# REFORESTATION, CARBON SEQUESTRATION AND AGRICULTURE

Can carbon financing promote sustainable smallholder activities 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 partner studies, we adapt the value chain map and business model LINK methodology developed by the International Center for Tropical Agriculture (CIAT) to understand if and how PES and carbon approaches can help smallholders successfully enter and benefit from existing markets. Results from this research are published in the **Payments for Ecosystem Services in Smallholder Agriculture series** under Shaping Sustainable Markets, and can be downloaded online.

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## BOXES



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# GLOSSARY

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| 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 |

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| 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. |

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| 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

| | |
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| APRODEIN | Association of Professionals for the Holistic Development of Nicaragua (Asociación de Profesionales para el Desarrollo Integral de Nicaragua) |
| CIAT | International Center for Tropical Agriculture |
| $CO_2$ | Carbon dioxide |
| $CO_2e$ | Carbon dioxide equivalent |
| GHGs | Greenhouse gases |
| ICCO | Interchurch Organization for Development Cooperation |
| ICROA | International Carbon Reduction and Offset Alliance |
| IIED | International Institute for Environment and Development |
| INAFOR | National Forestry Institute (Instituto Nacional Forestal) |
| MARENA | Ministry of the Environment and Natural Resources |
| MAGFOR | Ministry of Agriculture and Forestry |
| PES | Payments for ecosystem services |
| RSIV | Reductions Sold in Advance of Verification |
| SCPIMS | Smallholder Carbon Project Information Management System |
| 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 partner studies, we adapt the value chain map and business model LINK methodology developed by the International Center for Tropical Agriculture (CIAT) to understand if and how PES and carbon approaches can help smallholders successfully enter and benefit from existing markets. Results from this research are published in the **Payments for Ecosystem Services in Smallholder Agriculture series**, under Shaping Sustainable Markets.

In Nicaragua we look at an ongoing project that links forest activities in smallholder agriculture to carbon sequestration. The CommuniTree project, managed by Taking Root, is the only example reviewed in our series that is fully financed through the sale of carbon offsets. This project is different from the other partner studies chosen for the PES Learning Trajectory Programme. It is a more established project with an ongoing carbon component that has made continuous sales. While it is a smallholder project, it focuses on timber rather than energy or soil fertility, uses a different standard (Plan Vivo Standard, while the other projects use the Gold Standard), and makes cash payments directly to farmers. It is not a Hivos-related project, although it takes place in the same region as the PASCAFEN project also analysed in this series.

Through the project, farmers establish mixed native species forest plantations on under-utilised portions of their farms in exchange for cash payments from carbon and potential future sales of timber when the trees reach maturity. The project has established a successful approach to using technology to keep transaction costs manageable, and an active marketing approach that ensures carbon sales are secured.

Operational since 2010, the project has a clear and efficient approach to delivering carbon offsets. Participant farmers receive a cash payment for ecosystem services (PES) over a ten-year period, equivalent to 60 per cent of the carbon credit sale price – a requirement of the Plan Vivo Standard. Plantation management provides other sources of income, for example through timber from the thinning process and expected future timber sales. Because they are part of agroforestry systems, trees help increase farm resilience and provide shade to other types of crops. The project also supports the promotion of additional market linkages, for example for sustainably produced forest products and tree nurseries, and provides local jobs for community members.

The project currently includes 866 hectares and has enrolled 280 families. It has issued over 250,000 carbon offsets certified by Plan Vivo. Its successful approach is being explored for replication in Guatemala, Haiti and El Salvador, and its approach to data management and benefit sharing is informing the design of future Plan Vivo projects.

# ONE
# INTRODUCTION

While the science is still developing, there is 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) are one of these mechanisms. They are proposed as methods to provide extra funding either to 'tip the balance' in terms of cost recovery from switching to better practices at farm level, or as co-funding for upscaling good practices.

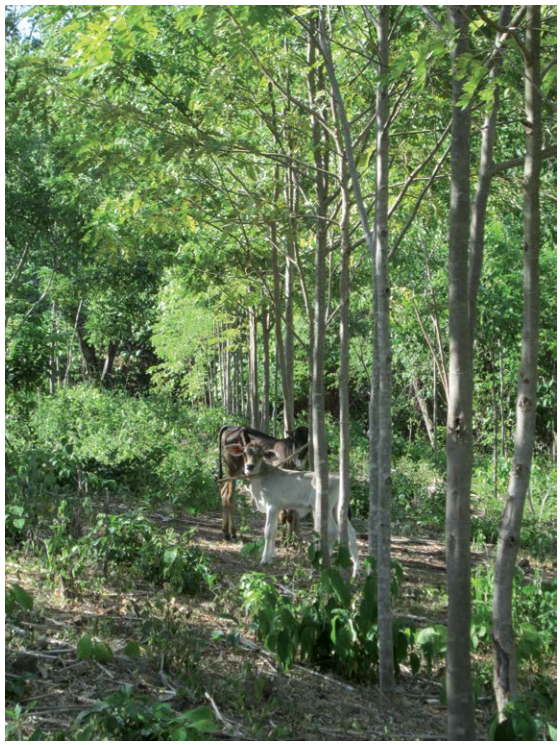
## 1.1 PES AND THE GREEN ENTREPRENEURSHIP PROGRAMME

Hivos has been looking into possibilities to provide market-based incentives to smallholders that will allow them to bring their production systems to a higher level of environmental sustainability. In conjunction with IIED, Hivos is examining the potential of PES as a viable financing strategy to boost provision of ecosystem services within smallholder agriculture in developing countries. In this project we look at the role of, and benefits and costs to, key stakeholders involved in existing or proposed PES-type projects. Our main focus remains on the smallholder farmer.

At the partner level, we hope this study will help stakeholders to map their business strategy, 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 and offer wider lessons on the design and implementation of PES.

## 1.2 THE COMMUNITREE PROPOSAL

In this report we focus on how carbon offsets can complement the promotion of forestry activities (agroforestry, reforestation and afforestation) in smallholder economies in Nicaragua. We look at an ongoing project that links forest activities in smallholder agriculture to carbon sequestration. The CommuniTree project, managed by Taking Root, is the only example reviewed in our series that is fully financed through the sale of carbon offsets. This project is different from the other partner studies chosen for the PES Learning Trajectory Programme. It is a more established project with an ongoing carbon component that has made continuous sales. While it is a smallholder project, it focuses on timber rather than energy or soil fertility, uses a different standard (Plan Vivo Standard, while the other projects use the Gold Standard), and makes cash payments directly to farmers. Also, it is not a Hivos-related project, although it takes place in the same region as the PASCAFEN project also analysed in this Payments for Ecosystem Services and Smallholder Agriculture series, under Shaping Sustainable Markets.



Agroforestry system in the CommuniTree Carbon Programme, Nicaragua © Kahlil Baker

The underlying causes of deforestation in the tropics – and especially in Central America – are deeply entwined with the advance of the agricultural frontier. Nicaragua lost 20 per cent of its forest cover in 1990–2005, from 6.54 to 5.2 million hectares of forest. Many of the country's main environmental challenges are linked to deforestation and the impacts it has had on soil erosion, including reduced resilience to climate change and extreme climatic events. Parallel to the degradation of its natural ecosystems, Nicaragua is one of the poorest countries in Latin America, with low per capita income, widespread underemployment, increasing international debt and high levels of inflation.

Smallholder farmers in Nicaragua are a vulnerable group, usually depending on a mix of agriculture production activities and dual-purpose cattle ranching, mostly on (previously forested) degraded land (Tara Phelan, 2015). Production systems which utilise this combination of production activities can play a key role in national and regional economies, for food security and poverty alleviation, but are considered major contributors to agricultural GHG emissions (Peters *et al.*, 2012). **While full-scale solutions to the problem will require broader locally embedded political change** and not merely market creation (Van Hecken and Bastiaensen, 2009), **in this report we focus on the potential of carbon revenues** from reforestation, afforestation and agroforestry to change behaviours towards better land management. To do so, we look at how these incentives to change behaviour affect, and are affected by, existing value chains.

We focus on the CommuniTree Carbon Programme in Nicaragua, located in the municipalities of San Juan de Limay, Esteli and Somoto, Madriz in northern Nicaragua. The project, managed by the NGO Taking Root, has been operational since 2010. The project seeks to **improve environmental outcomes** (climate change mitigation, increase local species and biodiversity habitat, increase forest cover and thereby soil and water stability) by sequestering quantifiable volumes of $CO_2$ from the atmosphere through a combination of forestry-based activities that increase and diversify smallholder farmers' income and the participation of women. Reforestation will also provide firewood for home cooking – 95.5 per cent of the population in the municipality uses firewood for cooking and outside of urban centres this percentage increases to 99.2 per cent (Municipality of San Juan de Limay, 2009). Through these activities, the project aims to contribute to reducing future forest degradation by addressing the drivers of that degradation.

The project currently works with 280 smallholder farmers on agroforestry, reforestation and afforestation. Carbon offsets generated by the project are certified by Plan Vivo – with a total of 256,604 certificates in 2015 (equivalent to one tonne of $CO_2e$ per certificate). The project was registered and validated in 2011, and went through its first verification process in 2015. Buyers of the carbon offsets include the Inter-American Development Bank, Tuff Gong Worldwide, Arvid Nordquist and Jack Wolfskin.

## 1.3 METHODOLOGY

We present a brief value chain map (see Box 1) and description of the basic business model underlying the timber–carbon proposition. We used a combination of desk-based analysis, Skype meetings with experts, and a field visit to the project in Nicaragua to inform this research.

### 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.

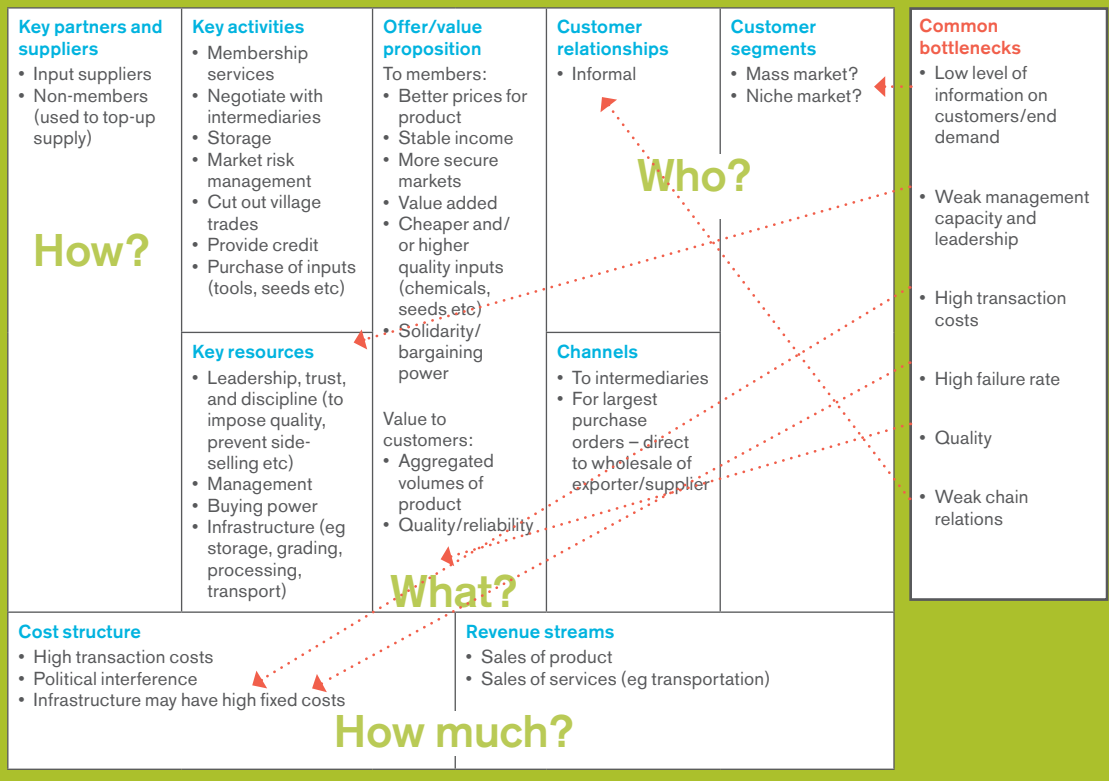
## BOX 2. WHAT IS A BUSINESS MODEL CANVAS?

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 TIMBER–CARBON VALUE CHAIN

The 280 participating farmers are located in 29 communities in San Juan de Limay and in Somoto in northern Nicaragua. They interact in a system composed of different (but integrated) product value chains:

- Carbon value chain, and
- Timber value chain (alongside diverse agricultural value chains including corn, sorghum and dairy/beef)

In this section we present a brief description of these value chains, and concentrate on the farmers and Taking Root as the project developer. We use the methodology presented in Section 1.3.1 (see also Figure 1).

## 2.1 THE CARBON CHAIN

The process for recruitment of new farmers starts every year between December and January. The number of new farmers that the project recruits is balanced with the projected carbon sales of the coming year.

The overall project coordination is done by Taking Root (financial planning, project reporting, quality control, design of technical specifications and monitoring) in partnership with a local technical and operational service provider, the Association of Professionals for the Holistic Development of Nicaragua (Asociación de Profesionales para el Desarrollo Integral de Nicaragua or APRODEIN).

APRODEIN is responsible for on-site logistical support, including recruitment of farmers, monitoring, payments, provision of inputs and capacity building. They work directly with the farmers, and engage with local government groups and other community environmental commissions.

Carbon credits are issued by Plan Vivo who conducts formal monitoring every five years. Taking Root sells credits on voluntary markets through wholesale intermediaries or directly to retailers. Of the total revenues from sales, 40 per cent is allocated to programme operations and development – part of which covers APRODEIN expenses – and 60 per cent is allocated to a Plan Vivo trust fund where the money is used to make direct payments to participating smallholders.

## 2.2 THE TIMBER CHAIN

Because the project is relatively recent (the first trees were planted in 2009) none of the participating farmers have reached the required harvest period of 10 years or more (when the trees can be felled). Our analysis of the timber activities is therefore based on projections. In 2014, the project began a pilot for a forest-products processing facility, which will test the process for producing two new products: green charcoal and furniture. Once the pilot is scaled up, Taking Root will offer to buy the timber, thereby ensuring

Local sawmill and workshop for adding value to timber produced © Alexandra Amrein

a market outlet for the farmer's timber supply. This is an important component of the project, as the local timber market is relatively weak and prices are low. This is a small step towards the promotion of a local timber market, creating an additional financial incentive for the farmers not to fell their trees once the PES payments have stopped (van Mossel-Forrester, 2014).

Both of these activities are complementary to traditional agricultural activities and use multiple land-use strategies which helps to spread the risks associated with them across different activities and time scales, thereby supporting the resilience of farmers' livelihoods. Traditionally, farmers in Limay and Somoto produce sorghum, corn and beans. These crops are mostly for subsistence but some are sold commercially to local intermediaries. Many farmers also own cattle – and much land in the region is currently used to cultivate foraged food. Milk is collected daily by local intermediaries or sold to other members of the community as fresh milk or cheese. Cattle are also sold to local traders.

## 2.3 KEY ACTORS

### 2.3.1 The farmers

According to the project, participating smallholders are located throughout the municipalities of San Juan de Limay and Somoto. Participants must have long-term tenure rights to economically under-utilised land that is in need of reforestation, be in close proximity to road access and must demonstrate that participating in the programme will not conflict with their subsistence activities, notably cattle ranching and agriculture.

There is a legal process underway in Nicaragua to try to standardise land ownership, which has been in a chaotic state since the agrarian reform in 1979. The San Juan de Limay project has benefited from this process where it is further advanced. For smallholders to enter into long-term carbon contracts, and to avoid land-tenure disputes, potential participants must demonstrate their land-tenure rights by having a legal deed to their land in either their own or their parents' name with a legal contract demonstrating their right to a specified fraction of the property. If the first two options are unavailable, the third is to have an

official letter from the local government testifying that they are the owners of the land.

### 2.3.2 Taking Root as project developer

Taking Root is a Canadian federally incorporated, independent NGO with operations in Nicaragua and Canada. Its role includes overseeing programme implementation and development; negotiating and recording carbon sales with buyers; managing the Plan Vivo Fund, including annual payments to APRODEIN following internal annual monitoring; processing and recording Plan Vivo certificates, producer sale agreements and other producer information; storing reports and documentation; coordinating external reviews; reporting to the Plan Vivo Foundation as external certifier; assessing the security of land tenure rights; receiving reports from APRODEIN; and liaising with local government.

Monitoring trees on the plantation © Kahlil Baker

### 2.3.3 APRODEIN as local logistics coordinator

APRODEIN is a Nicaraguan NGO, in charge of all local logistical support including recruitment; annual payments to producers; organising regular community meetings and encouraging further community engagement, local capacity building and workshops with farmers (including identifying relevant professionals and resources when needed); collecting local data; and internal monitoring.

### 2.3.4 Plan Vivo Foundation

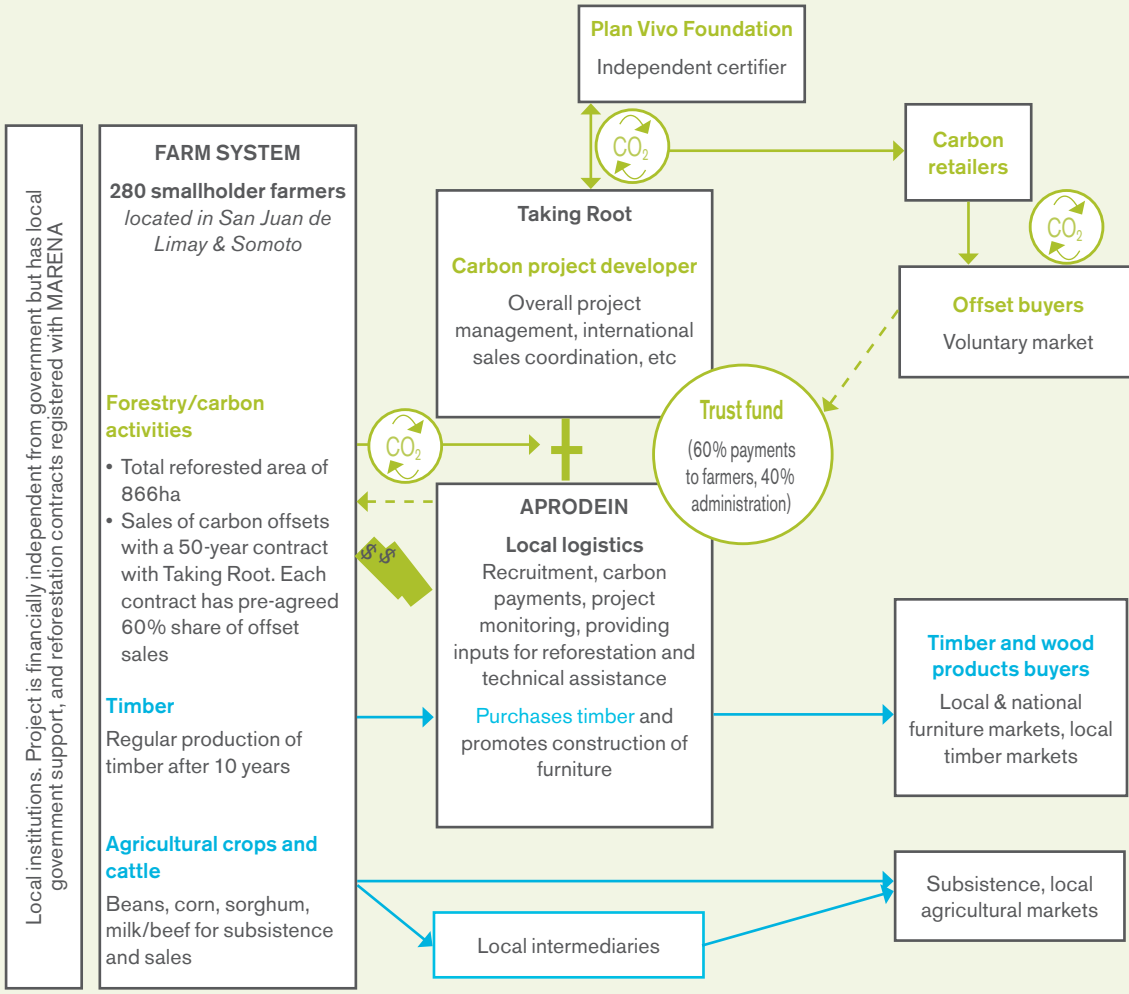
Plan Vivo is the independent certification body, which specialises in smallholder and community carbon projects. The standard requires clear benefit-sharing strategies (in the magnitude of 60 per cent of revenues for farmers, 40 per cent for administration). Verification of certificates takes place after independent audits.

### 2.3.5 Independent carbon resellers

Approved certificates are sold either directly by Taking Root, or through independent carbon resellers, like MyClimate.[1]

1. See: www.myclimate.org/carbon-offset-projects/projekt/nicaragua-forestry-7186

## FIGURE 1. COMMUNITREE CARBON PROGRAMME TIMBER–CARBON VALUE CHAIN




Source: value chain constructed following interviews with key informants from Taking Root and APRODEIN.

# THREE
# THE BUSINESS MODEL

Because of the CommuniTree project's strong carbon component we focus on Taking Root's/ APRODEIN's roles as project developers and on the farmers' role in implementing the activities (see figures 2 and 3). We follow the methodology described in Section 1.3.2, describing how a Business Model Canvas can illustrate to what extent PES can aid/complement the main agricultural business model, 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 from project documentation available on the Plan Vivo website (Plan Vivo, undated) and consultations with experts.

## 3.1 TAKING ROOT'S BUSINESS MODEL AS PROJECT DEVELOPER

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

Taking Root offers carbon offsets, and has plans to expand to include manufacturing forest products (like furniture) with the timber produced, as well as charcoal from timber generated during the thinning process. Their long-term goal is to expand the model to more farmers in Nicaragua and other countries.

By issuing certified carbon offsets with a high emphasis on co-benefits, Taking Root has been able to obtain Plan Vivo certification and through it access to niche voluntary carbon markets. They have been making sustained sales since the start of the project, either directly or through resellers in Europe and Canada. Buyers include the Inter-American Development Bank, Tuff Gong Worldwide, Arvid Nordquist and Jack Wolfskin.

### 3.1.2 How is value created?

Carbon offsets are based around trees: agroforestry, reforestation and afforestation. Future income streams will come from timber and potentially the creation of a charcoal industry. The project is also beginning to provide consulting services for other projects (see Table 1 for net carbon benefits for these activities).

**Key activities that create carbon offsets:** the project focuses on planting trees as the vehicle to generate carbon offsets. All the activities use mixed species of trees which are common to the region and which can be used for multiple purposes, as well as other multipurpose, mixed species (*Caesalpinia velutina, Swietenia humilis* and *Bombacopsis quinata*). These species have different characteristics affecting their growth and use – some fast-growing leguminous trees are used for fence posts or rural construction, whereas others are highly valued longer rotation species, commonly used for locally and internationally marketable sawn wood. In addition to the cash PES payments, farmers receive continuous training and support throughout the duration of the project.

## TABLE 1. NET CARBON BENEFIT PER UNIT, PER ACTIVITY

| ACTIVITY | NET CARBON BENEFIT PER UNIT ($TCO_2$) |
|---|---|
| Mixed-species forest plantation | 299.7/ha |
| Silvopastoral planting | 191.9/ha |
| Barrier planting | 214.80/km |

Note: This represents the summary values. The technical specification document (Baker *et al.*, 2014) presents a detailed description of captured carbon by activity and plot. The costs to implement the activities vary on individual plots. CommuniTree does not record the individual costs of joining (Baker, 2015a).

## FIGURE 2. TAKING ROOT/APRODEIN BUSINESS MODEL

**Partners**

- 280 smallholder farmers, 1,183,640 trees planted (2010–2014)
- Local seed suppliers
- Plan Vivo
- National Forestry Institute (INAFOR)
- Tree nurseries – managed locally
- ICCO (from 2014)

**Activities**

**Carbon**

- Recruitment of new farmers
- Provision of technical assistance
- Monitoring plantations
- Marketing and networking

**Forest products**

- Design and production of furniture

**Resources**

**Carbon**

- Strong leadership, reputation and partner/client network
- Plan Vivo certification and pooled risk buffer
- Staff: 8 technicians, 1 administrator and 1 coordinator
- Highly developed information systems for monitoring and reducing transaction costs

**Forest products**

- Smallholder project information-management system

**Value proposition**

**Carbon credits**

Carbon offsets from reforestation by smallholder farmers certified by Plan Vivo

**Forest products**

Furniture and other crafts made of local and sustainable wood grown by smallholder farmers

**Charcoal** (from thinning process)

**Relationships**

Customer relationships are based on reputation and credibility

Strong leadership within project; active and continuous targeting of buyers

**Channels**

Carbon Plan Vivo issues carbon credits under a holistic reforestation framework that emphasises community participation, using native tree species and protecting critical watersheds

**Customers**

**Voluntary carbon market**

- Wholesalers in Sweden, Germany, Switzerland and the UK
- Retailers in Canada
- Direct sales to institutional and individual buyers

**Forest products, including charcoal**

Market for forest products
Individuals at local and national level

**Cost structure**

**Costs associated with carbon credits (2010–2014)**

- Carbon payments currently made (directly and indirectly) to farmers US$532,834. Total payments to farmers equivalent to 60% of total carbon sales, paid in installments
- Programme costs = 40% of carbon sales (technical assistance, provision of inputs, registration and validation costs within Plan Vivo standard – eg registration and approbation fee: ~ US$10,000. Issuance fee: US$0.35/tonne. Total for period October 2013 to October 2014: US$345,799

**Costs associated with forestry products**

- Timber purchase at US$20/tree – but price varies according to species
- Manufacturing costs

**Income sources/benefits**

Income from sales of carbon credits (2010–2014): 256,605 credits sold
Income from sales of forest products: US$4,000 in 2014
Income from sales of charcoal: estimated sales price = US$500/t
Other income in 2014: consulting, other services, operational revenue: US$99,186
Grant: US$55,989

Traditional products (eg timber, crops)  Carbon rights/offsets flows

**Mixed-species forest plantation:** the plantations consist of alternating rows of fast-growing firewood species (*C. velutina and Gliricidia sepium*) and longer-lived hardwood species (*Swietenia humilis, Bombacopsis quinata* and *Albizia saman*). The firewood species are nitrogen fixing and will be coppiced at an early age, providing an early harvest of firewood while fertilising the soil. Due to the spacing between rows, there is enough room for the shoots to grow back for a second harvest before being entirely crowded out by the hardwood species. The hardwood species have differing growth rates and shapes, allowing for variable thinning before the entire stand reaches maturity. This system is designed to provide benefits to participants in the short, medium and long term. In the short term, participants receive payments for the ecosystem services; in the medium term, participants benefit from the subsistence harvest or sale of firewood; and in the long term, participants benefit from the harvest and sale of high-value timber. The revenue from the sustainably managed harvests creates an incentive for the farmers to continue participating in the programme, since the revenue is expected to be greater than the ecosystem payments of the first phase of the programme.

**Reforestation within silvopastoral landscapes** involves the planting and intensive management of a multi-purposed, mixed-species silvopastoral planting system alongside the use of improved pasture seeds. For the first few years of establishment, the silvopastoral system must be implemented in areas either where cattle have been temporarily removed or three large wooden stakes must be placed around each tree to prevent trampling. The trees selected are not palatable to cattle. As an additional precaution, it is suggested that producers only graze smaller cattle in these areas for the first few years. After the first year of planting, once the seedlings are established and to minimise competition, improved pasture seed will be sown throughout the pasture to improve the number of cattle the land can support. The planting design consists of trees planted at a 5m x 5m x 5m spacing, with every second tree being *C. velutina* alternating with *B. quinata* and *S. humilis.* As the crown cover of the system increases, the *C. velutina* trees will be thinned to leave a young stand of high-value timber trees. Another half of these trees will be thinned until the stand reaches maturity with a final density of 10m x 10m x 5m. Since all of these species coppice well, new trees will regenerate as older ones are removed keeping the stand semi-forested at all times.

**Reforestation through live fences/barriers:** this system involves the intensive management of a mixed-species boundary-planting system, using species common to the area alongside existing property boundaries such as fences such as *C. velutina. C. velutina* is predominantly used for the production of posts for new fences or rural construction. As existing fence posts start to decay, the planted *C. velutina* trees can be used to support the barbed wire and two trees are planted between alternations of *B. quinata* and *S. humilis.* The *C. velutina* trees are harvested and replanted at alternating intervals so that at least one tree remains at all times.

**Crediting period:** this is a long-term programme generating ex-ante carbon offsets using the average sequestered volume over the crediting period. The average crediting period is 50 years from each participant's starting year. For example, the programme period for the producers who joined the programme in 2012 will last until the beginning of the planting cycle in 2062. This time period was selected to allow sufficient time for transition from a non-forested

landscape to a plantation forest, to a sustainable, managed forest.

**Project period:** the programme has a rolling ten-year programme period. The programme is annually extended at the time of payment for signed ecosystem service agreements. This annual extension will continue for ten years after the first year to support the continuation of fence-planting activities.

**Key resources and partners:** the project's technical specifications have been developed using local knowledge and experience combined with technical input from the local National Forestry Institute (INAFOR) representative, expert consultations with local members of the Ministry of the Environment and Natural Resources (MARENA), the Ministry of Agriculture and Forestry (MAGFOR), and professionals from APRODEIN and Taking Root. Bioclimate Research and Development (a not-for-profit organisation which works with communities on ecosystem projects) provides guidance on the methodology and accounting methods. In 2014, Taking Root began a cost-sharing partnership with the Interchurch Organization for Development Cooperation (ICCO) based in the Netherlands, helping to improve financial sustainability and prepare for larger upscaling.

APRODEIN professionals provide guidance for the central **tree nurseries** while professional community technicians provide on-site supervision. Most of the labour is provided by the participating smallholders who are responsible for their proportional share of the work depending on the size of their individual farm. This helps build local capacity while ensuring quality guidelines are met. In some cases, where individual smallholders or small groups of individual smallholders live far from the central nursery, satellite nurseries are established. These satellite nurseries tend to be more independently run by smallholders but the community technicians provide regular quality guidance.

**Professional local foresters lead workshops** which are held for the community technicians and the participating smallholders on how to establish and manage the forest plantations at the various stages of development. Under the guidance of community technicians, each smallholder is responsible for the management of their own management plan. However, it is not uncommon for participants to exchange labour with their neighbours to help each other.

A cornerstone of the project is the use of information and communication technologies for monitoring and management. Because the project has not relied on official development assistance of any kind, finding ways to **keep down transaction costs** has been essential. To do this, Taking Root has developed a successful tool called the Smallholder Carbon Project Information Management System (SCPIMS) to address the basic needs of organising, finding, tracking, sharing, monitoring and reusing technical and financial information from the project as well as communicating it to those who depend on that information. Information collected in the field is entered directly into hand-held tablets and automatically uploaded to the SCPIMS system, ensuring efficiency in the data-entry process and all projects are verified by third parties to verify accuracy. Monitoring data allows an instant calculation of the payment due to the producer, and the transaction time required to issue payments is hugely reduced – transactions that would have taken months to complete are now done a matter of minutes (Baker, 2015b). Plan Vivo is exploring how to upscale this technology to other projects, both existing and forthcoming.

TABLE 2. PAYMENTS AND TRANSFERS MADE FROM THE PROJECT TO PARTICIPANTS (US$)

| | CERTIFICATES SOLD | PES MADE | ADVANCES MADE TO ESTABLISH PLANTATIONS | OTHER PAYMENTS AND CONTRIBUTIONS |
|---|---|---|---|---|
| 2010 | 12,342 | 1,226.59 | 3,792.78 | n/a |
| 2011 | 33,684 | 9,199.84 | 19,417.20 | 14,220.82 |
| 2012 | 66,207 | 57,248.27 | 44,282.47 | 33,288.19 |
| 2013 | 78,430 | 103,366.94 | 52,751.26 | 44,290.74 |
| 2014 | 65,941 | 86,499.03 | 32,254.63 | 30,996.00 |
| **Total** | **256,604** | **257,540.67** | **152,498.34** | **122,795.75** |

Source: van Mossel-Forrester *et al.* (2014)

### 3.1.3 How much? Benefits and costs involved

Total offset sales in 2010–2014 have been made for 256,604 certificates. The price per offset is confidential.

Participants receive payments over a ten-year period. Each year, new participants are recruited into the programme and Taking Root commits itself to supporting farmers for a minimum of ten more years. One of the programme's objectives is to use carbon finances to help farmers during the early years of the plantation before the first saleable forest products are generated.

Table 2 summarises the payments made from the beginning of the project. Between 2010 and 2014 the project transferred US$257,540 to farmers as payments for ecosystem services. In the first year of planting the project also provides all new smallholders with additional advances for planting needs. These payments are deducted from future payments, and are very important as they allow those farmers who lack sufficient capital to join the project. The total amount that has been paid as advances during this period has been of US$152,498. Other payments and contributions to the community include nursery expenses, fuel-efficient cooking stoves and grafted fruit trees. Cooking stoves are not taken into account in the measurement of carbon offsets but are treated as part of the project co-benefits.

From the outset, the project was designed to 'pay its own way', with very little input in the way of grants or donor support, keeping income and

TABLE 3. PROJECT EXPENSES, REPORTING PERIOD SEPTEMBER–OCTOBER (US$)

| EXPENSES | 2009–2010 | 2010–2011 | 2011–2012 | 2012–2013 | 2013–2014 |
|---|---|---|---|---|---|
| Human resources (staff, consultants) | 67,030.55 | 130,763.00 | 209,104.00 | 169,458.00 | 198,451.00 |
| Administration | 1,699.19 | 15,853.00 | 13,834.00 | 15,956.00 | 47,490.00 |
| Operations (transport, equipment, training, materials) | 16,103.65 | 24,621.00 | 25,814.00 | 70,199.00 | 67,153.00 |
| Marketing/sales | 6,411.76 | 3,089.00 | 7,762.00 | 14,955.00 | 10,365.00 |
| Financial fees | 3,421.00 | 12,905.00 | 4,762.00 | 11,964.00 | 22,340.00 |
| Emission/validation fees | 5,549.40 | | 19,192.00 | 29,115.75 | |
| **Total for period** | **100,215.55** | **187,231.00** | **280,468.00** | **311,647.75** | **345,799.00** |

Source: Project annual reports, Plan Vivo website (undated)

outgoings in line with each other. As Table 3 shows, some expenses vary in terms of timing, linked to the intensity of recruiting, monitoring or supporting activities during the initial years. Costs also increase as the project's scale increases. The average costs of the project for the period between October 2013 and October 2014 was US$345,799. All information on costs is transparent and available online, except for information referring to offsets prices which is confidential.

## 3.2 THE FARMERS' BUSINESS MODEL

Systems that include tree planting are not new in Nicaragua, but their uptake has been limited. Some of the main constraints to adoption are linked strongly to insufficient access to credit, information and capacity to implement and capitalise from investments (Tara Phelan, 2015). For farmers with land (including those with less than a hectare) and access to family labour, Taking Root offers a model to help overcome these constraints by providing a meaningful cash payment of sufficient value, the facility to draw advances on future carbon earnings, training on forest management and support to access future timber markets. While payments are welcome, the technical and extension support is one of the main benefits reported by previous studies in the area, such as the silvopastoral pilot conducted by the World Bank (van Hecken and Bastiaensen, 2009). Figure 3 summarises the key points of the farmers' business model, which are discussed in the following section.

## FIGURE 3. FARMERS' BUSINESS MODEL IN THE COMMUNITREE PROJECT

### Partners

- National Forestry Institute (INAFOR)
- Local seed suppliers

**How?**

### Activities

**Carbon**

- Set-up phase: clearing land, growing seedlings and planting trees
- Growth phase: monitoring development of trees, clearing land, replacing harvested/lost trees

**Forest products**

- Harvesting trees (10%/year starting in year 10)

### Resources

**Carbon**

- Set-up phase: previously under-utilised land; investment capital
- Growth phase: forest plantation (types: mixed species, silvopastoral, boundary), basic forestry knowledge, labour, access to water

**Forest products**

- Tools and own/external labour for cutting trees

### Value proposition

**Carbon credits**

Carbon offsets through reforestation of under-utilised land

**Forest products**

Sustainably grown timber from native species (*Bombacopsis quinata*, *Swietenia humilis*, *Caesalpinia velutina*, *Gliricidia sepium*, *Albizia saman*)

**What?**

### Relationships

Communication is personal via farm visits by technicians or when farmers claim their cheques from the office

**Who?**

### Channels

**Carbon**

- Contract with Taking Root over 50 years with a 10-year technical assistance plan
- Process is accredited by Plan Vivo

**Forest products**

- Farmers deliver wood to the workshop in Limay

### Customers

**Carbon offsets**

Taking Root

**Forest products, including charcoal**

Taking Root's sawmill and wood workshop, local timber buyers

### Cost structure

Carbon and forest products are the same. Set-up costs (material and equipment): wire (US$163/ha), seedling bags, seeds, labour ie clearing land (US$39–58/ha). Running costs/maintenance costs, a lot using family labour
Harvesting forest products requires labour, equipment and transport to workshop

### Income sources/benefits

Income from sales of carbon credits (2010–2014): 256,605 credits sold
Income from sales of forest products: US$4000 in 2014
Income from sales of charcoal: estimated sales price = US$500/t
Other income in 2014: consulting, other services, operational revenue: US$99,186
Grant: US$55,989

Income from carbon offsets years 1–10: farmers receive 7 carbon payments (in 3 installments). The amount of income from reforestation depends on the chosen plantation style. From Year 10 onwards timber can be harvested on a yearly basis. Prices vary, but fast-growing timber species are worth about US$20/tree

**How much?**

Traditional products (eg timber, crops)  Carbon rights/offsets flows

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

Farmers are responsible for establishing the forest activities described above, and following a sustainable management plan to maximise tree survival. Their carbon offsets are purchased by Taking Root. As the timber reaches maturity, they can choose to sell it to Taking Root or to other outlets if available.

### 3.2.2 How is value created at the farm level?

Once farmers are registered, a contract is signed with Taking Root over a 50-year period. This contract details the future carbon payments that the farmer will receive over a ten-year period, and specifies the wood harvest rate which is regulated by Nicaraguan law.

**Key resources** needed for the value proposition are different according to the phase of participation in the project:

1. The set-up phase includes preparing the area of under-utilised land available for reforestation according to the activities promoted by the project (plantation, boundary planting or agroforestry). Activities include preparing the land, growing seedlings and planting trees. The project does not allow replacement of agricultural land with forestry activities. Agriculture and forestry can only co-exist through agroforestry systems. Farmers need financial capital for the initial investment, which depends on the type of activity they undertake.
2. During the growth phase, farmers need to ensure the health of the plantation through access to labour, water and a basic knowledge of forestry management (ie clearing weeds and replanting harvested or lost trees during the growth phase). The combination of different types of trees (see Section 3.1.2) means that farmers benefit from the trees at different times and for different purposes, thereby complementing the carbon revenue streams. Monitoring of the activities requires the participation of the farmer, providing immediate feedback on the health of the plantation and deciding which corrective measures are necessary.

Each contract clearly displays information about the carbon component by types of activity, how much the farmer is expected to receive and at what periods (see Table 4).

TABLE 4. PRICE AND NUMBER OF TREES PER ACTIVITY, 2013

| BOUNDARY FENCES: 214.8 TONS | TOTAL PAYMENT PER KILOMETRE: US$708.84 | |
|---|---|---|
| Trees per **kilometre**<br>Total: 670 trees<br>Mandagal: 446<br>Pochote: 112<br>Caoba: 112 | Year 1: US$177.21<br>Year 2: US$141.77<br>Year 3: US$106.33<br>Year 4: US$70.88<br>Year 5: US$0 | Year 6: US$70.88<br>Year 7: US$70.88<br>Year 8: US$0<br>Year 9: US$0<br>Year 10: US$70.88 |
| PLANTATION: 209.8 TONS | TOTAL PAYMENT PER MANZANA: US$692.34 | |
| Trees per **manzana**<br>Total: 1,167 trees<br>Mandagal: 778<br>Pochote: 97<br>Caoba: 97<br>Cenízaro: 97<br>Madro Negro: 97 | Year 1: US$173.09<br>Year 2: US$138.47<br>Year 3: US$103.85<br>Year 4: US$69.23<br>Year 5: US$0 | Year 6: US$69.23<br>Year 7: US$69.23<br>Year 8: US$0<br>Year 9: US$0<br>Year 10: US$69.23 |
| SILVOPASTORAL: 134.3 TONS | TOTAL PAYMENT PER MANZANA: US$443.31 | |
| Trees per **manzana**<br>Total: 280 trees<br>Mandagal: 140<br>Pochote: 70<br>Caoba: 70 | Year 1: US$110.83<br>Year 2: US$88.66<br>Year 3: US$66.50<br>Year 4: US$44.33<br>Year 5: US$0 | Year 6: US$44.33<br>Year 7: US$44.33<br>Year 8: US$0<br>Year 9: US$0<br>Year 10: US$44.33 |

Note: In Nicaragua, one manzana is equivalent to 0.704 hectares.

The **key partner** for the farmer, apart from their direct link to Taking Root/APRODEIN, is the National Forestry Institute (INAFOR). All planted trees are registered with INAFOR and are therefore legally permitted to be sold.

### 3.2.3 How much? Benefits and costs involved

If the farmer does not have enough capital to begin activities (eg access to seeds, bags or wire to construct fencing to protect young trees from wild animals) the project offers advanced **access to start-up capital**, either in cash or in kind, to help cover initial expenses. These costs are recorded and paid back through future PES payments.

During the first ten years, farmers receive seven payments, which are spread according to the intensity of work required: higher payments are made in the first five years where labour and material costs are high. Payments then decline over time while ensuring liquidity to the end of the period. Annual payments are split into three installments. After the ten-year period carbon payments end, and the regular wood-harvesting period begins at an approximate yearly rate of 10 per cent combined with continuous planting of new trees to maintain the forest. Throughout the first ten years, farmers receive technical assistance from Taking Root.

The second part of the value proposition is the wood that can be harvested sustainably 8–10 years after planting and sold to Taking Root for an estimated price of US$20 per tree (for fast-growing species). Slow-growing trees will be harvested after approximately 25 years and therefore no price estimates are available. Farmers are expected to deliver the timber to Taking Root's sawmill and workshop in Limay. The major costs for this part of the value proposition include labour costs for the harvest and for transport.

A producer exchange visit, CommuniTree Carbon Programme, Nicaragua
© Kahlil Baker

# FIGURE 4. OPPORTUNITIES AND POTENTIAL BOTTLENECKS IN THE COMMUNITREE TIMBER–CARBON PROPOSITION

Carbon activities provide clear benefits to farmers in terms of timber and better farm health. An important limitation is the time-lag: timber takes years to be harvested.

**Clear leadership is needed** within the project, with committed direction and staff, good contacts abroad to promote sales and with a commitment to local needs. Upscaling will put a strain on the system, so ensure that the human contact remains as the project grows.

Targeted extension support improves long-term human capital.

**Income diversification** beyond carbon revenue will add financial sustainability to the model. **A better long-term analysis** of timber viability is needed for the project at farmer level.

## Farmers

### How?

**Partners**
- National Forestry Institute (INAFOR)
- Local seed suppliers

**Activities**

Carbon
- Set-up phase: clearing land, growing seedlings and planting trees
- Growth phase: monitoring development of trees, clearing land, replacing harvested/lost trees

Forest products
- Harvesting trees (10%/year starting in year 10)

**Resources**

Carbon
- Set-up phase: previously under-utilised land; investment capital
- Growth phase: forest plantation (types: mixed species, silvopastoral, boundary), basic forestry knowledge, labour, access to water

Forest products
- Tools and own/external labour for cutting trees

### What?

**Value proposition**

Carbon credits

Carbon offsets through reforestation of under-utilised land

Forest products

Sustainably grown timber from native species (*Bombacopsis quinata*, *Swietenia humilis*, *Caesalpinia velutina*, *Gliricidia sepium*, *Albizia saman*)

### Who?

**Relationships**

Communication is personal via farm visits by technicians or when farmers claim their cheques from the office

**Channels**

Carbon
- Contract with Taking Root over 50 years with a 10-year technical assistance plan
- Process is accredited by Plan Vivo

Forest products
- Farmers deliver wood to the workshop in Limay

**Customers**

Carbon offsets

Taking Root

Forest products, including charcoal

Taking Root's sawmill and wood workshop, local timber buyers

### How much?

**Cost structure**

Carbon and forest products are the same. Set-up costs (material and equipment): wire (US$163/ha), seedling bags, seeds, labour ie clearing land (US$39–58/ha). Running costs/maintenance costs, a lot using family labour

Harvesting forest products requires labour, equipment and transport to workshop

**Income sources/benefits**

Income from sales of carbon credits (2010–2014): 256,605 credits sold
Income from sales of forest products: US$4000 in 2014
Income from sales of charcoal: estimated sales price = US$500/t
Other income in 2014: consulting, other services, operational revenue: US$99,186
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Income from carbon offsets years 1–10: farmers receive 7 carbon payments (in 3 installments). The amount of income from reforestation depends on the chosen plantation style. From Year 10 onwards timber can be harvested on a yearly basis. Prices vary, but fast-growing timber species are worth about US$20/tree

## Taking Root/project developer

### How?

**Partners**
- 280 smallholder farmers, 1,183,640 trees planted (2010–2014)
- Local seed suppliers
- Plan Vivo
- National Forestry Institute (INAFOR)
- Tree nurseries – managed locally
- ICCO (from 2014)

**Activities**

Carbon
- Recruitment of new farmers
- Provision of technical assistance
- Monitoring plantations
- Marketing and networking

Forest products
- Design and production of furniture

**Resources**

Carbon
- Strong leadership, reputation and partner/client network
- Plan Vivo certification and pooled risk buffer
- Staff: 8 technicians, 1 administrator and 1 coordinator
- Highly developed information systems for monitoring and reducing transaction costs

Forest products
- Smallholder project information-management system

### What?

**Value proposition**

Carbon credits

Carbon offsets from reforestation by smallholder farmers certified by Plan Vivo

Forest products

Furniture and other crafts made of local and sustainable wood grown by smallholder farmers

Charcoal (from thinning process)

### Who?

**Relationships**

Customer relationships are based on reputation and credibility

Strong leadership within project; active and continuous targeting of buyers

**Channels**

Carbon Plan Vivo issues carbon credits under a holistic reforestation framework that emphasises community participation using native tree species and protecting critical watersheds

### How much?

**Cost structure**

Costs associated with carbon credits (2010–2014)
- Carbon payments currently made (directly and indirectly) to farmers US$532,834. Total payments to farmers equivalent to 60% of total carbon sales, paid in installments
- Programme costs = 40% of carbon sales (technical assistance, provision of inputs, registration and approbation fee: ~ US$10,000. Issuance fee: US$0.35/ton. Total for period October 2013 to October 2014: US$345,799

Costs associated with forestry products
- Timber purchase at US$20/tree – but price varies according to species
- Manufacturing costs

**Income sources/benefits**

Income from sales of carbon credits (2010–2014): 256,605 credits sold
Income from sales of forest products: US$4,000 in 2014
Income from sales of charcoal: estimated sales price = US$500/t
Other income in 2014: consulting, other services, operational revenue: US$99,186
Grant: US$55,989

## Offset buyers

### Who?

**Customers**

Voluntary carbon market
- Wholesalers in Sweden, Germany, Switzerland and the UK
- Retailers in Canada
- Direct sales to institutional and individual buyers

Forest products, including charcoal

Market for forest products
Individuals at local and national level

**Successful sales,** with renewed purchases from buyers who are willing to pay higher prices for the co-benefits of carbon.

**Cash income** from PES helps cover some of the plantation costs. Cash advances against future earnings help cash-strapped farmers.

**Smart monitoring and data management:** Data management systems (1) keep down transaction costs and allow for time-smart decisions (2) are key for upscaling (3) provide feedback to farmers, allowing them to make decisions on their management strategies and (4) can also be customised to provide clear, transparent information to buyers to fuel their interest in the project.

# FOUR
# KEY POINTS: RELEVANCE AND COMPLEMENTARITY

In this section we discuss the most important points of the timber–carbon proposition. Figure 4[2] shows the key opportunities and potential bottlenecks along the value chain, and highlights areas for complementarity between carbon and smallholder agriculture.

## 4.1 COMPLEMENTARITY WITH AGRICULTURE

The carbon proposition takes place on land not suitable for agriculture, or that has been abandoned and therefore does not incur a cost in terms of a reduction of food security. The species used in the project generate many local benefits at different times, and help ensure energy security generated through the thinning process and the production of firewood. As the project is scaled up, the increased forest coverage will help improve resilience to climate variation.

## 4.2 CLEAR BENEFITS FOR FARMERS

Even though plots are relatively small, farmers still manage to receive sufficient cash payments to allow them to reinvest in the farm system. By providing access to upfront finance, technical support and help to develop markets for products, the project overcomes three of the key constraints to changing local behaviour towards landscape management. But it has not been designed as a development project: participants clearly understand their responsibilities, repayments and their role in ensuring future benefits in terms of timber.

## 4.3 MAKING SUCCESSFUL CARBON SALES

The project has been very successful in selling their carbon offsets to new and existing buyers who are making continuous purchases at prices that are appropriate (ie not too low to make the project unfeasible but not too high to discourage buyers from returning). This has been a weak point for many similar projects: without adequate marketing skills and opportunities, sustaining sales and therefore profitability in the long term is a significant challenge – regardless of the environmental or social merits of a project.

## 4.4 PROJECT OWNERSHIP IS REFLECTED IN STRONG, LOCAL COMMITMENTS

The project has a strong drive and with many young, enthusiastic and committed people involved – this has injected energy throughout the rest of the project. It has generated stable jobs for local professionals – many of them young people and women managing their own nurseries and running parallel projects. The regular communication means that participants retain a high level of enthusiasm for the project, which reduces the risk of defaulting.

2. Information inside the business canvas in Figure 4 is taken from figures 2 and 3.

## 4.5 INFORMATION MANAGEMENT AS AN INVESTMENT

From the beginning, the project has had a clear understanding of the need to use technology, and to invest in the capacity building of its staff. Information systems are seen as an investment to reduce transaction costs associated with a range of different activities: from recruitment to monitoring to making payments. They provide immediate feedback to farmers on the health of their farm, how it will affect payments, and any corrective measures that need to take place to ensure tree survival. Information systems also provide clear and tailor-made information for buyers – such as how funds are used and who benefits – and generate annual reports for the Plan Vivo Foundation. Because all the information is digitalised from the moment it is entered in the field, these reports can be prepared in minutes at very low cost.

## 4.6 UPSCALING POTENTIAL

The project is relatively small – and much of its success so far has been linked to the personal relationships between the actors involved. There is good potential for upscaling – and there is interest in the methodologies and systems from different parts of Nicaragua, Guatemala and Haiti. The Plan Vivo Foundation is currently negotiating with Taking Root on how to facilitate the transfer of information technologies to other smallholder and community projects within the Plan Vivo portfolio and projects in the pipeline.

## 4.7 INSETTING

The project currently has little potential for insetting. Their activities are linked to local markets (timber, crops), but insetting requires linkages to international value chains (eg through coffee or sugar).

# FIVE
# CONCLUSIONS: IMPLICATIONS FOR PES LEARNING

This project is different from the other partner studies chosen for the PES Learning Trajectory Programme. We chose this project primarily because of the wealth of lessons that can be learnt from its contrasting approach. These are:

1. Clear and committed leadership for the project, with a strong, locally-driven approach that encourages ownership and discourages future defaults in agreed activities. However, the project is relatively small, and it may struggle to maintain its participatory approach as it grows.
2. Management, information and communication technologies at all levels, linking farmers to buyers. These technologies are not expensive, and the benefits they provide (reducing transaction costs, facilitating sales and reporting) at all levels significantly outweigh the costs of using them.
3. Ex-ante sales. This is a difficult issue in carbon markets but very important to generate start-up capital where smallholders lack credit facilities. Some standards do not allow for ex-ante sales as the risk of defaulting is higher. By introducing some requirements – like the creation of Carbon Trust Funds – Plan Vivo has allowed ex-ante sales in some projects. This approach is slowly being adopted by others, for example the International Carbon Reduction and Offset Alliance[3] (ICROA)'s Reductions Sold in Advance of Verification (RSIV), which highlights the rules so that its members may sell credits prior to verification.

This project began small but is steadily growing. Project staff work as advisors to other smallholder projects in the area, as well as informing the wider climate change agenda in Nicaragua. Its successful approach is being explored for replication in Guatemala, Haiti and El Salvador, and the project's data management and benefit-sharing processes are informing the design of future Plan Vivo projects.

3. ICROA is a non-profit industry body promoting best practice in voluntary carbon management and offsetting. Their membership is composed of carbon service providers committed to providing the highest quality carbon reduction solutions for business and public sectors. www.icroa.org

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# REFORESTATION, CARBON SEQUESTRATION AND AGRICULTURE

## CAN CARBON FINANCING PROMOTE SUSTAINABLE SMALLHOLDER ACTIVITIES IN NICARAGUA?

This report explores the CommuniTree project that links forest activities in smallholder agriculture to carbon sequestration in Nicaragua. Managed by Taking Root, it is fully financed through the sale of carbon offsets. Farmers establish mixed-species forest plantations and receive a cash payment for ecosystem services (PES). The project currently involves 280 families and has issued over 250,000 carbon offsets certified by Plan Vivo. Plantation management also provides other sources of income, from sales of timber from the thinning process and expected future timber sales. Because they are part of agroforestry systems, trees help increase farm resilience and provide shade to other crops. The project also supports the promotion of additional market linkages, for example for sustainably produced forest products and tree nurseries, and provides local jobs for community members and local technicians. The project has kept transaction costs down by incorporating ICT tools into their systems. A strong marketing approach also keeps a steady inflow of carbon funding. CommuniTree's successful approach is being explored for replication in Guatemala, Haiti and El Salvador, and its approach to data management and benefit sharing is informing the design of future Plan Vivo projects.

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