

REFORESTATION, COFFEE AND CARBON IN SIERRA PIURA, PERU:

Can carbon financing promote sustainable agriculture?

ALEXANDRA AMREIN, INA PORRAS AND BILL VORLEY – 2015



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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: <http://shapingsustainablemarkets.iied.org/library>

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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 ₂ e)	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 <i>et al.</i> , 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 <i>et al.</i> , 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 <i>et al.</i> , 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 ₂ O), carbon dioxide (CO ₂), nitrous oxide (N ₂ O), 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 <i>et al.</i> , 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 <i>et al.</i> , 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 <i>et al.</i> , 2010; Porras <i>et al.</i> , 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 <i>et al.</i> , 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 <i>et al.</i> , 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 <i>et al.</i> , 2014).

ACRONYMS

AVSF	Agronomes et Vétérinaires Sans Frontières (Agronomists and Veterinarians Without Borders)
CEPICAFE	Central Piurana de Cafetaleros (Central Piurana Coffee)
CIAT	International Center for Tropical Agriculture
CO ₂	Carbon dioxide
FLO	Fairtrade International (originally Fairtrade Labelling Organizations)
FOB	Free on board
GHGs	Greenhouse gases
IIED	International Institute for Environment and Development
MASL	Metres above sea level
ODA	Official development assistance
PDD	Project design document
PES	Payments for ecosystem services
tCO ₂ e	Tonnes of carbon dioxide equivalent
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 adopt 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 Peru we analyse a coffee and reforestation project led by a large coffee cooperative (Norandino) and a local NGO (Progreso). An 'upstream-downstream' approach links two groups of farmers in a climate change mitigation and adaptation project: (a) 350 poor subsistence farmers in the upper parts of Sierra Piura (over 3,300 MASL or metres above sea level) create carbon offsets through reforestation. These activities contribute to regeneration of the upper slopes of the watershed and reduce siltation for b) 240 coffee producers located in the lower reaches of Sierra Piura (about 1,100 MASL) who also implement climate adaptation activities like drip irrigation and shade planting. The coffee-carbon link is used to target carbon offset buyers through **insetting** (see glossary). Carbon buyers benefit in two forms: they offset their carbon emissions, while promoting resilience of coffee production at the base of their value chain.

Carbon revenues are used mostly to fund upstream activities, with 10 per cent diverted to complement official development assistance (ODA) funding used for the adaptation activities. In addition to a modest cash payment per tree planted in the community-managed nurseries, upstream farmers benefit from continuous technical support to establish a timber industry,

and vegetable gardens for food security. The process has been long and technically challenging, but the project has managed to successfully sell carbon offsets to Norandino's coffee buyers. The existing institutional structures offered by cooperative alliances and the technical capacities to deliver carbon offsets created through this project mean that there is high potential for upscaling, for example expanding to include other coffee cooperatives, as well as expanding to other cooperatives working in high-value crops like cocoa, sugar and fruits. However, the project needs to invest strongly in marketing to expand the sales of carbon offsets.

ONE

INTRODUCTION: PES AND REFORESTATION 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 the protection of water quantity and quality (MEA, 2005). There is growing interest in developing financing mechanisms that try to bring these ecosystem services to markets, creating new incentives to promote behavioural changes towards more sustainable practices.

Payments for ecosystem services (PES) is one of these mechanisms. PES is proposed as a method 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 NORANDINO PROPOSAL FOR SMART AGRICULTURE AND CARBON IN SIERRA PIURA

In this report we focus on how carbon offsets can help promote climate-smart agriculture at the watershed level.

Peru is a large country with a varied geography and extreme physical contrasts. The Andean mountain chain divides the country into extremely arid areas along the coast, a high mountainous zone along the Andes, and extensive tropical rainforests. Throughout its history, geography has affected climate, precipitation, physical accessibility and the location of human settlements.

Piura is located on the northern coast, covers 36,403.5km² and has a large population of 1.45 million people. The combination of misuse and weak governance of natural resources, and information gaps – for example on how these resources are used – is driving a fast – and possibly irreversible – process of desertification (Torres Guevara, 1999). The exact history and causes of ecosystem degradation of the Sierra Piura Highlands is still debated amongst

international scientists, but it is largely agreed that large-scale deforestation was driven in the 1960s by demand for firewood and construction materials and the expansion of infrastructure by the Peruvian government. This degradation causes further changes in the water cycle and affects food production.

Norandino¹ is a cooperative of smallholder farmers, producing agricultural crops such as cocoa, coffee and sugar. The increasing degradation of natural resources had become a real problem for farmers. Two main problems have been identified, requiring urgent measures:

- Decreased/limited precipitation affecting the commercial coffee farmers who rely on rain for coffee production, and
- Degraded soils, which mostly affects subsistence farmers who lack sufficient income to invest in fertilisers to boost soil fertility.

Both commercial and subsistence farmers live within the same watershed. Although the environmental externalities of their respective approaches to land management led to negative impacts on one another, no formal or informal arrangements were in place to address them.

In 2008, Norandino joined forces with local NGO Progreso and several other stakeholders to try to address these environmental issues. The project aimed to reverse deforestation of the highlands, where only a small area of original forest remained after the rest was converted to pasture. Their underlying assumption was that reforestation of the highland areas would help improve water balances – benefiting downstream coffee production – while simultaneously reducing greenhouse carbon emissions. With a lifetime of 25 years, the project site selected a total of 213 hectares to reforest, of which 192 hectares are now complete. This generates 37,214 tCO₂e, certified by the Gold Standard Foundation and verified by the Rainforest Alliance as an external verifier. To date 9,746 tCO₂e have been sold to three buyers, the majority through insetting – ie selling to coffee businesses (Cafédirect, UK and Bewley's, IREx) that already exist within the supply chain.

1. See: www.coopnorandino.com.pe

1.3 METHODOLOGY

We present a brief value chain analysis and description of the basic business model underlying the reforestation, coffee and carbon proposition. We used a combination of desk-based analysis, conversations with experts, and a field visit to the project in Peru.

1.3.1 Value chain mapping

We use CIAT's LINK methodology to explore the advantages and disadvantages that the new carbon markets offer to farmers in timber processes and how both business components complement each other. This requires an understanding of the different actors involved along the value chains linking to crop and timber

industries in the area. This includes for example input providers, those dealing with processing and trading, as well as those associated with the newly created carbon chain. At the upstream end of the supply chain, the potential for carbon revenues to promote the participation of small-scale farmers involved in timber growing (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 (eg costs associated with research and development, or those associated with reaching small-scale and scattered farmers).

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?

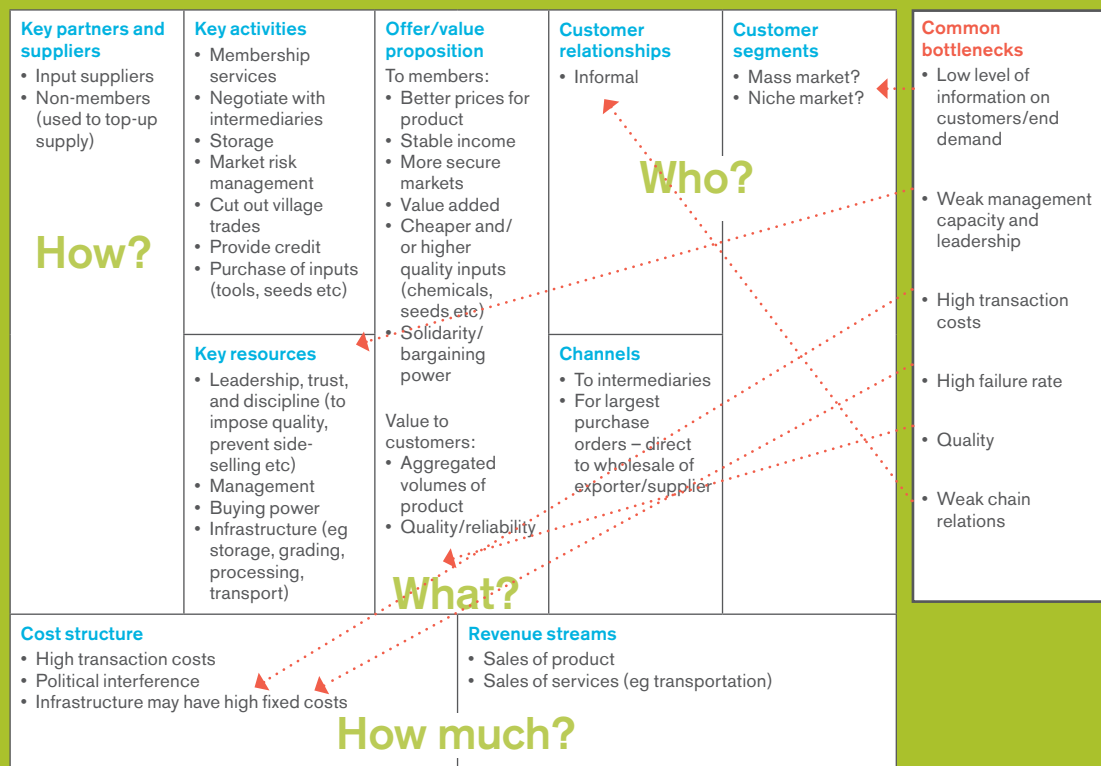
The Business Model Canvas is a useful tool to assess how a key business in the value chain functions, to develop a shared language to describe and assess a business model, and to create a baseline for the development of innovations in the business model. By providing a 'visual picture' of the organisation's 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 AND REFORESTATION VALUE CHAINS

The project focuses on four sets of actors: two groups of farmers (subsistence farmers who reforest in the upper parts of the watershed, and coffee farmers downstream in the watershed who are organised as a local (first-level) cooperative)²; Norandino as a second-level cooperative and as the carbon project developer; and the international buyers. We use the methodology presented in Section 1.3.1 to describe the value chain.

2.1 THE CARBON CHAIN

The process undertaken to access the carbon market under the Gold Standard has involved several stages and a number of different stakeholders (Paucar, 2015):³

- August 2008–2009: the project idea note, which describes the initial idea, was sent to the Gold Standard technical committee (if a project idea note is accepted, the project can move to the next stage).
- January 2010: the project design document (PDD) is developed, detailing eligibility of land, additionality, forestry management, socio-economic aspects, environmental aspects, baseline for carbon, leakages, carbon fixing, capacities and land tenure.

- October 2010: pre-validation
- July 2011: initial certification
- September 2011–December 2013: monitoring by the Markit registry, which collects information on all certified carbon projects under approved standards (eg the Gold Standard, *Verified Carbon Standard*, Plan Vivo) to offer transparency to buyers and prevent double selling
- October 2013: certification of management units
- Thereafter: periodic verification.

Figure 1 summarises the key aspects of the value chain.

The key stakeholders and their roles are described below, and further discussed in Section 3.

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

3. For more information see: www.climateprojects.info/PE-RSP/#

2.1.1 Farmers

(a) Reforestation upstream produces carbon offsets – this involves a group of 350 subsistence farmers located at around 3,100 MASL who create carbon credits through reforestation. Almost all the land in the project site had been converted to pasture, with only a small area of native forest remaining. The farmers' production is restricted by highly degraded soils. They live in extreme poverty and only cultivate a limited selection of starchy vegetables and grains such as potatoes, beans, wheat, barley, corn and ulluco.⁴

(b) Middle of watershed – downstream coffee farmers benefit from land management upstream and receive partial funding from carbon for adaptation activities. There are 1,700 smallholder coffee farmers, directly associated with a first-level cooperative located at around 1,100 MASL. Farms range between 0.5 and 2 hectares in size and yield between 3 and 5 quintals/hectare/year. Their agricultural methods are highly dependent on rainfall – the rainy season usually lasts between November and May but has become less predictable in recent years. The farmers' ability to predict when the rains begin and end is crucial, as it allows the fruit to mature. 240 of these coffee farmers are members of the local cooperative Central Piurana de Cafetaleros (CEPICAFE)⁵ and participate in climate-change adaptation

measures partly financed through the carbon credit trade. These activities do not generate carbon offsets.

2.1.2 Coffee association and carbon project developer Norandino

Norandino is a farmer-owned coffee trading platform⁶ that processes parchment coffee into green coffee and subsequently exports it to roasters and importers in the United States and Europe. Norandino deals with three member organisations which either sell coffee to Norandino, or pay a processing fee for the milling process but trade their coffee independently. There are also two non-member producer organisations which sell their coffee to Norandino. Norandino has been involved in all stages of the carbon process, including producing the PDD, implementation and commercialisation of the project.

2.1.3 Buyers of coffee and carbon offsets

Norandino sells coffee to approximately 12 roasters and importers located in the United States and in Europe, with whom Norandino maintains long-term relationships. Two of the coffee buyers, Cafédirect (buying ex-ante offsets to provide initial funding) and Bewley's, also buy carbon offsets through **insetting**.⁷ A smaller one-off sale was made to an independent client called P3Value (a French financial consultancy).

4. Ulluco or *Ullucus tuberosus* is a root vegetable developed in the Andes mountains.

5. CEPICAFE is in the process of merging with Norandino. For the purpose of this document we refer to them as separate institutions.

6. Norandino also trade for cacao, sugar and jams but in this study we only focus on coffee.

7. See glossary.

2.1.4 Independent certifiers and verification

A range of indirect actors support both the coffee and the carbon value chains. These are:

- (a) For coffee – **Fairtrade International (FLO)** and **Biolatina** provide Fairtrade and organic certification, respectively, covering all coffee traded by Norandino from both associated and non-associated farmers.
- (b) For carbon – the project was initially registered with CarbonFix as an international standard for certified emission reductions. After CarbonFix was acquired by the Gold Standard, it has been going through a transition process to fully move into **Gold Standard accreditation** (Gold Standard, 2014). There is a cost of US\$0.37 per credit sold (via their financial management platform Markit). The **Rainforest Alliance** is in charge of independent audits to the Gold Standard every five years.

2.1.5 Technical and implementation support

- **Progreso Foundation** – an NGO that is responsible for the implementation of the reforestation project and the provision of coordination and technical assistance.
- **ProClimate** – a local programme under the Progreso Foundation and managed by Avance. Both organisations are based in the Netherlands. They provide support services particularly for the certification process and also played an important role in the set-up phase of the project.
- **ForestSense** – a Dutch international company which provided support during PDD stages and links to offset buyers.
- **Just Green BV** – a project developer based in the Netherlands.
- **Welthungerhilfe (World Hunger Help)** – a German organisation which provides funding for the adaptation to climate change project with downstream farmers.
- **Agronomes et Vétérinaires Sans Frontières (Agronomists and Veterinarians Without Borders, AVSF)** – a French organisation that supports farmers in poor regions, it has helped arrange meetings between stakeholders and made initial contacts in the area.
- **HIVOS** – provides support to Progreso and Norandino for upscaling.

THREE THE BUSINESS MODELS

In this section we present the three business models employed by the main actors involved in the project:

- Upstream subsistence farmers
- Downstream coffee farmers
- Norandino cooperative, as project developer

In each business model we distinguish between elements related to coffee trade/subsistence farming and elements related to carbon credit trade. We follow the methodology described in Section 1.3.2, describing how the Business Model Canvas can help understand how PES can aid or complement the main agricultural business model, or not, and to develop a clearer idea of how business processes can support social development and the provision of ecosystem services. The information from this section has been obtained through interviews with Norandino and Progreso and from related project documentation.

3.1 NORANDINO'S BUSINESS MODEL AS PROJECT DEVELOPER

In this section we describe Norandino's proposition of coffee and carbon, based on Figure 2. We discuss the key aspects of the value proposition and their clients, their partners and inputs, and the cost/benefit structure.

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

Coffee: as illustrated in Figure 2, Norandino's value proposition is built on high-quality, organic and Fairtrade-certified green coffee which is sold to US and European markets. Norandino has approximately 12 clients, composed of roasters and importers with whom Norandino maintains a long-term, trust-based relationship. The coffee beans are packaged and loaded onto containers in Norandino's processing plant in Piura and from there transported to the nearby port in Paita. Once the coffee reaches the ferry, the remaining transportation of the product is the client's responsibility.

Carbon: Norandino's carbon **value proposition** currently consists of 37,214 tCO₂e created through communal reforestation of 213ha of deforested land in the Sierra Piura Highlands (2,700–3,300 MASL). The reforestation activities are expected to provide other environmental benefits such as improved water availability downstream (of particular importance to the coffee-growing regions located lower downstream in the watershed), the provision of habitat for wildlife and the conservation of endangered tree species (Rojas Hernandez, 2014; Paucar, 2015)

FIGURE 2. NORANDINO'S BUSINESS MODEL

Key partners Coffee 1,700 directly associated farmers (240 of whom are beneficiaries of reforestation project) Three member cooperatives Two non member cooperatives INPUT PROVIDERS: for fertilisers, equipment, tools, etc. FINANCIAL PARTNERS: banks (Coopac Norandino, Banco Continental) Services for transport and certification Cooperation agencies (Equal exchange, CCA) NGOs (Progreso, AVSF) Public institutions (municipalities, FONCODES, regional government) Carbon 350 subsistence farmer families (>3,000m) Partners: Progreso (implementing: preparation of PDD; establishing forest plantation; inform, integrate and train local community; monitoring) Supporting partners (most also for coffee): Proclimate, Gold Standard, FLO (Fair Carbon), GIZ, AVSF, Forest Sense, Welthungerhilfe, Hivos	Key activities Coffee <ul style="list-style-type: none">Processing parchment into green coffee; cupping and quality control; provision of technical assistance; client negotiations and trading Carbon <ul style="list-style-type: none">Trading credits; managing finances Key resources Coffee <ul style="list-style-type: none">Processing facilities and warehouseReputation and client networkTechnical, administrative & management staffOrganic and Fairtrade certification Carbon <ul style="list-style-type: none">(Access to) 213 ha of communal landProject implementation staffCommunity member to maintain and monitor plantationsGold Standard certification and approbation of independent auditor Rainforest Alliance	Value proposition Coffee Green high-quality coffee from smallholder farmers, organic and Fairtrade certified Carbon credits A total of 37,214 tons of CO2e generated from reforestation of marginalised communal highlands with additional benefits such as water provision for lower located coffee farmers, conservation of endangered tree species and provision of bird habitat	Relationships Coffee <ul style="list-style-type: none">Long term and trust based relationship; Negotiations via email, Skype or in person; Participation in coffee and organic fairs. Carbon With inserting clients Long term, trust based; With other: Trust based Channels Coffee Coffee place in containers at processing plant and transport to port free on board (FOB) Carbon Credits are transferred to clients via Gold Standard's Registry Tool (Markit); direct sales without intermediary; market outlets are facilitated by ProClimate	Customers Coffee Export market (Fairtrade, organic, speciality markets) 12 roasters and traders in the US and EU. The bulk goes to USA, Belgium and Germany. Carbon insetting <ul style="list-style-type: none">Cafédirect (16 US\$/ton for 5,900 tons)Bewleys (15 US\$/ton for 3,786 tons) Independent offset buyers: P3Value (25 US\$/tonne for 60 tonnes)
Cost structure Coffee Purchase of parchment coffee from direct associates. Total amount purchased: 26,000 qq from direct associates and 15,000 from first-level cooperatives. Average purchase price: US\$180/qq. Purchase price = stock exchange price ² + organic premium (US\$30/qq) + Fairtrade premium ³ (US\$20/qq) + Quality premium – administration costs (~US\$35/qq). Operation costs: 76 staff salaries. Operating costs for processing plant. Yearly certification costs: Fairtrade ~US\$5,000 and Biolatina ~US\$18,000. Climate change adaption activities of 240 coffee farmers (funded by 10 per cent of carbon credit sales = US\$15,200 – the adaption costs of the remaining farmers are funded by ODA). Carbon Implementation costs: unclear. Certification and verification: Gold Standard certification (initial certification costs: US\$1,500; transaction fees: US\$0.37 per credit sold); Rainforest Alliance for independent verification (initial: US\$9,000–10,000; intermediary: US\$7,000; recurrent: US\$7,000–9,000 every 5 years for 25 years)		Income sources/benefits Coffee Income from sales of coffee: Sales of green coffee in 2014: 37,698qq sold. Sales of processing service: US\$3.5/qq Carbon To date: 9,746 tCO2e sold for a total of US\$152,690 (Cafédirect: over 5 years future payment (2010–2015); Bewleys: over 3 years (2011–2013); P3Value: one-off payment (2014)). Future: 27,468t to be sold		

● Traditional coffee market and linkages ● Carbon market

Notes: figures report 2014 values. AVSF – Agronomes et Vétérinaires Sans Frontières (Agronomists and Veterinarians Without Borders); GIZ – Deutsche Gesellschaft für Internationale Zusammenarbeit (German Federal Enterprise for International Cooperation).

BOX 3. REFORESTATION AND LOW-SEASON WATER FLOWS

The relationship between forests and water is at the heart of this project. Hydrologists have been debating for many years the impact that planting trees may have on downstream water flows (Bonell and Bruijnzeel, 2005; Calder, 2005). While there seems to be consensus on the importance of preventing degradation of existing forests because of their potential negative impact on water and soils there is more debate on what happens with a reverse process. Public perceptions – often informing the policy debate – and scientific evidence do not always go hand in hand. Bonell and Bruijnzeel (2005) compile minute details on this. They urge caution on large-scale afforestation and reforestation projects in areas with water scarcity, as trees will always use more water than crops. Water is already scarce in the Piura region (World Weather and Climate Information, 2015) – with average precipitation of less than 20 mm/month between January and June, very high precipitation during one month (leading to flash floods), and very low rainfall between July and October.

The nature of the forests: whether old-growth, secondary or exotic-species forests, they can have significant impacts on water flows. Properly managed reforestation projects that take into account tree species and soil-management activities can have important impacts on infiltration and reduced sediment downstream while providing benefits in terms of timber, firewood and carbon.

While the project highlights that water quality is expected to increase due to lower siltation from the upper areas into the lower areas of the basin, it also says that 'water quantities in the form of water runoff will almost certainly decrease because of the reforestation activities' (Gold Standard, 2014). The reduced runoff may help potential floods during El Niño events. To mitigate potential negative impacts on water the reforestation activities are carried out on a fairly small scale with conservative tree densities, and a combination of exotic/native tree species.

The project uses exotic species (*Pinus patula* and *Pinus radiata*), as well as native tree species (*Polylepis incana* and *Alnus jorullensis*). They are non-invasive. Seeds used for the project must be certified to demonstrate that the material is not genetically modified. Water bodies are scarce in the project area. There is only one small waterbody present but no planting is done within 30 metres of it. After 30m, the native species *Alnus jorullensis* is planted, which can only grow in moist soils. Mist from clouds is very common in the area because of the altitude (3,300 MASL).

The trees planted are expected to increase water flows through fog interception (Gold Standard, 2014). The areas planted with the native species *Polylepis incana* will be managed to ensure the survival of seedlings, and will not be harvested for timber, ensuring that biodiversity and water benefits endure.

Around 13 areas have been selected by local farmers to be reforested. These areas are subdivided into smaller management units. The tree species are systematically planted at a

distance of 3m x 3m (at a density of 1,111 trees/hectare) or 2.6m x 2.6m (density of 1,480 trees/hectare). This will ensure a vegetation cover of over 30 per cent. Under normal growing conditions these trees will reach a height of at least 5m. In about 10–15 years, following proper forest management, the plantation will meet the criteria set by the Designated National Authority of Peru to be considered as ‘forest’ (Gold Standard, 2014). Estimations of growth and density are validated by means of a neighbouring native forest remnant (Mijal Forest), located about 1.5km northwest of the plantation area.

The project was initially validated by the Rainforest Alliance under CarbonFix Standard v3.0 in 2011. After that, it went through a transition phase to the Gold Standard in 2014. In June 2014 the project

was officially recognised as Gold Standard⁸ certified and thus sells Gold Standard credits. In September 2014, the project was selected as a road-testing project for the new Fair Carbon Standard of FLO.

So far, carbon offsets have been sold to three **clients**; two of these clients are part of the existing coffee value chains – so the sale is deemed as ‘insetting’: Cafédirect (5,900 tCO₂e) and Bewley’s (3,786 tCO₂e). Recently, a French financial consultancy made a small one-off purchase. Interestingly, **Norandino sells carbon credits directly** without using intermediary platforms or resellers, as is common in other projects. This seems to work well given their long trading partnership with coffee buyers and the opportunities created through insetting.

TABLE 1. OFFSETS AGREEMENT BETWEEN CAFÉDIRECT AND CEPICAFE

CAFÉDIRECT	PAYMENTS (GBP)	CARBON CREDITS (T)
2010	12,000	1,111
2011	11,000	1,018
2012	10,000	926
2013	9,000	833
2014	8,000	741
2015	5,000	463
	55,000	5,092

Source: (León, 2014).

8. According to Edmond Muller (2015), a project advisor with Forest Sense, certification through a recognised standard is key for long-term security of carbon. While personal relations with clients are important, willingness to buy offsets for a long period of time is highly dependent on corporations’ policies. Approved certification is necessary to create value, and provide diversification in the clients’ portfolio (ibid).

3.1.2 How is value created?

Norandino's **key resources** for the **coffee** proposition are:

- Processing plant and warehouse located in Piura,
- Reputation in the coffee market and strong client network,
- Technical, administrative and management personnel of 78 staff members plus eight governing board members and,
- Organic and Fairtrade certification required for fetching prices above market average.

Norandino's **key activities** include technical assistance, processing and negotiations with buyers:

- Technical assistance to farmers, strongly focusing on combating disease such as coffee-leaf rust and the coffee-borer beetle, which have been exacerbated by climate change in the area. They also promote land practices aimed at water security, shade provision and resilience to disease.
- Sourcing raw materials and processing parchment coffee into green coffee and associated cupping and quality-control measures of final product.
- Negotiations with clients based on harvest projections and the international coffee price.

Norandino works in **close partnership** with five first-level cooperatives, three of which are members of Norandino. Norandino's network is wide and is based along the northern part of Peru in Tumbes, Piura, Amazonas, Cajamarca, La Libertad and San Martín, producing mostly coffee, cocoa and sugar. Member cooperatives are expected to have democratic principles and institutional clarity, with a clear communication network between themselves and the farmer members. Norandino charges an initial joining fee, and a smaller fee per unit of produce (eg US\$4/qq⁹ coffee; US\$50/tonne cocoa). Other support partners are the two certification entities Biolatina and FLO.

Coffee cooperatives have the option to sell coffee to Norandino, or use the processing service and trade their coffee individually. In total there are 1,700 coffee farmers directly associated with (ie members of) Norandino, located in Sierra Piura (at 1,100 MASL). Within this group there is a smaller sub-group of 240 farmers located downstream from the PES project: these farmers benefit from the carbon insetting approach as 10 per cent of the revenues from carbon credits sold from reforestation upstream are allocated to support their climate-change adaptation practices.

Norandino's **carbon proposition** comes through their engagement in reforestation activities. The upstream communities are responsible for planting and maintaining the growing saplings until they reach maturity. The project pays them

9. *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 100 pounds.

directly in the form of **daily wages** needed to plant the saplings. In this way, the project supports the creation of employment. It also promotes other welfare activities such as the diversification of diets through the construction of vegetable gardens and fish ponds, and collecting mushroom from the pine plantations. The existence of these co-benefits usually helps the project fetch higher prices through voluntary markets, for example by appealing to buyers' social-responsibility agendas.



The project supports the establishment of family vegetable gardens © Norandino

The key resources, activities and partners needed for the carbon value proposition include:

- Access to 213 hectares of communal land, managed by the community in the town of Choco in Yamango district, Morropon province. Previously deforested lands are undergoing reforestation and land-management activities to **earn carbon credits**. The activities upstream are also expected to provide downstream benefits to coffee farms. In Section 3.2 we present a more detailed description of these farmers' business model.
- Trust and willingness to collaborate and effective communication:
 - a. Between the **250 subsistence farmers and community members upstream** – this ensures that the project engages enough farmers to provide meaningful levels of ecosystem services,
 - b. Between **community members and Progreso**, the implementing agency in charge of promoting reforestation activities in the area,
 - c. Between **Progreso and Norandino**, which ensures that activities take place but also that feedback channels exist to make adjustments when and if needed, and ensure long-term commitments, and
 - d. Between **upstream activities and CEPICAFE's downstream farmers**, who receive 10 per cent of revenues from carbon sales to support their adaptation activities (see Section 3.3 for a description of their business model).

- Gold Standard certification: the offsets generated by the reforestation activities are certified using the Gold Standard methodology and are independently verified by the Rainforest Alliance, providing credibility and trustworthiness to existing and potential carbon buyers.
- Solid market and management capacity in Norandino, ensuring the smooth and cost-efficient management of the additional activities and of finances required to fulfil the carbon proposition.

3.1.3 How much? Benefits and costs involved

Coffee: The business generates the majority of its **income** from the sales of green coffee to export markets. Coffee prices are above market average because of a US\$30 organic premium and a US\$20 Fairtrade premium per qq. Furthermore, the coffee qualifies as a speciality coffee – due to taste and quality – which leads to additional quality premiums. The major **costs** are purchasing parchment coffee from farmers. Norandino bought 41,000 quintals of parchment coffee in 2014 at an average price of US\$180/qq. An administration fee of approximately US\$35/qq is deducted from this amount, for general expenses such as staff salaries and processing costs. The costs of climate-change adaptation practices implemented by the 240 coffee farmers are partially paid for by carbon income (described below).

Carbon: The project has managed to sell carbon at above market average value, between US\$15 and US\$28/tCO₂. The **income** generated from the sales of carbon credits amounts to a total of 152,690 US\$ of which 90 per cent is designated to cover project' upstream activities and implementation **costs** – including certification expenses. It also includes long-term technical

assistance, capacity building, upscaling, payments to farmers per tree planted, etc. The remaining ten per cent of the carbon credit sales is to be used for climate-change adaptation activities by coffee farmers located downstream.

3.2 UPSTREAM SUBSISTENCE FARMERS' BUSINESS MODEL

Figure 3 shows the subsistence farmers' business model. The project initially planned to work with coffee farmers on reforestation activities. However, they faced difficulties in terms of availability of land to reforest large expanses of forest. In addition, farms were too small and scattered to generate sufficient carbon credits. The community of Choco, located upstream from the coffee farmers, declared their interest in reforestation. A partnership was established in June 2008, after consultations between Progreso, Norandino, Cafédirect, Adaptation for Smallholders to Climate Change (AdapCC), AVSF, ProClimate, ForestSense and Just Green (Paucar, 2015).

There are 10 communities in the Choco area involved to date: Choco, Alto Mayo, Cajas, Confesionarios, Chontalí, Las Huacas, Santa Cruz, Alto Huancabamba, Huambiche and Sargento Lórez. The total number of families involved by 2014 was 348 (Rojas Hernandez, 2014). Illiteracy is high in the area, and to keep farmers engaged and updated a field technician from Progreso/Norandino visits the area on a regular basis. During the design phase of the project, presentations were made explaining the planned activities, the project objectives and the responsibilities of each stakeholder, in a manner that could be easily understood by everyone (Gold Standard, 2014).



Weeding the seedling beds in the community-managed nursery © Norandino

Value proposition: most farmers in the Sierra Piura highlands cultivate corn, potatoes, beans, wheat, barley and ullucu for the family's consumption. Any surplus is sold sporadically to a local market. There is some cattle ranching but this is limited by poor pasture quality.

Because the project promotes a diversified diet, farmers now also cultivate vegetables in the family garden and have started to collect mushrooms from the pine forest and construct fish ponds.

The **carbon-related** activities represent a major source of revenue for subsistence farmers participating in the project, and their key benefits are **immediate job creation** in terms of planting trees (farmers receive a wage for planting trees

and caring for the tree nurseries – see below), and **future timber potential** when the trees reach maturity. These farmers live in very remote areas, with little contact with outsiders and according to field interviews a certain level of scepticism was evident at the beginning of the project. Through Progreso – the implementing agency – the project has been able to actively engage community members and increase trust.

The key resources required are **land, labour and social capital** to ensure cohesion and a sufficient number of farmers to maximise reforestation and keep transaction costs down. The farmers agree to a set of activities to reforest marginal lands in their communal areas with pine (*Pinus patula* and *Pinus radiata*), aliso (*Alnus jorullensis*) and queñoal (*Polylepis incana*). As a community, they have the rights to use and manage the 213 hectares included so far.

The project has promoted the creation of **reforestation committees**, one for each of the communities involved (10 currently), which have been working since 2008. Each committee is made of up to 50 community members in charge of running a local nursery and planting and maintaining the trees. The communities are supported by a technician (who is constantly in the area) and a coordinator, who both work with Progreso. They receive technical assistance and equipment from Progreso. In exchange, farmers sign a contract with Norandino where they transfer the carbon offsets generated by the project.

THREE THE BUSINESS MODEL CONTINUED

As explained before, of the total revenues from carbon sales, 90 per cent is used to fund the project, and 10 per cent is used to promote adaptation activities downstream (see Section 3.3). The monetary benefits that farmers receive vary, but include:

- Short-term cash payment for the farmers who participate in the reforestation committees, equivalent to a third of the total cost. The project makes a one-off payment of S/0.25¹⁰ (US\$0.08) per sapling produced in the nursery, and S/0.50 (US\$0.16) per sapling planted (Norandino, 2014).¹¹ The remaining two thirds are voluntary, in-kind contributions from the farmers in expectation of future benefits from the forest, eg in the form of timber.
- Medium-term benefits: thinnings from pine plantations provide poles, and there are some firewood benefits from *Alnus* thinnings.
- Quality timber – after 25 years farmers can begin selective timber harvesting following a sustainable forest management plan.

The project proposes several uses for timber, including: firewood, pulpwood, furniture, pallets, construction materials, and traditional medicines for native species like *Polylepis incana*. Because of uncertainty of future prices of timber, the project is purposely vague when it comes to capitalising on timber revenues and uses very conservative estimates for future revenues. It is uncertain how much farmers will get from timber harvesting and how they will access timber markets. It is expected that if current prices persist they will be sufficient to make viable economic returns. The rate by which the selective harvest

will take place is not defined yet nor is there a contract beyond the 25 years that regulates the harvest rate.

The project also promotes, as a side activity, setting up vegetable gardens and other activities with families which is expected to improve the diets and health of participating farmers. The restoration of degraded lands is expected to improve habitats for wildlife, and downstream benefits in terms of protection of the water catchment.



An Andean family gathers forest thinnings for firewood from the plantation © Norandino

10. The currency of Peru is the Nuevo Sol (S/).

11. The average labourer's daily wage in Peru (*jornal*) is approximately S/15 (US\$4.80).

FIGURE 3. SUBSISTENCE FARMERS' BUSINESS MODEL

Key partners Carbon Progreso	Key activities Subsistence crops Garden crops Carbon <ul style="list-style-type: none">• Participation in training courses• Participation in reforestation committees• Preparation of seedlings and planting (years 1–4)• Pruning and thinning (years 7–8 then 14–15)• Selective timber harvest, forest management and continuous reforestation (beyond 25 years) Key resources Carbon <ul style="list-style-type: none">• Communal land• Strong social capital in communities• Reforestation committees• Forestry knowledge• Seedling nursery with native and exotic species (<i>Pinus patula</i>, <i>Pinus radiata</i>, <i>Alnus jorullensis</i>, <i>Polylepis incana</i>).• One technical advisor and one coordinator	Value proposition Subsistence crops Potatoes, cassava, beans, wheat, barley, corn, ullucus, milk and meat Newly promoted through project: vegetables and mushrooms Produce is used mainly for subsistence, only the surplus is sold sporadically. Carbon credits Climate-change mitigation through the reforestation of 213 parcels of communal land in the Piura highlands (Choco district = 2,700–3,300 MASL)	Relationships Carbon Newly formed relationship <ul style="list-style-type: none">• Requires time to grow• Cultural differences have to be overcome Channels Carbon Farmers sign a contract in which they allow Norandino to trade carbon credits in their name	Customers Subsistence crops For own consumption with sporadic access to local market Carbon Norandino
Cost structure Subsistence crops Time invested in vegetable gardens Carbon Time investment and workforce	Income sources/benefits Subsistence crops Income from sporadic sales of agricultural produce and income from sales of mushroom (new) Carbon Monetary benefits <ul style="list-style-type: none">• Short term: salary (1/3 paid; 2/3 voluntary) from participation in reforestation committees• Mid term (years 7–8 and 14–15): wood for firewood (partly), construction and making tools• Long term (after 25 years): income from selective timber harvest• Payment per sapling: US\$0.08 per sapling in nursery, US\$0.16 per sapling planted Non-monetary benefits <ul style="list-style-type: none">• Health: construction of vegetable gardens and fishponds to diversify diet• Biodiversity: 23ha of conservation area planted with endangered <i>Polylepis incana</i>• Water conservation for downstream users			

● Traditional coffee market and linkages ● Carbon market

3.3 DOWNSTREAM COFFEE FARMERS' BUSINESS MODEL

Figure 4 shows the coffee farmers' business model. The project works closely with downstream coffee farmers, providing 10 per cent of carbon revenues which supports a parallel project funded by donor funding through Welthungerhilfe (since 2011) promoting climate adaptation measures. These include drip irrigation, agro-ecological management, inputs and tools banks. The work on water management has helped to reduce conflict and increase coffee yields.

Coffee farmers in the project are associated with CEPICAFE, the local cooperative. They produce **organic and Fairtrade-certified parchment coffee** which is sold to Norandino. This does not operate as a monopoly, however: there are intermediaries who also provide an alternative market outlet for farmers to sell their coffee, constantly competing with Norandino. However, because the cooperative provides a holistic portfolio of services (purchase of other agricultural products,¹² technical assistance and financial services) to their farmers and is able to offer good prices due to the Fairtrade and organic premium, side-selling is low.



Women working in the community-managed nurseries
© Norandino



A woman replanting seedlings from the nursery into pots
© Norandino

12. Depending on the altitude, some farmers also grow sugarcane or cacao (made from cocoa), both products that Norandino also purchases

FIGURE 4. THE COFFEE FARMERS' BUSINESS MODEL

Key partners Coffee <ul style="list-style-type: none"> Norandino (provides technical assistance, credits, and sells fertilisers) Cooperativa de Ahorro y Crédito Norandino (Coopac) (sister cooperative for financial services) Carbon 350 subsistence farmer families (>3,000m) who reforest upper areas, create carbon offsets and improve watershed ecosystem benefits for coffee farming	Key activities Coffee <p>Pre-harvest activities (seed selection, growing seedlings, fertilising); harvest; post-harvest fermentation, washing and pulping; transport; participation in climate change adaptation activities</p> For carbon n/a	Value proposition Coffee <p>Organic and Fairtrade-certified speciality parchment coffee Average: 9qq/ha</p>	Relationships Coffee <ul style="list-style-type: none"> With Norandino: Trust-based, long-term relationship Frequent communication via field technicians Commitment to cooperative is enforced via their other service offers (ie credit) Carbon n/a	Customers Coffee <p>Norandino Intermediaries</p> Carbon n/a
Key resources Coffee <p>Between 0.5 and 3 ha of land with healthy and well-maintained coffee trees; drip-irrigation system; organic matter to producer compost</p> Carbon n/a	Income sources/benefits Coffee <p>Income from sales of coffee during harvest period (May–September). Sales price = stock exchange price + organic premium (US\$30/qq) + Fair Trade premium* (US\$20/qq) + Quality premium – Administration costs (–US\$35/qq); average sales price: US\$180/qq; average income: US\$2,835</p> <p>Drip-irrigation and land-management activities funded by the project resulted in an increase in coffee yield from 4qq/ha/year to 12qq/ha/year</p> Carbon <p>Indirect benefits (collective investment, no individual return): 10% of carbon sales to be invested into climate change adaptation such as increased resilience through drip-irrigation systems; improved shade through agroforestry systems; improved agricultural practices</p> <p>Better resource management is expected to improve resilience and productivity. These impacts have not yet been evaluated and the magnitude of the impact on small plots is unknown</p>			
Cost structure Coffee <ul style="list-style-type: none"> Organic fertiliser (partly to be purchased externally) Hired labour during harvest period Material costs for the installation of drip-irrigation system: US\$2,200/ha (funded by sales of carbon credits) – labour is being provided by farmers Carbon n/a	Traditional coffee market and linkages <ul style="list-style-type: none"> Carbon market 			

● Traditional coffee market and linkages ● Carbon market

THREE THE BUSINESS MODEL CONTINUED



Tree seedlings ready for transplanting on the plantation
© Norandino

Farmers deliver their coffee to either their first-level cooperatives or to a collection centre. From there, Norandino is in charge of transporting it to their warehouse and the processing plant in Piura, often hiring transport services from farmers. The relationships between farmers, CEPICAFE and Norandino are long-term, and based on trust and mutual respect.

Coffee farmers **do not create carbon offsets** through their activities, and their interaction with the carbon business is low, passive and indirect. They only receive the 10 per cent revenues from the sale of credits.

The farmer's **key resource for coffee production** is a healthy and productive coffee plantation, usually between 0.5 to 2 hectares. In order to maintain productivity, farmers have to fertilise

their crops during the different stages of growth. Fertilisers are partly made on-farm, in the form of compost, depending on the availability of organic matter, or bought externally. Due to limited water availability in the area, the technical irrigation system (as opposed to flood irrigation that enhances soil erosion) is another key asset. **Key activities** include activities such as seed selection and planting, fertilising and bean picking, pulping, fermenting and drying. The participation in climate-change adaptation activities such as the installation of irrigation schemes or introduction of shade management promoted from carbon credits funds is another key activity. The **key partners** in this business model are Norandino (in its function as supplier of fertilisers, credits and technical assistance) and Coopac (a sister cooperative focused entirely on the provision of financial services).

The coffee farmers' business model is unrelated to the creation of carbon credits and therefore no further information is provided in this section. By virtue of their geographic location in the watershed, they are however important as an entry point for the development of **insetting** activities.

The costs incurred in this business model relate to the purchase of fertilisers and hired labour during the harvest period. Some farmers use **drip irrigation** at a cost of US\$2,200/ha. The income is generated from the sales of coffee at an average price of US\$180/qq (in 2014).

Due to the increased water availability from drip irrigation and accompanying technical support, it is reported that the coffee yield has increased from 4qq/ha/year to 12qq/ha/year (Paucar, 2015). Assuming farms have an average of 1.5ha of land, a farmer's income from sales of coffee in 2014 was approximately US\$3,240, as opposed to US\$1,080 before the improvements promoted by the project.

The benefits from the carbon project for coffee farmers include:

- Indirect benefits, from an improved watershed managed by the subsistence farmers upstream (who receive carbon funding), and
- Direct benefits from the 10 per cent of carbon sales used to support ongoing efforts relating to climate-change adaptation, which include improved shade management, the installation of drip irrigation systems and changed practices that in turn improve water availability and increase disease resilience, eventually leading to increased productivity.



Selecting and transferring forest seedlings for planting © Norandino

FOUR

KEY POINTS – RELEVANCE AND COMPLEMENTARITY

In this section we discuss some of the main opportunities and potential bottlenecks for the Norandino coffee-insetting project. Figure 5 presents the interactions between Norandino, Progreso, and the upstream and downstream farmers involved. We highlight the main points below.

4.1 COMPLEMENTARITIES BETWEEN CARBON AND SMALLHOLDER COFFEE

The initial intention of the project was to work with coffee farmers but there was little room for reforestation as an activity, and opportunity costs were high. The project intelligently identified the **upstream/downstream linkages**, where reforestation could take place with lower opportunity costs with upstream subsistence farmers. By improving the health of the upstream ecosystems that feed the coffee farms the project was able to link to coffee markets via the insetting approach.

Carbon funding also supports the creation of vegetable gardens upstream – improving short-term livelihoods. A small amount of carbon revenue goes to support ongoing donor-funded adaptation projects for downstream coffee farmers – like drip irrigation – which increase farm yields.

4.2 BENEFITS BEYOND CARBON

Beyond the wider societal benefit of carbon sequestration, the reforestation project creates a number of environmental and social benefits for both groups of farmers. Reforestation uses a mix of exotic and native species, providing future opportunities for economic uses of timber and restoration of natural habitats.¹³ The project hopes to promote a more sustainable forest-based economy.

For farmers upstream, the project has provided a much-needed source of income. Although the cash payments are relatively low (about S/0.25, or US\$0.08 per tree in the nurseries and S/0.50 or US\$0.16 per tree planted) many of the benefits are in the form of capacity building and future timber harvests. The promotion of vegetable gardens has a direct positive impact on household diets.

Forest planting is carefully designed to minimise the potential negative impacts from reduced water runoff while promoting reduced sedimentation. Upscaling to large reforestation areas will be required to provide significant thresholds of downstream benefits in terms of reduced sedimentation. However, it can significantly reduce water availability downstream especially given that precipitation is low. The use of technologies like drip-irrigation downstream helps to maximise use of existing resources.

By linking into existing initiatives downstream, the project can also improve the benefits of the small contribution from carbon funding (10 per cent of sales) in terms of impact on agricultural practices. It is, however, difficult to disentangle the actual impacts of carbon funding vis-à-vis donor funding.

13. The area used to be covered by páramo (alpine tundra ecosystems) and cloud forests (unique highland forests characterised by 100 per cent humidity) – only a few patches now remain.

FIGURE 5. OPPORTUNITIES AND POTENTIAL BOTTLENECKS

Traditional bad practices – like slash-and-burn agriculture – can cause losses (eq 27 hectares recently lost to fire)

Some upstream communities are still suspicious of market approach. High illiteracy requires participative communication methods. Strong local contact from Progreso is key to providing trust and long-term commitment

existing coffee – final buyers already keen to pay more for it

Upstream – downstream link allows access to areas with **lower opportunity cost** while keeping the coffee link needed for **insourcing**

Development of timber markets should start soon

Strong institution with vertical integration from farmers to inter markets

Buyers
(via inseting)

Second level cooperative / project developer (NORANDINO)

Loyal base of coffee buyers interested in conservation and buying offsets at very good prices.

But need to expand the number of buyers, and find longer-term commitment to offsets

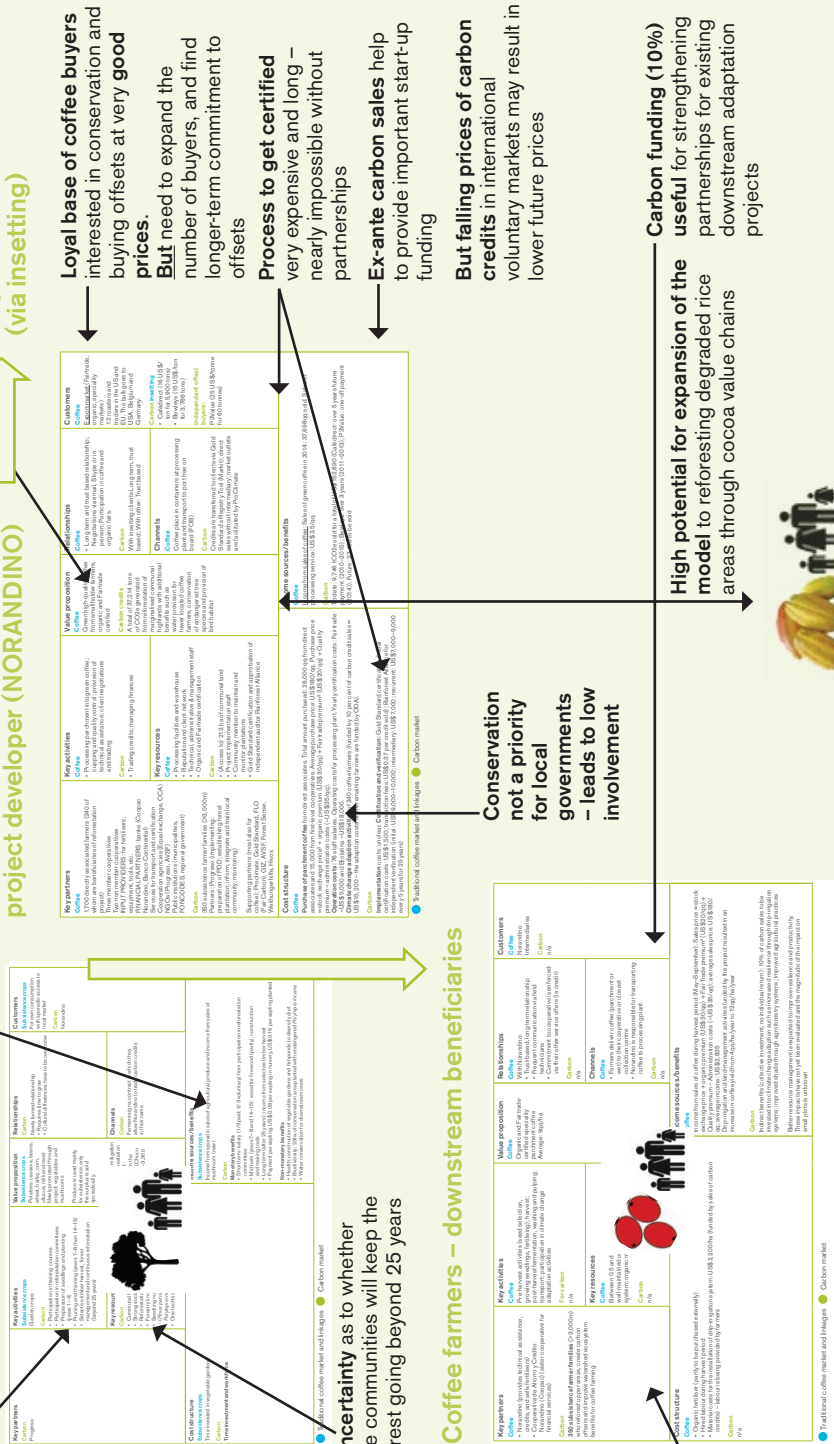
Process to get certified
very expensive and long –
nearly impossible without
partnerships

Ex-ante carbon sales help
to provide important start-up
funding

But falling prices of carbon credits in international voluntary markets may result in lower future prices

Carbon funding (10%)
useful for strengthening
partnerships for existing
downstream adaptation
projects

Cost of adaptation measures downstream mostly covered by ODA



Source: Authors' own. Information inside the business canvas for Norandino and upstream and downstream farmers can be found in figures 2, 3 and 4 respectively.

4.3 COSTS AND REVENUES

The process has been a long one (it began in 2008) and has been complicated by the high level of technical knowledge required and a series of changes with regards to the certification process (CarbonFix, then the Gold Standard). Interviews with different stakeholders have highlighted how expensive the process has been – and the value of, and need for, partners willing to share the costs. There is a strong push for standards to respond to the needs of smallholder agriculture – providing flexibility on methodologies, for example, and reducing costs.

Prices for carbon offsets have been very good so far, over US\$15/tCO₂e, significantly higher than existing average values for carbon on voluntary markets. It is possible that, unless there is a strong campaign with buyers, future sales will receive lower prices and this should be accounted for accordingly in expected revenue flows.

4.4 LONG-TERM SUSTAINABILITY

Timber-related projects require long-term approaches, because of the length of time required to grow the timber. The communities are expected to continue to sustainably manage the forests after 25 years of the project. However, they may choose to change the harvesting times or manage the forest unsustainably. Traditional agricultural techniques, like slash and burn, continue to be used, resulting in losses of areas being reforested. It is difficult to predict behaviour in the future, but Progreso and

Norandino are working with local communities to promote behavioural changes for this and future generations.

4.5 UPSCALING POTENTIAL

Norandino offers the institutional structure, contacts with multiple stakeholders and access to a portfolio of specialised clients that demand good-quality produce and may be willing to add a conservation element via insetting (see point below).

There is a wide pool of farmers within Norandino's reach. At the moment the project involves only 240 coffee producers, while Norandino has 1,700 direct associates and over 5,300 farmers linked through different forms and products (cocoa, sugarcane, coffee, fruits). It is not clear, however, how and where upscaling would take place: eg will these farmers produce carbon credits, or will they be beneficiaries (via the 10 per cent benefit share, as with the current project)? Future upscaling requires consideration of the following factors:

- **Offsets created through reforestation upstream:** this project shows that existing coffee farms have low potential for carbon revenues through reforestation due to limited space on their coffee farms. There is therefore a need to involve other communities who do have potential for carbon revenues through the upstream/downstream link. Upscaling this way will involve the expansion of areas under reforestation.¹⁴ This will require a better

14. A very rough calculation suggests that Norandino would need to reforest over 1,500 hectares to provide a 10 per cent benefit to their 1,700 associates. This value is assuming that the ratio of land reforested upstream per coffee farmer downstream remains (213ha:240 farmers).

understanding of future timber value chains and the trade-offs involved in upscaling, specifically:

- a. **Economic trade-offs** using native and non-native species: there is little available information on native species that can be commercially viable when planted at that altitude (3,300 MASL). The project has managed to propagate the native species *Alnus* and *Polylepis*, but farmers prefer the faster-growing, less risky non-native *Pinus* which also creates greater carbon offsets.
- b. **Ecosystem trade-offs**: upscaling with *Pinus* will create a larger pool of carbon offsets, but can potentially reduce water flows downstream if the trees utilise more water than they capture through fog interception. Better understanding of potential reductions in water flows downstream resulting from large-scale reforestation using fast-growing species like *Pinus* – a situation highlighted in the PDD of the Choco project – is needed.
- **Offsets created through changes in practices on coffee farms**: upscaling could also take place by switching to practices geared towards organic agriculture as the Pascafen project in Nicaragua and CEDECO project in Guatemala have done.¹⁵ Again, this will require an understanding of existing baselines and potential carbon capture in relation to the costs of accessing this market.

Finally, while there is the institutional potential and know-how to upscale the project, this expansion will be meaningless if not accompanied by a **strong marketing approach to reach out to new buyers of carbon offsets**.

4.6 INSETTING

This project is a very good example of how **insetting** works. Ninety per cent of income from carbon offsets is used directly to promote activities upstream which are expected to improve water-flow regulation and prevent further soil losses. These activities will have a direct impact on coffee growers located in the middle parts of the watershed. Ten per cent of income from carbon sales is used to support coffee growers' climate-change adaptation strategies. The benefits for coffee buyers like Cafédirect and Bewley's are twofold: they offset their carbon emissions, while promoting resilience of coffee production at the base of their value chain. The strong relationships with existing coffee buyers has resulted in very high carbon prices, reaching US\$15–28 (Paucar, 2015), significantly higher than the average prices currently paid in voluntary carbon markets.

The watershed linkage is useful but there is a degree of trust in this system with respect to the delivery of ecosystem services downstream. At this stage the project is relatively small, and given climate-change variability it is currently difficult to quantify the impact on water sources.

15. These partner studies are also available in this Payments for Ecosystem Services in Smallholder Agriculture series – see list of titles at the end of this report.

FOUR KEY POINTS – RELEVANCE AND COMPLEMENTARITY CONTINUED

Apart from selling carbon offsets to existing coffee buyers, the links to coffee production are relatively small – with only 10 per cent of carbon revenue actually reaching the coffee farmers directly. Insetting buyers may want to see a higher direct share invested in coffee production – although this depends on how open to wider conservation impacts these buyers are (for example understanding the upstream/downstream linkages).

This project presents a good example of a coffee–carbon proposition that involves a third group of actors with lower opportunity costs. It also expands the benefit potential to poorer groups and there is a clear pro-poor approach built into

the project. The upstream link ensures that these carbon offsets can be traded through insetting approaches using existing channels and good relations with existing buyers. Buyers, however, may demand a more direct link to the coffee production, rather than the indirect upstream/downstream approach. The learning process to set up the carbon market has been long and expensive but hopefully it will be easier to replicate for upscaling purposes. But even with the best intentions and methodologies, the expansion will be meaningless unless accompanied by strong marketing to bring new carbon offset buyers into the value chain.

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coffee producers located in the lower reaches of Sierra Piura. The coffee–carbon link is used to target carbon offset buyers through insetting. Carbon buyers offset their carbon emissions, while promoting resilience of coffee production at the base of their value chain. The report explores the challenges and opportunities associated with combining payments for ecosystem services with smallholder agriculture.



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