COFFEE AND CARBON OFFSETS FOR SMALLHOLDERS

Can carbon financing promote cleaner coffee in Nicaragua?

INA PORRAS, ALEXANDRA AMREIN AND BILL VORLEY – 2015

SHAPING SUSTAINABLE MARKETS

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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.

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BOXES

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

CEDECO	Educational Corporation for Costa Rican Development
CIAT	International Center for Tropical Agriculture
PRODECOOP	Promoter of Cooperative Development
GHG	Greenhouse gas
IIED	International Institute for Environment and Development
JAZ	José Alfredo Zeledón Cooperative
PASCAFEN	Sustainable Agriculture in Coffee Plantations in Nicaragua
PES	Payments for ecosystem services
REDD	Reducing emissions from deforestation and forest degradation
VCM	Value chain map

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.

This report looks at the ongoing PASCAFEN-CamBio2 project (Sustainable Agriculture in Coffee Plantations in Nicaragua) to understand the potential of carbon-offset funding for smallholder agriculture in coffee-producing landscapes. Carbon emission reductions in the project are expected over the course of 20 years via the establishment and maintenance of aerial biomass (trees in the coffee agroforestry system), soil carbon biomass from composting, and avoided emissions from nitrogen reductions. The project is expected to produce higher coffee yields, better disease control, improved coffee quality and a reduction in defective coffee beans, and important socio-economic benefits by improving income and livelihoods and strengthening farmer organisations. Business benefits along the value chain will be enhanced by improving environmental resilience at the production end of the value chain, and instruments like **insetting** (offsetting within existing value chains) can provide important funding to ensure long-term stability.

The project is based on the principle that small-scale farmers deliver important services to the environment through projects like organic agriculture, and that upscaling these actions can be significant for national climate change strategies. The PASCAFEN-CamBio2 project offers a good opportunity to combine coffee and carbon. It is based on a highly valuable crop with potential for insetting with a high degree of co-benefits in terms of wider ecosystem benefits and smallholder livelihoods. Activities that generate carbon credits also generate benefits for the farmer – which should also provide long-term incentives to participate. The report concludes with a summary of key lessons:

Environmental and social benefits: climate change is a significant threat to livelihoods in the area. Activities like the PASCAFEN project can help local farmers buffer at least some of these events and increase biodiversity, and resilience to climate events.

Coffee and carbon complementarity: coffee is a valuable crop but climate change risks mean that for some farmers, it will be too costly to continue in the industry. Support for climate change adaptation (eg through carbon offsets revenues) may provide enough extra funding to do so. But for farmers, accessing international carbon markets is a costly process. Would simply promoting climate-smart agricultural practices be as beneficial?

Legitimacy of standards to measure and monitor carbon: the monitoring of carbon is essential to provide the legitimacy and credibility that buyers in international carbon markets demand. Effective monitoring should therefore also increase carbon sales. Farmers need to recognise that monitoring activities are legitimate but that they also provide other benefits, such as feedback on agricultural practices. However, choosing the right methodology to minimise costs and satisfy potential buyers should not compromise local benefits. Project developers must balance legitimacy for buyers and also for the farmers. For example, CamBio2 is a holistic approach which places the farmer at the centre of the proposition. However, it is not recognised internationally, and efforts are now being made to move to a more highly recognised approach through the Gold Standard and Fairtrade.

Clear benefit sharing: how will carbon revenues be allocated? Project developers must manage expectations. Carbon revenues could be collected at group level, in the same way as a Fairtrade premium, and invested in collective activities aimed at strengthening coffee production and climate resilience. A revenue-sharing approach could bring benefits closer to farmers, but too much income fragmentation could hinder larger-scale investment projects. In addition, there may be confusion about how a new carbon standard will add value, or how eventual benefits will be shared among participants. Much of this can be remedied through more and better information, shared in less technical forms with the different groups involved.

Upscaling: this will only be feasible if costs for soil profiles (testing for organic matter and chemical soil analysis to estimate nutrient levels, existing carbon stocks and the potential future carbon sequestration rate) can be reduced, and if sufficient numbers of farmers participate in the project. A clearer idea of the required number of participants to break even in the project will help manage expectations. Accessing carbon markets has been quite bureaucratic, and for some, hard to follow and understand. Without more information sharing, and with carbon prices decreasing internationally, farmers and their cooperatives could lose interest – which could affect the potential for scaling up.

ONE
INTRODUCTION: PES AND COFFEE IN SMALLHOLDER AGRICULTURE

While 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 carbon, biodiversity conservation and protection of 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 to incentivise 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 PASCAFEN PROJECT

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

Over 70 per cent of coffee is produced by small farmers in Central and South America, Southeast Asia and Africa (Panhuysen and Pierrot, 2014). Smallholder coffee is one of the most important cash crops in many developing countries. In Nicaragua and Honduras, for example, coffee represents 20–25 per cent of export revenues.

Despite its economic importance, coffee production has faced increasing environmental challenges. Climate change is increasing the frequency of extreme weather events like droughts and floods; seasons are not as clear or predictable, which affects harvest periods; local temperatures – which affect quality of the beans – are changing, making coffee more vulnerable to plant diseases like rust (Panhuysen and Pierrot, 2014). Vulnerability of the crops to pests, droughts and floods, and by default of those who produce them, will increase with climate change (Läderach *et al.*, 2013). Adaptation will require a strong combination of policies and incentives and support from multiple stakeholders, including a stronger commitment from the private sector to invest at the base of the value chain (ie the production end).

In Nicaragua, the Sustainable Agriculture in Coffee Plantations in Nicaragua (PASCAFEN) project is supporting smallholder farmers to implement climate-smart agricultural practices. This project is managed by a cooperative – the Promoter of Cooperative Development of Nicaragua (PRODECOOP) – which links 2,300 farmers from 38 local smallholder cooperatives in Northern Nicaragua (Madriz, Estelí and Nueva Segovia); nearly a third of them from women-headed households. According to PRODECOOP, smallholder agriculture suffers the consequences of climate change, but smallholders can also be players in reducing greenhouse emissions. The agriculture sector releases greenhouse gases like methane (CH_4 eg from rice and livestock production) and nitrous oxide (N_2O, eg from the use of fertilisers based on nitrogen). Improved agriculture practices can reduce greenhouse gas emissions, and remove CO_2 through the use of agroforestry systems. PRODECOOP's proposal (which we review in this document) is to **capitalise on the agroforestry systems in which the associated farmers produce their coffee – in the form of certified carbon offsets as a form of payments for ecosystem service (PES)**. These offsets will be sold to voluntary markets. While the revenues from carbon credits are unlikely to cover the full cost of climate change adaptation, it is expected that it will contribute towards specific adaptation activities such as the construction of a bio-fertiliser production site.

It is important to highlight that the carbon component in the PASCAFEN project is still at the development stage. The earlier pilot project introduced climate-smart practices in several coffee plots, providing the space to develop and test a methodology to measure emissions. The current stage focuses on ensuring certification of carbon offsets and access to international markets.

1.3 METHODOLOGY

We present a brief value chain map (VCM) and description of the basic business model underlying the coffee–carbon proposition. We used a combination of desk-based analysis, telephone and virtual meetings with experts, and a field visit to key stakeholders located in Nicaragua and Costa Rica (Hivos, CEDECO) (see section 2.2 for stakeholders).

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)

1.3.1 Value chain map

We used the LINK methodology[1] to explore the advantages and disadvantages that the new carbon markets offer to coffee farmers and how both business components (coffee and carbon) function as complements to each other. This requires clarity of which actors are involved along the value chains attached to coffee industry in the area. They include, for example, input providers, those dealing with processing and wholesale coffee trade, as well as those associated with the newly created carbon link. Upstream in 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.

1.3.2 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.

In Nicaragua, we built a 'quick' Business Model Canvas through meetings with key stakeholders at PRODECOOP, farmers from Lozahoren Cooperative in Dipilto and from José Alfredo Zeledón Cooperative in San Juan de Rio Coco; face-to-face and virtual conversations with CEDECO and Hivos. We also examined existing literature (published, internal reports and website information). This allowed for an initial understanding of how PES and carbon are relevant to the existing coffee supply chain.

1. See http://dapa.ciat.cgiar.org/link-methodology-version-2-0/

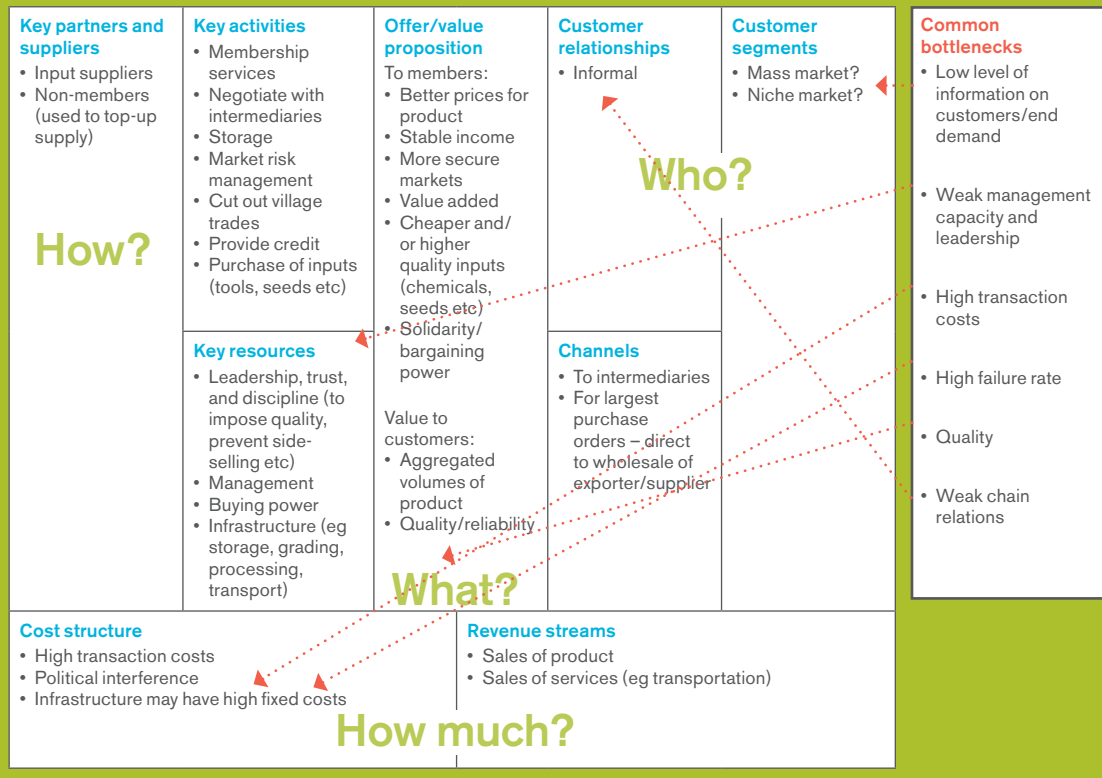
BOX 2. WHAT IS A BUSINESS MODEL CANVAS?

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 project, concentrating on the value chains that affect farm enterprises using the methodology described 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 offers a basic description of how a smallholder coffee system works in the project.[2] Further details can be found under 'Activities' in the farmers' business model (Figure 4).

2.2 KEY STAKEHOLDERS

We look at the key actors at the production stage (planting, processing, milling); in markets (roasting, trading); and partners providing different supporting roles (capacity building, technological support, financial resources). Their interactions are depicted in Figure 2. For the purposes of this study we concentrate on coffee and carbon.

2.2.1 Key actors at the production stage

Individual farmers: there are 2,300 cooperative members (30 per cent women). Approximately 50 per cent of the cooperative members grow organic coffee and the remaining 50 per cent grow conventional coffee. **Coffee** is the main cash crop within the family farming system, harvested once a year. Several varieties are used, and there are experiments with some varieties (catimor) which have a higher resistance to diseases like coffee-leaf rust (roya). All farmers are certified by Fairtrade and produce 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 the calculation of carbon sequestration). Other products include **honey** – introduced and supported by CEDECO since 2010 and sold in national markets – and **maize**, mostly for family consumption.

Carbon offsets are generated through organic agriculture at the farm level (see description in Box 4) in a pilot project in San Juan cooperative which began in 2011. Calculations of emission reductions at farm level are made based on the CamBio2 methodology, which integrates carbon into the wider farm activities linking it directly to coffee markets.

Cooperatives play a significant role in smallholder coffee production, and their role should not be underestimated. For example, in 1990 cooperatives only exported 1 per cent of coffee production. By 2010 this had increased to 20 per cent of total coffee exports (Mendoza *et al.*, 2001). They are organised by levels: first level, second level, central union, and federation (ibid). The cooperatives will play an important role in the development of carbon markets, as they will be responsible for deciding how revenues from carbon will be allocated.

2. Coffee production includes processes ranging from harvesting the raw coffee fruit to the production of finished coffee ready for national and international markets. The use of organic practices and improved agricultural methods are expected to reduce carbon emissions.

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.

First-level cooperatives are smaller and work directly with farmers at the local level. There are 38 first-level cooperatives in the study area. First-level organisations run collection points where the coffee undergoes wet processing (if not done at farm level) and is subsequently transported to PRODECOOP. We look **in more detail at two of these organisations** involved in the carbon offset pilot: José Alfredo Zeledón (JAZ) Cooperative in San Juan de Río Coco (organic coffee production) and Lozahoren Cooperative in Dipilto (conventional coffee production).

Second-level cooperatives bring together first-level cooperatives. We focus on **PRODECOOP**.[3] Operating since 1992, it has its administrative headquarters in Estelí and its processing facilities located in Palacagüina. PRODECOOP is responsible for the coffee's dry processing, marketing and export logistics. PRODECOOP also provides other services, including buying and processing coffee beans from non-members, providing micro-credit for production inputs, organisational support to smaller cooperatives (eg legal requirements), as well as dealing with food security and gender issues.

In terms of carbon offset roles, although the offset is 'created' at the farm level, the commodification and trading process takes place off the farm through other stakeholders. PRODECOOP will channel carbon offsets created under CamBio2 and act as a focal contact point for CEDECO. Once sales of credits take off, PRODECOOP will be selling credits in the name of the farmers and also be responsible for investing the generated returns.

3. See www.prodecoop.com

2.2.2 Key actors in market outlets

There are formal and informal markets for coffee and honey. All coffee production is certified under different schemes, for example, Fairtrade, Biolatina (which includes organic certification) and OSIA.[4] The large majority is sold to importers and coffee roasters in Europe, the USA, Oceania and Japan. A small fraction of the production, typically the coffee that does not fulfil the quality requirements of international markets, goes to national markets under the Café de Palo national brand. Formal sales are concluded via PRODECOOP but informal local intermediaries also compete for the farmer's coffee.

In terms of carbon markets, although the project is in relatively early stages, the plan is to make offset sales directly in the voluntary markets[5], and to explore the possibilities of insetting through existing coffee chains.

2.2.3 Partners providing support and ancillary services

CEDECO[6] (Educational Corporation for Costa Rican Development) supports smallholder farmers in Latin America to improve environmental farm management, energy efficiency and the promotion of carbon sequestration and accounting. CEDECO, with support from 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: carbon in soil (past and future), carbon in biomass, reduction of fertiliser use, and on-farm energy efficiency.

Hivos[7], both through their local office in Central America and 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, the Gold Standard, and the development of the Fairtrade Carbon Credit Standard).

Independent carbon certifiers: initially the project sought to develop its own certification using CamBio2 as an accounting methodology and as the basis for certification. However its limited international recognition became an obstacle to achieving successful offset sales. During the past months the project has been pursuing certification with the Gold Standard, through the newly created Fairtrade Carbon Credit Standard. At the moment negotiations are centred on recognising CamBio2 as one of the methodologies approved by the Gold Standard Technical Advisory Committee (TAC) in agriculture.

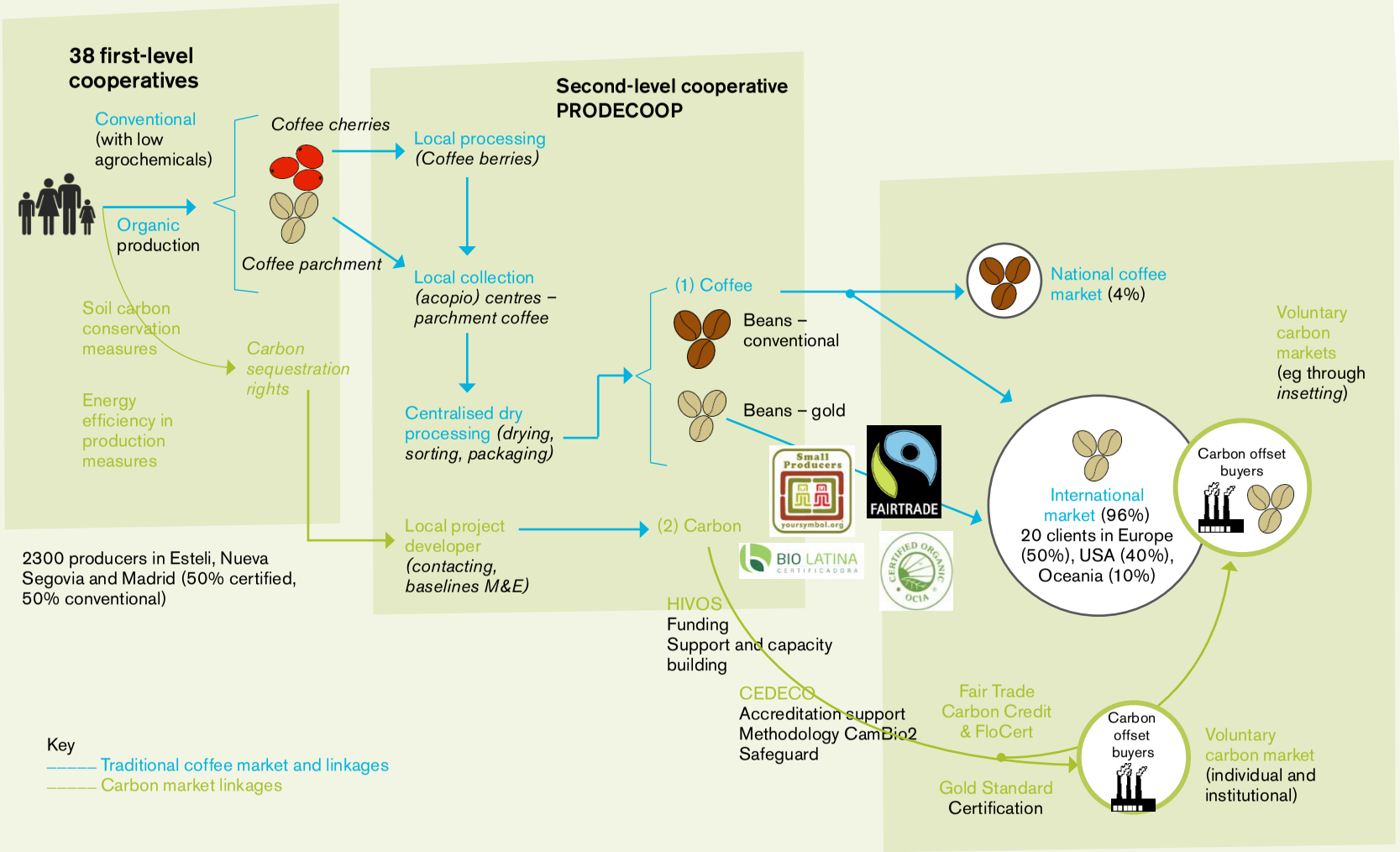
4. Ohio Seed Improvement Association (OSIA) is a voluntary certification programme to ensure that forage (hay, cubes and pellets) and mulch (straw) meets minimum standards that limit the spread of noxious weeds. Biolatina is a Latin America certification aimed at agricultural and silvopastoral production (see www.biolatina.com).

5. For more information on voluntary carbon markets, please see Porras *et al.* (2015).]

6. See www.CEDECO.or.cr.

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

FIGURE 2. PASCAFEN COFFEE AND CARBON VALUE CHAIN



Source: Value chain constructed following interviews with key informants from PRODECOOP, Hivos and CEDECO.

THREE
THE BUSINESS MODEL

We now focus on two key actors in the value chain: the farmers and PRODECOOP project developer. We base our analysis on the Business Model Canvas described in Section 1.3.2 (see also Annex 1). We present the analysis from two points of view: from the farmer, in charge of implementing the activities that will result in reduction of GHG emissions (Figure 4 and discussion in Section 3.1) and from the point of view of the key project developer – in this case PRODECOOP – whose role is to sell the carbon offsets and upscale the project to make it a viable business proposition (Figure 5 and discussion in Section 3.2). This information is used as the basis to discuss the opportunities and potential bottlenecks presented in Figure 6 in Section 4.

3.1 THE SMALLHOLDER COFFEE BUSINESS MODEL

This analysis describes the basic business model of 178 coffee farmers (92 organic and 86 conventional farmers) from José Alfredo Zeledón (JAZ) Cooperative in San Juan de Río Coco (organic coffee) and Lozahoren Cooperative in Dipilto (conventional coffee) who participated in the CamBio2 pilot study. Although farmers also produce other crops such as honey (since 2009) and several subsistence crops like maize (with sporadic excess sales) they are not included in the analysis of the business model as they do not interact with the carbon component. Figure 4 presents a summary of the farmers' business model.

3.1.1 What is the value proposition? Who are the farmers' customers?

The middle of the Business Model Canvas displays the bundle of products or services that create value for a segment of a particular market. In the case of farmers, the key products from the farm system are 'traditional' products: agricultural cash crops – in this case coffee and other produce[8] like maize and beans (mainly subsistence) and, since 2009, honey and carbon offsets.

Coffee: as shown in Figure 4, the primary value proposition is built on speciality coffee of the Caturra or Catimor variety. Although Caturra is of higher quality, many farmers are switching to Catimor because it shows greater resistance against diseases such as coffee-leaf rust. All farmers are certified by Fairtrade and half of the associated farmers also produce certified organic coffee. The coffee is sold to PRODECOOP whose processing facilities are located in Palacagüina. Intermediaries compete with PRODECOOP, particularly in times of high demand, and at times are able to offer higher prices leading to side-selling which causes tensions between PRODECOOP and the associated farmers.

Carbon: carbon offsets are the new value proposition. Currently farmers use either organic or conventional farming methods, with low fertiliser use and under agroforestry systems that provide greater environmental benefits than

8. Farmers also produce other agriculture products such as maize and beans which are mainly used for subsistence with sporadic excess sales to the local market. Since 2009, honey has been produced by 40 coffee farmers as another cash crop that helps diversify production and income sources. The honey produced is currently sold at US$2.50/kg to several local supermarkets and in informal markets within local communities.

Farmers collecting organic compost for fertilising their coffee – using shared labour © Alexandra Amrein

shadeless monoculture coffee plantations. The project proposes to introduce a series of activities that will generate carbon emission reductions over a period of 20 years, through aerial biomass (trees in the coffee agroforestry system), soil carbon biomass from composting, and avoided emissions from nitrogen reductions (see Section 3.1.2 for a full description of how carbon offsets are created). The project is expected to produce higher production yields, better disease control, improved coffee quality and a reduction in defective coffee beans.

To date, the initial amount of carbon offsets from the pilot project in both cooperatives is 17,198 tonnes of CO_2e, estimated using the CamBio2 methodology. Further upscaling generated 419,388 tonnes of carbon, which so far have not been sold. One of the reasons may be linked to the low international market recognition of CamBio2 as an approved methodology. The project coordinators are currently shifting to Gold Standard accreditation which is expected to help improve sales (see Box 3).

BOX 3. PARTNERSHIPS TO ACCESS INTERNATIONAL CARBON MARKETS

Carbon emissions are measured using the CamBio2 methodology developed by CEDECO with support from Hivos. To access international markets the project is working with the Gold Standard and the Fairtrade Foundation through a new partnership to develop a Fairtrade Carbon Credit Standard.

This partnership, currently in advanced stages of consultation (Gold Standard, 2015), shares two key sets of values: 1) social values: improvement of livelihoods, respect of human and labour rights, participation and empowerment of local communities; and 2) environmental values: protection of biodiversity, conservation of natural resources and ecosystems, reduction of greenhouse emissions and improvement of climate resilience. By promoting different activities related to agriculture, renewable energy, energy efficiency and forest management the standard seeks to enable greater access to and participation in the voluntary carbon market for the most disadvantaged communities, to deliver a greater proportion of carbon income to them, and increase their resilience to the effects of climate change. The carbon offsets will be marketed internationally through brokers (for example MyClimate,[9] a climate-neutral group) and/or directly through associated coffee value chains through insetting.[10]

3.1.2 How is value created at farm level?

Coffee: the farmers' **key activities** for **coffee production** can be separated into continuous activities such as those related to the maintenance of the plantation (planting, pruning and fertilisation) and those activities carried out during the harvesting period from November to March. The coffee beans are harvested, and are either directly transported as fresh berries to one of the ten collection centres (*centro de acopio*) strategically placed in each municipality, or wet-processing is carried out on the farm. If the necessary wet-processing facilities are available on the farm, the beans are pulped, fermented, washed and pre-dried (in wooden boxes) on the farm and subsequently transported to the collection centres as parchment coffee (mucilage-free parchment coffee) which receives a slightly higher price due to the value added by the wet processing. At the collection centres information about the delivered beans is collected such as quantity, quality verification, variety, type (organic/conventional) and name of the cooperative. After separation into organic and conventional, the coffee is further processed. Parchment coffee is sent directly to a dry processing plant (*beneficio seco*) in Palacagüina where it is sun-dried, milled, sorted and packaged. Fresh coffee berries first undergo the wet processing at the collective facilities of each collection point and are subsequently sent to Palacagüina (see Figure 1 for more details on coffee processing).

9. See www.myclimate.org

10. See for example www.planvivo.org/carbon-insetting-video-released or an example of carbon offsetting within the flower industry in Kenya here: www.goldstandard.org/insetting-%e2%80%93-carbon-neutrality-from-coops-kenyan-flower-supply-chain

Promoting organic composting among smallholder coffee growers in Nicaragua © Alexandra Amrein

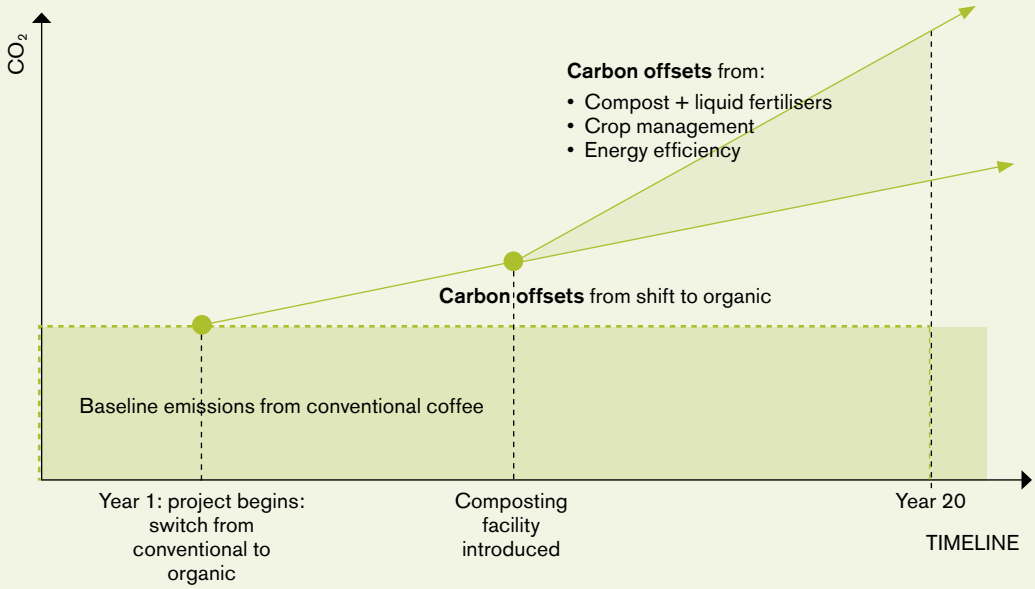
There are several **key resources** needed by the farmers to produce coffee:

- Natural capital of the coffee-based agroforestry system including access to water. Typically, PRODECOOP's farmers cultivate coffee on 2–10 *manzana*[11] – a plot of land equivalent to 1.72 acres – with an average of 3,200 coffee trees per *manzana*.
- Manufacturing capital in the form of wet-processing facilities to transform fresh berries into parchment coffee. Alternatively, the group facilities at the collection points can be used. Pulped beans are usually pre-dried in wooden boxes (instead of drying them on the ground which leads to contamination of the beans). For transporting beans to the local collection points, farmers need access to a vehicle or other transport such as animals. Alternatively, PRODECOOP runs a mobile collection unit for those who do not have access to public or private transport.
- Financial capital in the form of cash or access to credit is needed to purchase fertilisers (organic or conventional depending on agricultural practice) and to plant new coffee seedlings to replace old plants that are no longer productive.
- Human capital in terms of family labour to maintain the coffee plantation all year round and external labour during harvesting time. Human capital also includes the entrepreneurial and technical skills required to use the technology and carry out general maintenance of farms and equipment.

The farmer's **key partners** in the production of coffee are the 38 first-level cooperatives and PRODECOOP as the overall cooperative that helps group these first-level local cooperatives. In this study, we visited the two organisations that participate in the CamBio2 pilot study, the JAZ Cooperative and Lozahoren Cooperative. The first-level organisations act as local collection points, offer wet-processing facilities and provide technical assistance to their members. During the harvesting period, farmers are dependent on day labourers from nearby communities.

11. 'Manzana' is a measurement unit used in most Central American countries. It is roughly equivalent to 1.72 acres or 6,961m^2 with some variations between countries.

FIGURE 3. ADDITIONALITY IN CARBON DUE TO INVESTMENT TYPES



Source: adapted from CEDECO (2014b)

Carbon: farmers create carbon offsets through several **key activities** (see Figure 3), which include:

- Improved soil management techniques including zero tillage and permanent cover,
- Use of compost and the maintenance of a shade-providing agroforestry system,
- Biomass from agroforestry systems and renewal of perennial shade trees (coffee trees are not included in the study), and
- Reduced emissions from other greenhouse gases through moderate or zero use of agro-chemicals.

The project has become a vehicle to strengthen the CamBio2 methodology (see Box 4). CamBio2 collects information from sample farms (eg on energy efficiency, inputs, socio-economic data and soil analysis including time horizons, organic matter and chemical soil analysis) to model farm use and estimate existing carbon stocks and the potential future carbon sequestration rate. Besides informing the design of carbon-related activities, the information 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 the diversification of crops to increase climate-change resilience and improve the family's diet.

BOX 4. ESTIMATING CARBON OFFSETS IN ORGANIC AGRICULTURE

The pilot project initially used the CamBio2 methodology, developed by CEDECO with support from Hivos, to estimate carbon stocks in trees within the agroforestry coffee systems, and the carbon-reduction potential from new practices. It also quantified biomass estimates of the coffee plants – shown in the table and figure below. The pilot stage looked at 48 permanent monitoring plots in the Dipilto (conventional) and San Juan del Río Coco (organic) cooperatives (see table below for values per cooperative). Although small, the plots are highly heterogeneous in their size and composition. Averaged at about 4 hectares and ranging from less than 1 hectare to nearly 20 hectares, these plots have significant differences in tree density (with an average of 190 trees but ranging from 40 to 420 trees per hectare).

Age, variation in density and tree species are important factors affecting carbon estimates from biomass. The average biomass stock per plot measured at 392 CO_2e across all plots measured (organic and conventional), with estimates as low as 63 and as high as 1,697.6 CO_2e. Measurements of the stock also revealed potential for future carbon capture. Some of the plots show low levels of carbon stock because their trees are young, with small diameters. This makes them ideal in terms of their potential for capturing future carbon stocks. The figure below shows this relationship. With a correlation factor of -0.314, the potential for future carbon reductions decreases with the existing stocks of carbon. Because of the additionally condition attached to carbon markets, this becomes a disincentive to existing positive practices that are already generating ecosystem benefits through mature trees.

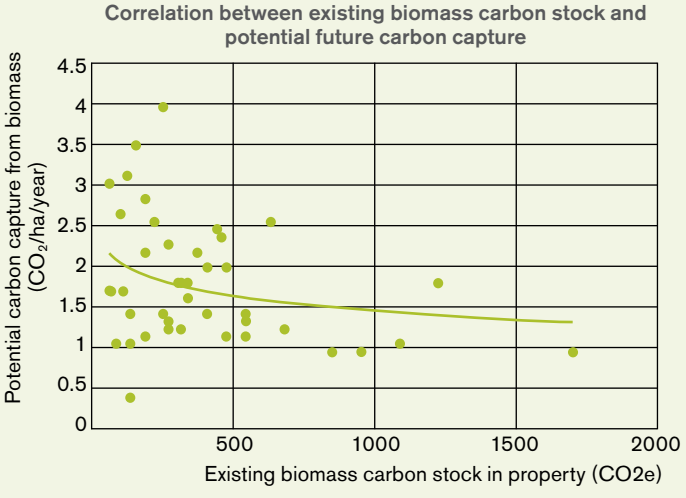
CamBio2 was also used to measure nitrogen emissions associated with fertilisers in both cooperatives. Used by approximately 80 per cent of producers in conventional farming in Dipilto, the resulting estimated emissions are used as a baseline for estimated avoided emissions from the organic cooperative. Models reveal annual emissions from nitrogen fertilisers of 6.69kg CO_2e/ha/year for organic systems and 58.69 CO_2e/ha/year for conventional systems. Using a project life cycle of 20 years it is equivalent to 89.15 CO_2e/ha/year and 217.12 CO_2e/ha/year respectively. Better crop management through climate-smart agriculture and the use of a composting facility will also generate environmental benefits from the shift to organic production (as per the baseline) and subsequent reductions in nitrogen emissions.

The information obtained through CamBio2 is useful but data and time intensive. 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 their impacts 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 long-term support of agricultural adaptation activities.

Source: Authors' own, developed from field information and CEDECO (2014a).

Average values from pilot study	*Organic coffee*	*Conventional coffee*
Plot size (ha)	4.90	2.60
Trees/ha	156.60	248.00
Average stock CO_2e in trees (tonne CO_2e/ha)*	97.01	90.24
Capture rate for CO_2e for the arboreal component (tonne CO_2e/ha/year)	1.47	2.33
Number of plots measured for nitrogen	30.00	15.00
Average measured area (ha)	0.97	0.69
Average parchment coffee production kg/ha	799.50	996.10
Average nitrogen emissions (CO_2e/kg of coffee)	0.01	0.29

*Note: There are several larger properties in the organic farming sample, increasing the average biomass stock per plot.



The most important **partner** that farmers rely on in the creation of carbon offsets is CEDECO, which is responsible for conducting the carbon study, creating soil profiles and providing training on the methodology. As CamBio2 is a participatory methodology, farmers are typically actively engaged in taking samples resulting in increased empowerment and understanding of carbon sequestration.

3.1.3 How much? Benefits and costs involved

Coffee: Farmers' primary **income** source is the sale of coffee. All of PRODECOOP's members are certified with the Fairtrade label, with a current guaranteed minimum price of US$140/quintal.

Farmers explain that since conventional coffee prices have been much higher in recent years than in previous years, the minimum price guarantee does not provide any additional benefits for them – an argument used to justify the need to include carbon as an additional incentive. The Fairtrade premium of US$20/quintal is not paid out individually but invested in collective activities (see PRODECOOP's business model in the following section). The organic farmers receive an additional bonus of US$30/quintal. However, the farmers we interviewed stated that this price premium is not enough to incentivise a shift to organic agriculture because of lower yields for an increased amount of work.

The mains **costs** for the production of coffee are related to expenses for fertilisers (organic or chemical), and the costs of labour during the harvesting period (about US$5/day/labourer). The number of labourers needed depends on the size of the farm and the strength of the family workforce. Farmers' children are increasingly moving to urban centres resulting in a lack of a family workforce and the need for hired labour from nearby communities. In addition after some years, coffee trees need to be replaced which leads to higher investment costs in the long term.

Carbon: revenues from carbon offsets sales have not yet materialised. If and when sales take place, the income is not expected to be large at the individual level (ie a carbon sequestration rate **per year per ha** of 2.98 tonnes CO_2e). The **benefits** are expected to accrue back to the cooperative as a whole, facilitating investments for collective purposes.

One suggestion on how to use eventual funding from carbon sales is to co-finance a production site for organic fertilisers (from organic waste materials from coffee production and animal manure from nearby slaughter houses) at PRODECOOP's processing headquarters in Palacagüina. Another is the creation of a revolving fund to support farmers in purchasing production inputs in the short term and to finance the renewal of coffee plantations in the long term.

According to CEDECO the benefits of sustainable agriculture are multiple and will be apparent beyond the income generated by the trade of carbon offsets, benefiting farmers directly. Economic benefits are expected in terms of higher productivity through tailored organic/chemical fertiliser use. Organic coffee production by the JAZ Cooperative is predicted to increase by up to 46.83 per cent and by 24.6 per cent by the Lozahoren Cooperative (CEDECO, 2014a). This increase is possible due to the fact that farmers are currently using far less fertiliser (organic and/or chemical) than recommended. The diversification of production and access to new forms of markets will provide further economic benefits. Social benefits include welfare stability through new business opportunities (carbon, honey), higher social and community participation, capacity building for farmers in terms of climate change and resilience and strengthening

Testing the quality of smallholder coffee in Nicaragua © Alexandra Amrein

of cooperatives in rural areas. Biodiversity conservation can also result in improved food security (eg in agroforestry systems), natural disease control, as well as improved landscape beauty and cultural values associated with coffee systems. Agroforestry systems also support soil stability and prevent sediments near water sources. Overall, small farms will be managed more sustainably, securing livelihoods and increasing climate-change resilience.

However, the production of carbon offsets generally entails **high transaction costs** in terms of baseline studies, monitoring and evaluation (M&E), certification and third-party verification especially at the beginning of a project, and if a new methodology like CamBio2 is being developed. Currently, these costs are assumed by CEDECO, but are expected to be paid by the carbon credit sales once sales are being achieved. For the carbon business to be viable the project needs to be upscaled so that it generates profits after such costs are covered. Internal calculations made by CEDECO project a net present value (NPV) of US$60,261 assuming that 2,275 farmers (99 per cent of PRODECOOP's associates) participate and offer an aggregate of 242,336 tonnes of fixed carbon. This calculation assumes a conservative future carbon price of EUR5.29 (after 5 years) and EUR4.51 (after 15 years).

3.2 UPSCALING BEYOND THE FARM: PRODECOOP AS PROJECT DEVELOPER

We now briefly describe the key points linked to the upscaling model based on PRODECOOP acting as project developer. PRODECOOP is the second-level producer organisation grouping 2,300 small-scale coffee farmers, and is responsible for milling, packing, marketing and organising logistics that facilitate exports.

3.2.1 What is the value proposition? Who are the customers?

Coffee: PRODECOOP's value proposition is green (unroasted) Fairtrade coffee, both organic certified and conventional, for sale in markets in Europe, the United States, Japan and Oceania. These markets are largely composed of importers and a smaller amount of roasters. Approximately 4 per cent of the production is sold to national markets as roasted coffee.

Carbon: within the pilot project, 17,198 carbon credits were issued from the 178 participating farmers. The crediting period is 20 years.

3.2.2 How is value created?

Coffee: PRODECOOP's **key activities** include taking delivery of coffee and milling, cupping and quality control as well as packaging, marketing and negotiating with clients. The corresponding **key resources** needed for the value proposition are, most importantly, the supply of the agreed quantity of specialty coffee by first-level organisations; local collection points and processing facilities; and social capital in the form of PRODECOOP's reputation, the client network and the loyalty of the coffee farmers to supply the quantity and quality of coffee needed to satisfy customers' demands. Finally, financial capital is needed in the form of cash to pay farmers on time for their coffee berries.

The **key partners** needed to make the coffee business function are: most importantly, the 2,300 farmers as suppliers of the raw materials from whom 90 per cent of all coffee is purchased (10 per cent comes from non-associated farmers); and the certifying bodies: the Organic Crop Improvement Association (OCIA), Biolatina (both organic) and Fairtrade. PRODECOOP currently receives financial support from several donors and Oikocredit (a cooperative society that offers loans and investment capital) to fund a production site for organic fertilisers.

Carbon: PRODECOOP's **key activities** for the carbon business include documenting the progress of participating farmers; administrating contracts and monitoring; communicating with farmers about tasks, obligations and rights that come along with CamBio2; attending the third-party verification; and paying visits to all participating farmers at least once a year. The **key resources** needed are the internal control system, and project technicians that provide technical assistance on how to implement adaptation activities.

Key partners for the carbon business are CEDECO, the Gold Standard Foundation and Fairtrade with whom CamBio2 is running a pilot study to review the compatibility between standards.

3.2.3 Costs and benefits

Coffee: PRODECOOP's yearly budget amounts to approximately US$14 million, which is used to cover the following major **costs**:

- The purchase of coffee: farmers receive payments in three instalments (1) payment after delivery at local market prices, (2) payments of price premiums in June (ie organic, Fairtrade, high quality) and (3) dividend payments from coffee profits to cooperative members where relevant
- Staff costs of approximately US$400,000
- Certification expenses (Fairtrade and organic)

Income is generated from the sales of coffee. There are no numbers available on margins. The Fairtrade premium of US$20/qu is invested collectively by PRODECOOP with US$5 going towards productive activities and US$15 going towards the payment of certification costs, technical assistance, a farmer fund and processing facilities. Contributions (from donors) are approximately US$500,000 per year.

Carbon: as no carbon transactions had taken place at the time of this study, no monetary benefits had been gained. PRODECOOP already benefits indirectly from the CamBio2 methodology through the provision of soil studies and the climate-smart agricultural practices that allow farmers to improve their fertiliser use, which could potentially lead to an increase in production and thereby a secured supply of coffee.

FIGURE 4. BUSINESS MODEL IN PASCAFEN PROJECT – FARMERS' PERSPECTIVE

Partners

Coffee

38 first-level cooperatives
Day labourers during harvest
Support from Fair Trade and organic certifiers
Technical support from CEDECO

Carbon

First-level cooperatives through a pilot project with 178 farmers (92 organic and 86 conventional) with 638 ha of land.
Plans to upscale to 2,275 farmers with 4,887 ha of land.

Technical support also from CEDECO and CamBio2 methodology

Gold Standard (pilots CamBio2 methodology) – although they do not work directly with farmers

Activities

Coffee

Crop maintenance, coffee harvest, wet processing, delivering coffee to collection points

Carbon

Practices to increase/maintain carbon fixing in soil and biomass and tailored organic/chemical fertiliser use; crop diversification

Resources

Coffee

- 2–10 mz of land with ~ 3,200 trees/mz
- Equipment for wet processing *(alternative: access to collective wet processing facility)*
- Wooden box to (pre)dry coffee
- Means of transport to deliver coffee *(alternative: collective vehicle)*
- Cash/access to credits to buy fertilisers (chemical or organic) and to renew coffee trees
- Own workforce (and of the family) all year round and external day labourers during harvest

Carbon

- Agroforestry system with land ownership
- Soil carbon stock through past agro-ecological practices
- Detailed soil profile to tailor fertiliser needs
- Knowledge of CamBio2 methodology

Value proposition

Speciality coffee

- Parchment coffee or fresh berries
- Organic or conventional (with low fertiliser input)
- Arabica coffee of Caturra or Catimor variety of very high quality
- Certifications: Organic, Fair Trade, Small Producers

Honey (pilot project since 2009)*
Subsistence crops (ie maize, beans)*

2.98 tonnes CO2e/year/ha per farmer through:

- Soil Carbon
- Carbon in biomass
- Reduced soil emissions from reduced fertilisation

Relationships

Coffee

Long-term and trust-based relationship with **PRODECOOP**, which also works as intermediary in carbon project

Channels

Coffee

- Delivery at the local collection points via animals or vehicles (private, collective or public)
- From the local collection points, the coffee is transported to the processing centre in Palacaüina for dry processing via PRODECOOP's vehicles
- The farmers who do not have a wet processing facility on their farms deliver the coffee first to the wet processing facility

Carbon Credits will be sold via PRODECOOP and is facilitated and supervised by CEDECO which needs to approve the purpose of use of the funds. A contract between CEDECO and PRODECOOP formalises the transaction

Customers

Coffee

PRODECOOP
Second-level cooperative that groups smaller local cooperatives

Intermediaries
Do not pay a Fair Trade or organic bonus but occasionally offer more competitive prices

Carbon

Local cooperative, then PRODECOOP, and eventually reaching international voluntary carbon markets

Cost structure

Coffee

- Membership costs: initial inscription fee for Cooperative between US$3.7 and 2-5% of sales, kept by the cooperative. Other costs include conventional or organic fertilisers, day labourer during harvest, transporting the coffee to the collection centres, renewing the coffee plantation, etc.

Carbon

For the farmer: paperwork for taking part, time and investment to switch practices.

Income sources/benefits

Income from coffee Sales price = local market price with a minimum price of US$140/qu. guaranteed by Fairtrade (FT). Sales price November 2014: US$150/qu. Organic bonus: US$30/qu. Fairtrade bonus US$20/qu. Fairtrade bonus is not reimbursed at an individual level *(see PRODECOOP's business model)*

Income from carbon No sales made to date. The projected sales price of credits is EUR 5.29/4.51 (5 & 15 years respectively). Two types of benefits:
Directly for the farmer: benefits in the form of changes from agricultural practices: **economic** benefits as increased and stable income, diversified production; **environmental** as less pressure on their resources, increased biodiversity and climate resilience, crop diversification, improved energy use on farm; **social** benefits in the form of community participation, training on CC, sustainability of small farms
Group benefits for the cooperatives: co-funding for bio-factory for the production of organic fertilisers; revolving fund to finance the purchase of production inputs and the renewal coffee plantations

Traditional products (coffee) Carbon

FIGURE 5. BUSINESS MODEL IN PASCAFEN PROJECT – PRODECOOP PERSPECTIVE

Partners

Coffee

Associated farmers: 2,300 associates grouped in 38 first-level cooperatives

Certifiers:
- Fair Trade
- Biolatina
- OCIA

Donors:
Green Mountain Coffee, HEIFER, We EFFECT, CRS

Financial service provider:
Oikocredit

National alliance:
CafeNica

Non-associated coffee producers

Technical support from CEDECO

Carbon

First-level cooperative through a pilot project with 178 farmers (92 organic and 86 conventional) with 638 ha of land
Plans to upscale to 2,275 farmers with 4,887 ha of land
Technical support also from CEDECO and CamBio2 methodology
Gold Standard (pilots CamBio2 methodology)
BKS Öko-garantie
HIVOS

Activities

Coffee receives deliveries of coffee, milling, cupping and quality control, marketing, client negotiations, export logistics

Carbon
- Progress documentation of certified farmers and administration of database
- Communication with participating farmers on obligations and rights
- Attending external verification
- Visiting every participant at least once a year to check on progress

Resources

Coffee
- Natural capital: supply of speciality coffee
- Manufactured capital: collection points, processing facilities
- Human capital: 58 employees at the headquarters, governing board, expertise in coffee processing and marketing
- Social capital: reputation and client network, loyalty by producers
- Financial capital: cash to pay producers at point of delivery

Carbon
- Manufactured capital: internal control system
- Human capital: technician to provide support in the field and knowledge on CamBio2 norms

Value proposition

Speciality coffee

Green coffee for the international market
- Organic (50%)
- Conventional (50%)

Toasted coffee for the national market
- Conventional (100%)

The coffee from the sourcing area is famous for its high quality, and holds the following four types of certification:

Carbon offsets

17,198 carbon credits produced under CamBio2 methodology by small-scale coffee farmers over a crediting period of 20 years

Relationships

Coffee

Long-term relationships with frequent communication particularly pre and during the harvest period. The main forms of are email, telephone and personal visits

Channels

Coffee

The coffee is transported to its international destinations by ship

Carbon
- Sales will be supervised by CEDECO which also will need to approve purpose of use of eventual returns
- A contract between PRODECOOP and CEDECO regulates the rights and obligations under CamBio2
- An eventual accreditation by the Gold Standard is proposed to gain international recognition

Customers

Coffee

Export market (96%) for green coffee
- 50% to Europe (ie CaféMA International, Oxfam Belgium)
- 40% to USA (ie Royal Coffee, Equal exchange)
- 10% Japan and Oceania

National market (4%)
- Inferior quality
- Informal sales channels

Carbon

Voluntary carbon market
- Institutional buyers
- Carbon intermediaries

Cost structure

Coffee
- Expenses for the purchase of coffee (farmers receive three payments: local market price at moment of delivery, payment of price premiums in June an cooperative dividend)
- Costs for Fair Trade and organic certification
- Personal: US$400,000/year

Carbon

For project developers:
- Base line and project documentation, as well as expenses to access carbon market (issuance, M&E, 3rd party verification, etc.)
- Implementation costs (training, operational costs, infrastructure, etc.)

Income sources/benefits

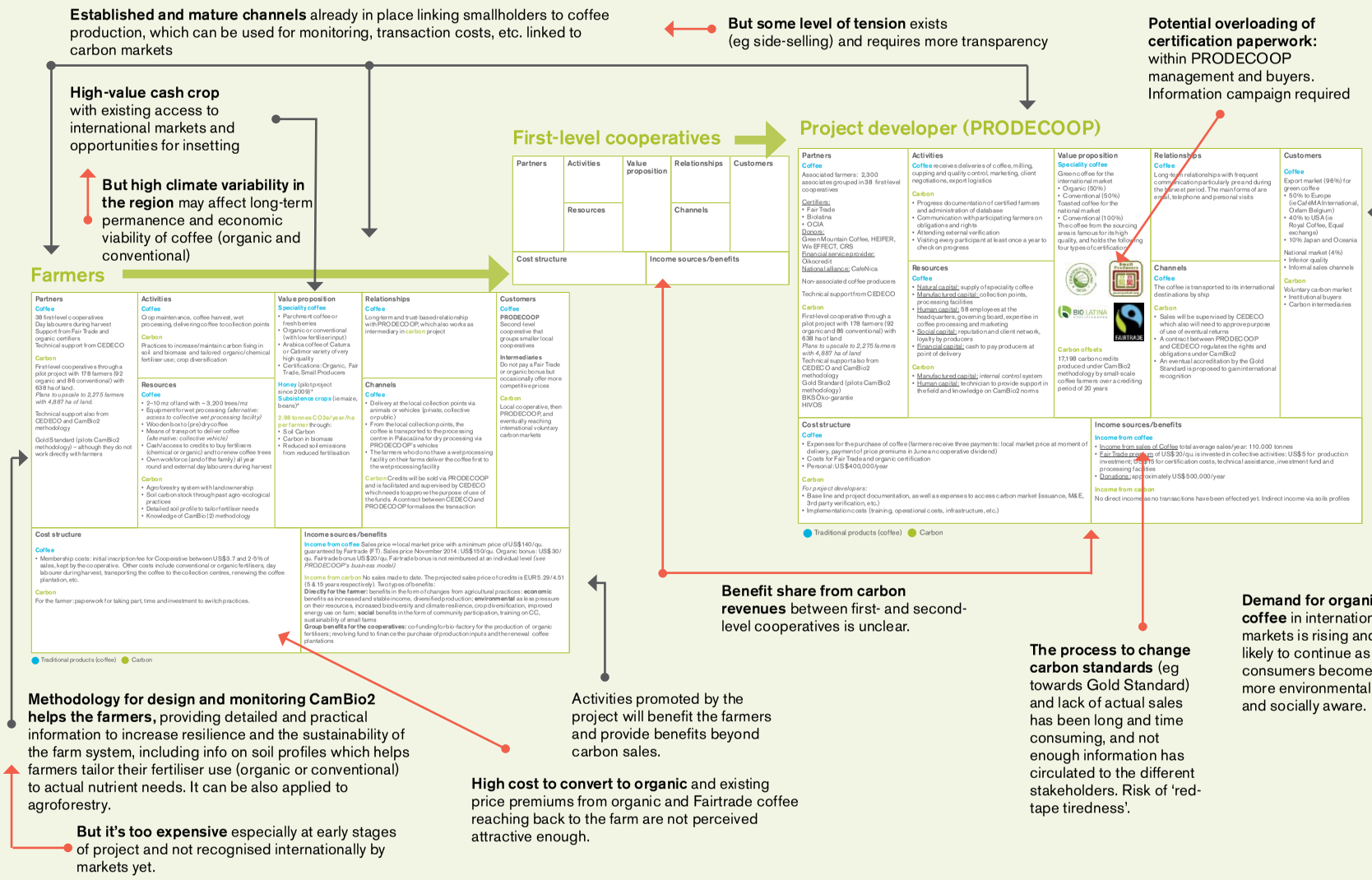
Income from coffee
- Income from sales of coffee total average sales/year: 110.000 tonnes
- Fair Trade premium of US$20/qu. is invested in collective activities: US$5 for production investment; US$15 for certification costs, technical assistance, investment fund and processing facilities
- Donations: approximately US$500,000/year

Income from carbon

No direct income as no transactions have been effected yet. Indirect income via soils profiles

Traditional products (coffee) Carbon

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



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

FOUR
KEY POINTS: RELEVANCE AND COMPLEMENTARITY

In this section we discuss the most important points of the PASCAFEN coffee–carbon proposition. Figure 6 shows the key opportunities and potential bottlenecks for the development of the carbon-coffee proposition along the value chain, and highlights areas for complementarity. This figure is built using the Business Model Canvas from the farmers' (Figure 4) and PRODECOOP's (Figure 5) perspectives. Due to time limitations we did not develop a similar model for the first-level cooperatives although their role is discussed below.

4.1 ENVIRONMENTAL AND SOCIAL BENEFITS

Climate change is a significant threat to livelihoods in the area. Extreme weather events involving drought and floods, changes in the pattern of coffee plants flowering, and rising temperatures increase the risk of disease and pests which are highly likely to reduce yields. A study conducted by CIAT, in 2010, shows that by 2015 the areas suitable for growing coffee will increase in altitude by approximately 300m.

Activities like the PASCAFEN project can help local farmers buffer at least some of these events. The project is expected to increase biodiversity and resilience to climate events through diversification in production, and improve pest and disease control. Organic agriculture provides a number of benefits such as the avoided contamination of soils, water sources and humans by toxic residues – and to a lesser extent this applies to low-input conventional agriculture (employed by 50 per cent of the farmers). There are important livelihoods benefits from supporting adaptation in smallholder farming systems.

4.2 COFFEE AND CARBON COMPLEMENTARITY

Coffee is the main product, and will continue to be for these cooperatives. While it is a highly valuable commercial crop with an established market outlet, coffee production also faces significant climate change risks in the region. This may affect the interest in furthering investments (ie switching from conventional to organic) in an already struggling activity that may not be viable in the medium to long term. For some farmers, support for climate change adaptation (eg through carbon offsets revenues) may provide extra funding to invest in, and continue coffee farming, but for others the costs of continuing in the industry may be too great.

For existing organic growers, the activities required for the carbon component will require little additional effort. Conventional growers will require larger investments. From discussions with farmers, existing price premiums from organic and Fairtrade certification are not sufficient to justify switching practices. Because the carbon component is still at the proposal stage it is unclear to different stakeholders involved how the funding – when it materialises – will help the farmers. For example, it is currently not clear from discussions on the ground if eventual financial benefits would actually incentivise farmers to change their agricultural practices compared to those changes that would take place regardless of any incentive. There is also an underlying sense of unease at the additionality component, which rewards only future activities but not existing good practices – thereby penalising existing good behaviour. It is important to also ask whether the same results could be reached by simply

promoting climate-smart agricultural practices amongst farmers without a connection to carbon markets and the associated high transaction costs in accessing international carbon markets.

4.3 LEGITIMACY OF STANDARDS TO MEASURE AND MONITOR CARBON

Accessing international carbon markets requires monitoring of carbon to legitimise the transaction to the buyers. Recognised international bodies, like Gold Standard and Fairtrade, bring credibility to satisfy buyers and increase willingness to purchase offsets. This is expected to help increase carbon sales – so far missing in the project.

Farmers, however, need to recognise that the monitoring activities are legitimate. Rather than being a list of 'tick boxes' to satisfy carbon-offset buyers, monitoring strategies can also provide valuable information for the farmer. For example, it can provide information on the health of their ecosystem (are the trees growing well? What is the state of the soil nutrients?). And when linked to capacity building it can provide suggestions on how to fix emerging problems. The long-term approach required by carbon markets can be a benefit to the farmer, if it generates support of this type over the life of the project.

Methodologies like CamBio2 are useful for the farmer in terms of feedback on their practices but can be very cost-intensive and not recognised internationally. A change to other methodologies to reduce costs and satisfy potential buyers should not compromise local benefits. Project developers must maintain a fine balance between ensuring legitimacy for buyers and also for the farmers.

4.4 CLEAR BENEFIT SHARING

The project needs to be clearer on how eventual carbon revenues will be allocated, to effectively manage expectations. Because emissions per plot are small, the project suggests that carbon revenues should be collected at group level, in the same way as a Fairtrade premium. The proposal is that PRODECOOP will receive future payments to invest in collective activities aimed at strengthening coffee production and climate resilience. At the time of writing, it is unclear if PRODECOOP will keep the full amount, or if a percentage of the benefits will be shared directly with the first-level cooperatives. A revenue-sharing approach could bring benefits closer to farmers, but too much income fragmentation will reduce the possibility to implement larger-scale investment projects.

Upscaling will only be feasible if the costs of soil profiles can be reduced, and if a large enough number of farmers enter the project. A clearer idea of the required number of participants to reach the break-even point (in terms of profits versus costs of entering carbon markets) will help in managing expectations. The process of accessing the carbon markets has been quite bureaucratic, and for some actors along the chain it has been hard to follow and understand. Without more information sharing, and with carbon prices decreasing internationally, there is a risk of farmers, first-level cooperatives and even PRODECOOP losing interest which could affect the potential for scaling up.

FIVE
IMPLICATIONS FOR PES LEARNING

This project offers a good opportunity to combine coffee and carbon. It is based on a highly valuable crop with potential for insetting. It has a high degree of co-benefits in terms of wider ecosystem benefits and smallholder livelihoods. Farmers are organised in tried and tested channels and developing the carbon component will not require the creation of new institutions. The activities that generate carbon credits will also generate benefits for the farmer – so there is an interest to continue in the long term.

The pilot project provides good learning on the importance of a holistic approach – CamBio2 – which places the farmer at the centre of the proposition. This method is considered 'weak' by some, in terms of resulting in actual offset sales because it is not recognised internationally, and efforts are now being made to move to a more highly recognised approach through the Gold Standard and Fairtrade. It highlights the divergence between what is important and legitimate at different ends of the carbon value chain and demonstrates the need to minimise trade-offs between farmers and buyers, especially if the farmers lose out.

Despite the benefits of a project like this, there seems to be little understanding of the process to enter carbon markets beyond those directly involved in preparing the pilot – especially at the farmer level. For example, there is confusion about how a new carbon standard will add value in relation to the various other standards already in place or if it will result in more paperwork. There is no clarity on how eventual benefits will be shared among the cooperatives. Much of this can be remedied through more and better information, shared in less technical forms with the different groups involved.

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COFFEE AND CARBON OFFSETS FOR SMALLHOLDERS

CAN CARBON FINANCING PROMOTE CLEANER COFFEE IN NICARAGUA?

This report looks at the ongoing PASCAFEN-CamBio2 project (Sustainable Agriculture in Coffee Plantations in Nicaragua) to understand the potential of carbon-offset funding for smallholder agriculture in coffee-producing landscapes. Carbon emission reductions in the project are expected over the course of 20 years via the establishment and maintenance of aerial biomass (trees in the coffee agroforestry system), soil carbon biomass from composting, and avoided emissions from nitrogen reductions. The project is expected to produce higher coffee yields, better disease control, improved coffee quality and a reduction in defective coffee beans, and important socio-economic benefits by improving income and livelihoods and strengthening farmer organisations. Business benefits along the value chain will be enhanced by improving environmental resilience at the production end of the value chain, and instruments like insetting (offsetting within existing value chains) can provide important funding to ensure long-term stability. The project is based on the principle that small-scale farmers deliver important services to the environment through projects like organic agriculture, and that upscaling these actions can have major significance for national climate change strategies.

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