' can limit potential for upscaling

Demand for organic coffee in international markets is rising and likely to do as consumers become more environmentally and socially aware

Methodology for design and monitoring CamBio2 helps the farmers: providing detailed and practical information to increase farm system's resilience and sustainability, including info on soil profiles which helps farmers tailor their fertiliser use (organic or conventional) to actual nutrient needs. It can be also applied to agroforestry.

But it's too expensive especially at early stages of project and depends on upscaling to recover costs. Financial benefits from crops or carbon are not yet high enough to justify this methodology from a business point of view. It's unclear how access to holistic knowledge for adaptation can be financed.

Activities promoted by the project will benefit farmers: and provide benefits beyond carbon sales.

High cost to convert to organic: and existing price premiums from organic and Fairtrade coffee reaching back to the farm not perceived as attractive enough .

Source: authors' own. Information inside the business canvas is available in Figure 4 (farmers) and Figure 5 (FECCEG).

FOUR
KEY POINTS: RELEVANCE AND COMPLEMENTARITY

In this document we set out to explore the ways in which the development of a carbon proposition sits within the existing coffee systems. We explored the main value chains and key actors involved. In Figure 6 we show the key opportunities and potential bottlenecks along the value chain, and highlight areas for complementarity where a carbon market can add value to the coffee production. This figure is built using the Business Model Canvas for farmers (Figure 4) and the second-level cooperative (FECCEG) as project developer (Figure 5). Due to time limitations we did not develop a similar model for the first-level cooperatives, although their role is discussed below.

4.1 SPECIALITY COFFEE AND CARBON HAVE COMMON ACTIVITIES

Both the coffee and the carbon elements of the business model can be highly complementary; at farm level the carbon credits are generated from the same activities that farmers undertake to produce their coffee value proposition, meaning that there are no extra costs involved in the carbon credit proposition. However, the situation changes when the transaction costs of accessing carbon markets are added – particularly measuring and verifying – to maintain the carbon value proposition. As it stands, it seems that entering the carbon markets may result in added costs (for quantifying and verifying) with uncertain offset sales and revenues.

Because of the very small scale of the current pilot, it is difficult to determine what long-term effects carbon payments might generate in terms incentivising farmers to continue improved agricultural practices– those who are organic to continue, and those who are currently conventional farmers to switch to organic practices. It is also unclear what will be the impact in terms of sustained livelihood improvements from carbon revenues, either as a stock (from existing good practices) and/or a flow (from future sequestration potential from improved practices).

4.2 CARBON GENERATES RETURNS AT GROUP LEVEL

This project proposes to use carbon revenues for collective purposes within each participating cooperative, in line with the way Fairtrade premiums are managed. This is to avoid fragmenting the income: keeping a larger pot of funding can help the groups implement larger-scale investment projects and achieve economies of scale. As things stand at the moment, even a collective investment is expected to have limited long-term impacts on the environment but rather respond to the short-term needs (such as fertiliser) of the producer organisations, and there is no information on how carbon funding will be used for upscaling.

4.3 CHOOSING A CERTIFICATION SCHEME THAT WORKS FOR BUYERS AND FARMERS

This project, similar to the PASCAFEN case study, has used CamBio2 as the methodology to quantify the ecosystem services component for the PES proposition. This holistic methodology has many benefits for the farmer. Its robust approach provides a better understanding of agricultural practices that can support small farmers to adapt to climate change and react to their immediate markets.

This information is useful, but it is costly and time consuming. At the moment, markets (coffee or carbon) are not yet recognising the investment in terms of payoffs, and it is considered too expensive to upscale. Also, CamBio2 is still a relatively unknown methodology beyond the CEDECO/Hivos sphere, and most carbon buyers tend to rely on the few well recognised large certifications such as Gold Standard.

Negotiations to have CamBio2 as an accepted methodology within Gold Standard are underway. The carbon market moves quickly in terms what is acceptable and what is not for carbon sequestration measurement methodologies. Until now, the Gold Standard has followed the Cool Farm Tool[10] developed by UNILEVER and researchers at the University of Aberdeen to help growers measure and understand on-farm greenhouse gas emissions. CEDECO and Hivos have been consulting with Gold Standard on how to integrate their CamBio2 methodology as part of the approved Technical Advisory Committee methods.

The negotiations are in process, but are lengthy and costly. Project managers in FECCEG and PASCAFEN need to take into account the benefits from switching to more widely accepted methodologies that may open up the way to carbon buyers, but which could potentially deliver fewer local benefits in terms of knowledge to the farmers – as CamBio2 does.

For both the Gold Standard and CamBio2, it is important to find ways to reduce transaction costs for upscaling, while searching for a combination of financial incentives that will make investments in research and climate adaptation more attractive from the point of view of the farmer and local project developers.

4.4 BETTER INFORMATION ACROSS STAKEHOLDERS IS AN INVESTMENT, NOT A COST

The decision to access carbon markets is not to be taken lightly. The capacity required to understand how the markets operate (from the quantification of offsets to the business of selling them) is great. Even with the best of intentions, it is common for processes to be managed by a few experts and little information is fed back along the rest of the chain.

10. See: www.coolfarmtool.org – see also www.goldstandard.org/climate-smart-agriculture-cool-farm-tool-to-calculate-gold-standard-credits-for-smallholders

In Guatemala, the lag time between quantification in the plots and eventual payment has been 1.5 years – an issue that several stakeholders have complained about. This is not an uncommon period of time, and many projects suffer from similar teething problems in making sales, and agreeing on what to do with the funding once it materialises. A more transparent approach to sharing information on the market development will help stakeholders understand the difficulties of the process and avoid 'losing heart'. We found that the trust-based approach used at the beginning of the project left too many avenues open for expectations that were not met. To avoid this, the project began drafting written contracts with farmers and cooperatives from the end of 2014, and has prepared a glossary of terms specifying the nature and times of information sharing.

Farmers and first-level cooperatives who feel excluded – or feel they are not getting the deal they should – may decide not to continue with the project, and this can seriously jeopardise upfront investments from others. In Guatemala, for example, CEDECO has absorbed most of the upfront costs for the carbon quantification study while the ongoing costs for external verification have been absorbed by BCS Ökogarantie. This is not an issue only for this project: we found similar problems faced by developers of smallholder biogas in Indonesia – a case study in this PES series, where farmers pulled out of a deal after a lengthy process where the risks and costs were taken by the developer (see Vorley *et al*., 2015).

The development of the CamBio2 methodology in the pilot project has been expensive: US$48,000 for the first 40 farmers and an estimated US$15,000 for every further group of 40 farmers. These costs are high due to the intensity of research during the pilot stage of the project. It is expected that the marginal cost for additional participants would be lower, but the only way that costs will be recouped is by significantly upscaling the process. If farmers and cooperatives are not fully engaged, they may decide not to continue and upscaling will not take place.

While participatory processes increase ownership among farmers and technical staff, they are more resource-intensive. A common problem in groups of this type is the high turnover of technical staff within producer organisations, which may mean that knowledge gets lost when key staff members leave.

4.5 INSETTING

Although the carbon transaction was made with general offsetting clients, in future carbon 'insetting' can be explored – companies purchasing offsets from within their own value chains – given that FECCEG serves a high-value coffee market. Based on interviews with FECCEG's sales representatives, to date none of the clients has expressed an interest in offsetting carbon dioxide emissions generated upstream in their value chains. However, this lack of interest may be caused by the fact that no defined offer has been made from FECCEG's side. This will be addressed once the project is formally accredited by Gold Standard.

FIVE
IMPLICATIONS FOR PES LEARNING

This project has a lot of potential for carrying forward a carbon proposition alongside a highly valuable crop. The most important point is complementary: the activities that generate carbon also result in benefits for the farmer. But moving from a pilot stage to a scaled-up project may be constrained from:

- **International recognition of the methodology.** The overarching threat is the limited market demand caused through the lack of international recognition of the CamBio2 methodology. In order to overcome this bottleneck, CEDECO recently initiated negotiations with the Gold Standard Foundation. After a pilot study that focused on measuring future sequestration potential rather than on current stocks (the main limitation of CEDECO's methodology), CamBio2 was presented in February 2015 to the Gold Standard's Technical Advisory Board to review and validate the methodology. The ideal scenario for CEDECO would be full recognition of CamBio2 by the Gold Standard Foundation, which would help projects in Central America to access international markets.
- **Implementation costs are currently too high**. Nearly all implementation costs are currently subsidised by CEDECO using official development assistance funds. The major costs are for soil studies, carried out for all the participants in the pilot study. While the information on soil profiles is useful for the farmer in terms of knowledge of their natural base, it carries a high cost in relation to payoffs from carbon markets. This is a big problem for smallholder agriculture – how to pay for appropriate information for better and greener agribusinesses, when the markets – crops or carbon – are not recognising the investment?
- **Limited information leads to unmet expectations.** Lack of information on the processes involved can reduce farmers and cooperatives' willingness to participate in upscaling the project.

The lessons from this project in Guatemala are similar to other two in this series: PASCAFEN in Nicaragua and Sierra Piura in Peru (Porras *et al*., 2015 and Amrein *et al*., 2015). Carbon-related activities are complementary to organic/Fairtrade valuable crops like coffee and cocoa, already traded in niche markets to clients with a defined corporate social responsibility agenda. But the transaction costs are still too high to justify the extra costs to achieve the certification required to access carbon markets, and the level of payoffs are still uncertain.

REFERENCES

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

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

CEDECO (2014) Resultados de la determinación de servicios al ambiente – PASCAFEN. San José, Costa Rica.

CEDECO (2010) Síntesis de las principales acciones y hallazgos del proceso de validación de Línea Base frente a la generación de Servicios al Ambiente por Organizaciones contraparte del Programa de Desarrollo Rural del Centro Cooperativo Sueco. *Síntesis de Informe, II Semestre.* San Jose, Costa Rica.

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.

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%20PES.pdf

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

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

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

Läderach, P, Haggar, J, Lau, C, Eitzinger, A, Ovalle, O, Baca, M, Jarvis, A and Lundy, M (2013) Mesoamerican coffee: building a climate change adaptation strategy. Policy Brief No. 2. CIAT and CATIE, Cali, Colombia. See: http://ciat.cgiar.org/wp-content/uploads/2012/12/policy_brief2_mesoamerican_coffee.pdf

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/link-methodology-version-2-0/

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, 26–29 June 2005.

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

Panhuysen, S and Joost, P (2014) Coffee Barometer 2014. Hivos, IUCN Nederland, Oxfam Novib, Solidaridad, WWF.

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

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, 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

Rodríguez, G (2015) Email to author from Gabriel Rodríguez Benavides, CEDECO, May 2015.

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

ORGANIC COFFEE PRODUCTION AND CARBON SEQUESTRATION IN GUATEMALA

CAN CARBON FINANCING PROMOTE SUSTAINABLE AGRICULTURE?

In Guatemala, we study a coffee project claiming carbon credits through its organic practices. Compared to conventional large-scale coffee production, the organic practices of smallholder farmers in the north of Guatemala provide a number of environmental benefits, including capturing and storing carbon dioxide in biomass and soil. The Educational Corporation for Costa Rican Development (CEDECO) has created the CamBio2 methodology to quantify the land's carbon stock and issue carbon credits. The project provides a good illustration of the potential of combining organic coffee in smallholder production with carbon markets. However, the costs involved in developing these markets are still too high, given the uncertainty of payments. How can future revenues be used to promote organic agriculture beyond the pilot project? This case study forms part of the Hivos-IIED Payments for Ecosystem Services for Smallholder Agriculture series, exploring the potential of carbon offset funding in relation to smallholder agriculture.

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