CREDITS WHERE CREDIT'S DUE

A GUIDE TO DEVELOPING COMMUNITY-LEVEL CARBON FORESTRY PROJECTS

20 YEARS 1993-2013
WORLD AGROFORESTRY CENTRE
ICRAF SOUTHEAST ASIA

World Agroforestry Centre

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A GUIDE TO DEVELOPING COMMUNITY-LEVEL CARBON FORESTRY PROJECTS

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This is a living document and we would be particularly pleased to hear about your experiences using the Guidebook and suggestions for its improvement. Please send feedback and suggestions to ICRAF-Philippines@cgiar.org.

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ACKNOWLEDGEMENTS

The authors wish to recognize the contributions made by organizations and individuals to the development of this guide. We believe the case studies in this publication offer unique insights into ongoing carbon forestry projects and much of that is thanks to the time and access provided to the authors by community members, project managers and fieldworkers.

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ABOUT THE AUTHORS

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As a research writer for the World Agroforestry Centre Philippines, **Andrea Alforte**'s work has focused on understanding smallholders' needs for carbon finance and translating the complexities of this practice into a useful resource for farmers and community organizations. Her background includes working for the Philippine Government on poverty alleviation programs and policies, where her main concern was on the then emerging sector of microfinance. She worked in this sector for six years, examining the performance of microfinance institutions in the Philippines and East Asia. Her niche is in developing innovative finance for agriculture and assisting rural credit organizations in poor and remote areas. She is currently part of The Munden Project, a company designing financial systems for sustainable land use and community enterprises.

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EXECUTIVE SUMMARY

Why carbon forestry projects?

Forests are central to sustaining life on our planet. Sometimes referred to as the 'Earth's lungs', they filter the very air we breathe. More than this, forests also influence precipitation patterns which provide rain for agricultural systems, are home to a rich variety of biodiversity and provide livelihoods to millions of people around the world.

The role of trees and deforestation in influencing global climate change is also well documented. Trees absorb carbon dioxide (CO_2) from the atmosphere and thus act as a significant 'sink', storing up to 650 million tons of one of the greenhouse gases which is driving climate change. Conversely, they can also be a source of CO_2 with as much as 20% of annual global emissions attributed to land use and land-use change, much of that due to forest loss and degradation.

Forests not only play a vital role in regulating atmospheric CO_2 levels but have a crucial role for the communities and individuals who rely on the services they provide to meet their daily subsistence needs, whether food, fuel or medicines. Furthermore, forests are central to the cultural beliefs of many indigenous peoples around the world.

Despite their central importance in the lives of so many, forests are in decline. The scale of global forest loss is staggering, with as many as 130 million hectares disappearing in the first decade of this century. Finding ways in which to reduce forest loss and reforest areas already denuded whilst at the same time enhancing (or at least not reducing) the livelihood options of agricultural communities has become of great importance. Clearly, striking a balance between the needs of an increasing global population to meet daily subsistence needs in the face of a changing climate - which increasingly see communities being forced to occupy marginal land - with environmental concerns is a real and pressing challenge.

Developing sustainable, effective and equitable carbon forestry projects and schemes which reforest areas of land cleared for agricultural uses could be one such approach. As techniques improve it has now become possible to calculate the amount of CO_2 absorbed by trees with greater accuracy and certainty. This has enabled the development of a market in which carbon credits - equivalent to 1 ton of carbon dioxide sequestered - can be sold to larger organizations that are compelled by legislation or individuals and smaller businesses who wish to 'offset' their carbon emissions.

If a carbon forestry project is designed in a manner which delivers fair and adequate benefits to participating smallhold farmers and at the same time real and verifiable carbon sequestering services, as we hope this guide will demonstrate the income generated by the sale of carbon credits can provide an important source of finance. Depending on the design of the scheme the finance can be provided via direct payments using a ‘payment for environmental services’ model or for investment in infrastructure, training and capacity building.

However, we are at pains to emphasize that carbon forestry projects do not represent a silver bullet in the fight against forest loss and climate change, nor do they represent a windfall for participants. Rather, a well-designed scheme should be viewed as tool to support a transition to more sustainable agricultural practices for smallholding farmers and make some contribution towards mitigating CO_2 emissions.

Who is this guide for?

It is estimated that between 500 million and 1 billion smallholds manage agroforestry-based systems or rely on remnant forests to meet subsistence needs. Clearly, these communities and individuals have a lot to lose as forests disappear and much to gain if they are maintained or restored. This guide is therefore aimed directly at those communities as well as civil society organizations, NGOs, people’s organizations and co-operatives which directly support, represent or work with them.

With this in mind, this guide has been developed to objectively describe the key features, scientific underpinnings, practical aspects and lessons from the field of forest carbon projects. The guide assumes no prior knowledge of the subject and presents information clearly and concisely, avoiding where possible the use of too much technical jargon, to demystify global carbon markets and forest carbon project development.

How to use the guide

The guide is broken into five chapters, each addressing a different aspect of carbon forestry projects. We start by drawing together the latest data on climate change, specifically, the role and influence of forests, before discussing the complex ways in which communities interact with, rely upon and manage them in order to provide a broad context for the subsequent chapters.

Next, we attempt to develop an understanding of the mechanics of global carbon markets: how and where they operate, what is a carbon credit, how is it created and where the finance comes from. A wide range of potential environmental, social and economic benefits are discussed in chapter 3, before the different type of carbon forestry project are described in chapter 4.

Finally, chapter 5 offers insights from the field with three case studies from around the world, all based on 'live' carbon forestry projects and providing some lessons learned and practical information for anyone considering developing such a project. Some of the challenges commonly faced by project developers and communities are described using real examples and insights into how some of these challenges have been, and could be, tackled.

With such a diverse range of circumstances faced by forest-dependent communities around the world we acknowledge that the guide does not represent a fully comprehensive 'how to' for those wishing to develop carbon forestry projects. Indeed, this was not the aim of the guide. We do hope it provides some useful insights and practical assistance on how to begin incorporating trees into agricultural landscapes for the benefit of communities, biodiversity and the wider environment towards meeting the multiple challenges of reducing poverty and mitigating and adapting to global climate change.

FOREWORD

The need to address the multiple challenges of rural poverty and environmental degradation requires innovative, evidence-based solutions. Solutions that acknowledge and address the relationship existing between these two pressing challenges are also needed. Well-designed carbon forestry projects represent one such approach in meeting these challenges under financial constraint.

Ultimately, carbon forestry projects are about trees and people. Forest communities and the landscape in which they live, and to which they are intimately connected, should be the focus of any carbon forestry project. Carefully developed projects that are sensitive to the relationship between people and their landscape can produce multiple benefits for communities, local biodiversity and the environment. In many cases, however, these positives are overlooked by project developers as merely non-essential by-products of these projects. Such an approach can lead to detrimental outcomes for local communities.

This guidebook represents an attempt to avoid this scenario through demystifying the often confusing and highly technical world of carbon forestry. Carbon forestry is a climate-change mitigation tool that conserves, restores and/or better manages forests and peat lands while simultaneously providing benefits to local people who maintain these forests. This work aims to help communities and the agencies which work with them, make informed decisions about how, and indeed if, carbon forestry can assist in balancing the trade-off between conservation and development.

Whether you are a community member seeking to learn more about carbon forestry, a non-governmental organization exploring carbon forestry as a potential solution for communities that rely on the ecosystem services forests provide, or from a private sector organization seeking quality forest carbon projects, there is something here for you. Acknowledging that no two places are the same, the book does not provide a step-by-step ‘how to’ guide to developing a carbon forestry project. Rather, it attempts to share some of the difficulties and success stories from existing projects and current literature.

I was delighted to see that one of the enlightening case studies in this guidebook is a Conservation International-led carbon forestry project in Quirino province, Philippines, which is working to achieve triple bottom lines: climate-change mitigation, improved community livelihoods and biodiversity conservation. CI has successfully been developing carbon forestry initiatives like these for more than a decade, ever since forestry had become a climate-change mitigation option, and has gained helpful insights along the way. This project and the others from Africa and Latin America serve to highlight some of the components required in developing a sustainable project which targets multiple benefits. They also provide useful learning points and insights into how project managers can avoid some of the common missteps along the way.

I hope the guidebook proves to be a useful resource for communities and organizations leading to the development of sustainable carbon forestry projects which place communities at their heart and empower local people to make the transition to a more sustainable future.

Yasushi Hibi
Conservation International Vice-President, Asia Policy

DEFINITION OF TERMS

Agroforestry – Simply put, agroforestry means growing trees on farms. This can include fertilizer trees for land regeneration, soil health and food security; fruit trees for nutrition; fodder trees that improve smallholders' livestock production; timber and fuelwood trees for shelter and energy; medicinal trees to combat disease; and trees that produce gums, resins or latex. Many of these trees are multipurpose, providing a range of benefits.

Biodiversity – The variability among living organisms from all sources, including land, marine, and other aquatic ecosystems; this includes diversity within species, between species, and of ecosystems themselves. Biodiversity forms the foundation of the vast array of ecosystem services that contribute to human well-being.

Bioenergy – Considered a renewable form of energy derived from natural or biological resources, including but not limited to wood and wood waste, straw, manure, sugarcane (bagasse). It often uses bi-products of agricultural processes.

Biomass – Most simply defined as the materials from living or recently living organisms, often referring to plant materials. Biomass is also considered a source of renewable energy.

Carbon – One of the most abundant elements on Earth and in the atmosphere. Carbon is the chemical basis for all known life. It is absorbed and emitted in various forms throughout the carbon cycle but the amount is effectively constant. Carbon forestry projects measure the carbon dioxide sequestered by trees which is fixed as carbon.

Carbon credit – A term describing a tradeable unit or certificate which represents one metric ton of carbon. A carbon credit or carbon offset can be sold as a reduction in emissions of carbon dioxide and other greenhouse gases made in order to compensate for or to offset an emission made elsewhere.

Carbon dioxide (CO_2) – A naturally occurring greenhouse gas and by-product of burning fossil fuels or biomass, or land-use changes and industrial processes. It is the principal anthropogenic greenhouse gas that affects the Earth's radiative balance, leading to global warming.

Carbon emissions – In the natural carbon cycle, carbon dioxide is absorbed by plants and may be re-emitted as carbon dioxide by organisms which consume the biomass accumulated by plants. The term carbon emission is often associated with the enhanced emissions produced by human activities through burning of fossil fuels. Carbon emissions from different activities including flying, driving fossil-fuelled private vehicles and public transport and heating or cooling homes, can now be accurately calculated and these calculations used to measure the amount of carbon credits required to offset such emissions.

Carbon forestry – Normally, a project-based approach to enhancing natural carbon storage in trees. Carbon forestry projects usually involve reforesting areas which have suffered from forest loss, planting areas which were not formally forested (afforestation) or protecting existing forests from real threats. The amount of carbon these trees sequester is calculated and compared to a baseline scenario to give a net carbon benefit. The resulting carbon is often then sold as carbon offsets (each equivalent to 1 ton) and a portion of the profits provided to the landholders with the rest often used to cover project costs or invested in further development. Many carbon forestry accreditation schemes require project developers to also demonstrate additional benefits such as social and community development or biodiversity enhancement. The term carbon forestry is used interchangeably with forest carbon in this guide.

Carbon markets – There are two types of carbon markets: compliance and voluntary. The compliance markets are prescribed by the United Nations Framework Convention on Climate Change and realized through Clean Development Mechanism projects' Certified Emission Reduction (CER) permits, which are sold and traded between nations. Until recently, the most established such market was the European Union Emissions Trading System although this has recently encountered some problems. The idea of these markets is to provide a limited number of permits to emit for major industries in each country, which can then buy additional permits, if they exceed their allowance, from other nations which have not used all of their permits. This 'cap and trade' concept is designed to reduce permits over time to encourage industry to reduce emissions. Voluntary markets are less centralized and include transactions between individuals and businesses and private or not-for-profit companies which buy and sell carbon credits to offset the carbon emissions they generate.

Carbon offset – See **Carbon Credit**

Carbon sequestration – Direct removal of carbon dioxide from the atmosphere through land-use change, afforestation, reforestation and/or increases in soil carbon.

Carbon sink or carbon pool – A system that can store and/or accumulate carbon e.g. above-ground biomass (trees and vegetation), litter, dead wood and soil organic carbon.

Carbon standard – Normally associated with the voluntary carbon market, a carbon standard is a set of quality standards and procedures to ensure a rigorous and transparent carbon forestry project. Each standard provides guidelines for validating, measuring, and monitoring carbon offset projects. There are a number of international standards including Verified Carbon Standards (VCS), Plan Vivo and Climate, Community and Biodiversity Alliance (CCBA).

Climate change – A change of climate caused directly or indirectly by human activity that changes the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.

Climate-change adaption – Climate-change adaptation refers to the ability of society to plan for, and respond to, change in a way that makes it better equipped to manage its exposure and sensitivity to climate change. Adaptive capacity depends on economic wellbeing, ecological well-being, the extent of dependency on natural resources, infrastructure (human-built or natural), effectiveness of institutions and governance systems, insurance, secure land tenure and mediation measures, and information and communication systems. A community with the capacity to adapt is likely to be more resistant to impacts or able to recover from stressful events and conditions.

Climate extremes – Rare weather events at a particular place and time of the year which may persist for a time, such as El Niño and La Niña phenomena and strong typhoons.

Conditionality – This is a key concept in carbon forestry projects, particularly those using a payment for ecosystem services' mechanisms. It simply means that the provider of the agreed service (in this case, carbon sequestration by planted or maintained trees) guarantees the provision of that service to the beneficiary.

Deforestation – The direct, human-induced conversion of forested land to another land-use through the removal of trees.

Ecosystems – A community of plants and animals (including humans) interacting with each other.

Ecosystem services – Ecosystem services are, in broad terms, the benefits that people derive from ecosystems. These could include carbon sequestration and storage (climate regulation), biodiversity conservation, watershed services, and landscape beauty for recreation and tourism.

Environmental services – See **Ecosystem services**

Forest degradation – The reduction of a forest's productivity or ecological function through selective logging or fragmentation. In contrast to deforestation this is often a gradual process enhanced by changes in local micro-climates and forest fires.

Forest carbon – See **Carbon forestry**. These terms are used interchangeably in this guide.

Gigatonne – 1 billion metric tons. Often used to quantify greenhouse gas emissions and concentrations in the Earth's atmosphere.

Governance – In general terms, this is the act of governing. In the context of carbon forestry projects this usually refers to how the project is managed, by whom and what structures and regulations are in place. There is a strong preference for local governance of projects accounting for power dynamics when developing community-based carbon forestry projects.

Greenhouse gas – Gases concentrated in the atmosphere which enhances the warming effect, effectively creating a blanket around the Earth. They include carbon dioxide (CO_2), carbon monoxide (CO), nitrous oxide (N_2O), oxides of nitrogen (NOx), methane (CH_4), and non-methane volatile organic compounds (NMVOCs). The Kyoto Protocol also addresses hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF_6).

Indigenous people – peoples defined in international or national legislation as having a set of specific rights based on their historical ties to a particular territory, and their cultural or historical distinctiveness from other populations. The United Nations' Declaration on the Rights of Indigenous Peoples guides member-state national policies on the collective rights of indigenous peoples, including culture, identity, language and access to employment, health, education and natural resources.

Livelihoods – Means of existence, including capacities, assets (social and material resources) and the activities needed (methods of existence: smallholding farmers, traders etc.) for well-being. A means of existence is sustainable when faced with constraints and impacts it can overcome them and maintain or improve its capacities and assets, now or in the future, without having a negative impact on natural resources.

Land use, land-use change and forestry (LULUCF) – The United Nations Framework Convention on Climate Change defines this as "A greenhouse gas inventory sector that covers emissions and removals of greenhouse gases resulting from direct human-induced land use, land-use change and forestry activities." Emissions from LULUCF are estimated to represent up to 20% of the global emissions annually.

Mitigation – Structural and non-structural measures undertaken to limit the adverse impact of natural hazards, environmental degradation and technological hazards. In the context of climate change, mitigation means a human intervention to reduce the sources, or enhance the sinks, of greenhouse gases.

Monitoring – A continuing assessment of conditions at, and surrounding, the action. This determines if effects occur as predicted or if operations remain within acceptable limits, and if mitigation or carbon-sequestering measures are as effective as predicted.

Nitrogen fixation – Nitrogen fixation is a process by which nitrogen (N_2) in the atmosphere is converted into ammonia (NH_3) and made available to plants.

Opportunity costs – Put simply, this is what you have to forgo when you choose to do one activity rather than another. For example, the opportunity cost of planting trees on agricultural land may lead to a potential reduction in profits from the sale of agricultural products. This is often weighed against the longer-term environmental benefits of planting trees, including potential soil stabilization and restoration, and should be considered and calculated as accurately as possible in any carbon forestry project. Including agroforestry components can help to overcome some of these opportunity costs.

Payment for ecosystem services (PES) – Also known as payments for 'environmental' services (or benefits), these are incentives offered to farmers or landowners in exchange for managing their land to provide some sort of ecological service. This can involve contracts between consumers of ecosystem services and the suppliers of these services. The party supplying the environmental services normally holds the property rights over an environmental good or land use that secures it and which provides a flow of benefits to the demanding party in return for compensation (payment).

Permanence – A key concept in carbon forestry projects. Ensuring 'permanence' of the claimed carbon sequestered through procedures and practices which guarantee that the trees planted or protected remain so. In practice this is difficult to guarantee and losses due to disease, fires and even neglect are a reality. Therefore, more carbon standards require the project to set aside a 'buffer' in case of loss of trees and the carbon they store.

Smallholders – A landholder who is not dependent on permanent hired labour, and manages their land mainly with their own and their family's labour force. There is no specific land-parcel size defined here but many of the smallholders discussed in this guide have typical average holdings of 1 to 3 hectares.

Technical specifications – A specific land-use activity, including the methodology used to quantify carbon sequestered, assessment of risks and leakage, the management and monitoring system to be adopted, and descriptions of likely ecosystem services, including but not limited to carbon. Many technical specifications have already been developed so there may be no need to develop ones for your specific project.

Transaction costs – Any costs relating to the development of carbon credits for sale to markets. This can include assessing the amount of carbon sequestered, the value of other ecosystem services, identifying and approaching prospective buyers, negotiating and closing a deal, and, finally, implementing the agreement.

Vulnerability – The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is the function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity.

Watershed – The technical definition of a watershed is any topographical area that can collect water and is drained by a river system with a common outlet. It can also be thought of as a continuum of interrelated ecosystems from headwaters in the forestlands, the downstream areas or lowlands and a coastal outlet or bay.

CHAPTER 1

FORESTS, COMMUNITIES AND CLIMATE CHANGE

Ecosystems are the most important factor in the survival and wellbeing of humanity. Whether these are rivers, oceans, coral reefs, grasslands, farmlands or forests, these living environments make life possible for every human being by providing air, water, food and other goods and services that support day-to-day needs. Of all terrestrial ecosystems, natural forests comprise 30% of the Earth's land surface, which is equivalent to almost 4 billion hectares of land (Easterling et al 2007).

Rural communities and forest ecosystems

Forest ecosystems provide the source of a wide range of commodities for consumption or sale, including food, fuel, fiber and medicine. Forests supply wood as an important economic commodity for many countries. They provide protection against extreme weather and act as safety barriers against natural hazards such as floods, hurricanes and tsunamis. Forests play a role in regulating water quality that is particularly important for communities, both those living within and outside forests. For many communities, forests have a spiritual or religious significance and symbolism that supports cultural and social stability (Pulhin et al 2010). Tropical forests, in particular, contain the largest terrestrial reservoir of biological diversity (Lasco 2008).

The role of trees

Trees and other forest vegetation have been known to improve the soil beneath them. Trees are a practical means of soil conservation, enhancing such properties as soil structure, porosity, moisture retention and erosion resistance. Forest cover has a sheltering effect in case of extreme climatic conditions, and protects against water and wind erosion while reducing loss of soil nutrients through leaching. Tree roots penetrate a larger proportion of soil, facilitating the uptake of nutrients from deeper layers. Trees also perform important roles in biomass production, and carbon and nitrogen fixation (Nair 1993) (see also figure 1).

Trees also play an emerging role in arresting development problems, such as food and energy security. Energy from wood is the most important source of bioenergy in the world. Wood from forests has the potential to create a more stable and carbon-neutral supply of energy (Langford 2011).

In other respects, the role of forests as a source of wood products must not overshadow its contribution to feeding many forest-dependent communities. Forests and trees provide a direct source of both staple and supplemental foods, not yet including direct cash incomes. Wild vegetation, fruits and wild animals form a small, yet critical, contribution to an otherwise bland and nutritionally poor rural diet (Kamiru 2011).

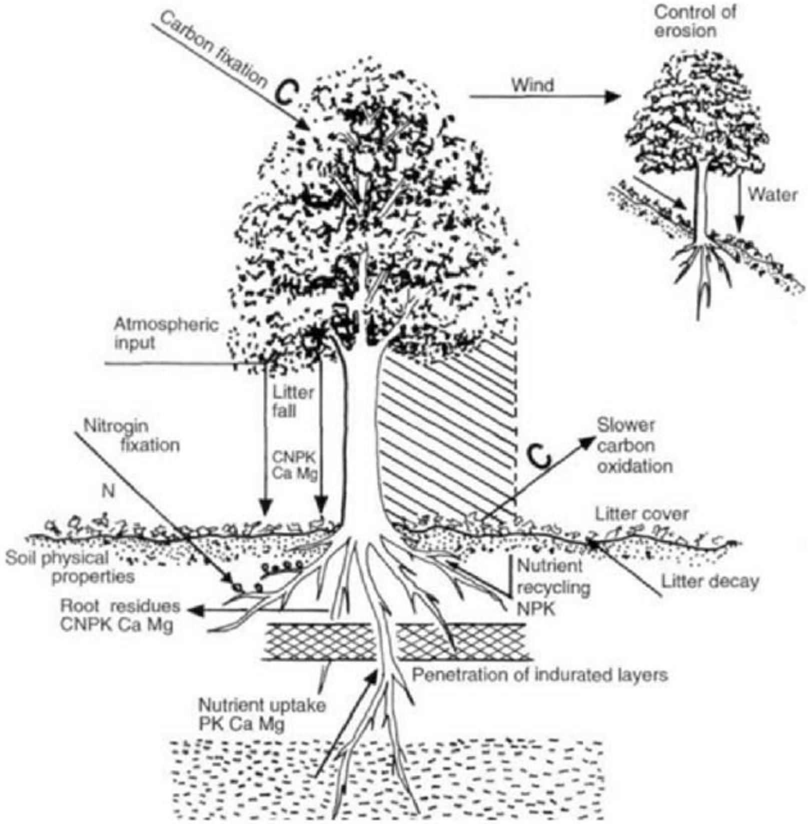


Figure 1. How trees improve soil
Source: Nair 1993

Income derived from forests

Forest resources play a significant role in the livelihoods of rural communities. Non-timber forest products (NTFPs) such as fruits, berries, meat from hunted animals, and other foods, firewood and medicinal herbs, provide subsistence and cash incomes to a large number of rural households. Small-scale processing of forest products like furniture, tools and baskets is likewise a source of off-farm rural employment. Income from nature-based tourism and payments that rural dwellers receive from maintaining environmental services like watershed preservation contribute to rural economies.

While the value of different forest products seems small in isolation, their aggregate value can, in fact, be substantial. According to a World Bank study, income from forests earned households an average of US$678 per year, with considerable amounts derived from wild foods, fuel wood and fodder (World Resources Institute et al 2005).

Income derived from forests forms a major part of total family income coming from not just one but a combination of sources (see table 1). In most regions, forest dwellers pursue numerous activities to generate subsistence and commercial income, which may vary depending on the season, access to resources or abundance of forest stocks (Barham et al 1999). The sale of NTFPs, for instance, is significant as it often fills seasonal income needs or other cash flow gaps to cover unexpected expenses (Tarigan et al 2010). Rural communities also consume substantial amounts of wild products, from wild fruits to construction wood, which significantly reduces their cash expenditures. This is essential in meeting day-to-day survival needs of rural households over the longer term. Forest income sources further diversify to include cash income from, among others, weaving baskets, making charcoal and selling medicinal herbs (World Resources Institute et al 2005).

> A rural South African household annually consumes 5.3 tonnes of fuel wood, 101 kilograms of fruit, 58 kilograms of wild vegetables and 185 large poles for house construction and fencing.

Forest income was found to be important to a large number of rural families at every income level, on every continent, and contributed significantly to both rural subsistence and commercial economies (World Resources Institute et al 2005). But the extent to which people draw part of their income from forest resources depends on opportunities available to them. For example, forest use is high when there are limited opportunities for off-farm employment or when smallholders have poor access to markets. Forest-dependent households can, therefore, be classified into three: low, medium and high reliance. These can be seen in more detail in table 2.

In terms of magnitude, however, it would be fairly accurate to assume that more than 1 billion people in the world depend fully or in part on forest resources (see table 3). These include smallholding farmers, indigenous peoples and the rural poor who turn to forest ecosystems as an available and sustainable source of environmental income.

The amount of benefit derived from forests may vary depending on season, location, access or use, but it is undeniable that forest income is nearly universally important to rural households. Dependence on forest ecosystems is unlikely to diminish in light of the growing demand for timber and forest products worldwide.

Table 1. Diverse sources of forest income and their benefits to households

Location	Goods or services used	Benefit to households
Shindi ward, Southern Zimbabwe	Wild fruits, timber, thatching grass, livestock fodder	Ecosystems contribute an average of 35% of total income
Southern Malawi	Firewood, fruit, mushrooms, bush meat, insects, honey	Forest income contributes up to 30% of total income
Iquitos, Peru	Non-timber forest products, including fruits, latexes, medicines, tourism and carbon sequestration	Forests provide $422 of potential sustainable income per hectare annually
Budongo Forest, Uganda	Fuel wood, building materials, wood for furniture, food, medicinal plants	Biomass provides 90% of the energy needs for the country and between 6% and 25% of household income in Budongo village
Wayanand district, Kerala, India	Wild foods such as honey and mushrooms, along with gooseberries and other medicinal plants	Annual average of Rs 3500 (US$75) per household
South Africa	Medicinal plants	Medicinal plant vendors bring in a mean annual income of R 16,700 (US$2680)
Kenya	Charcoal	Rural charcoal makers sell a 30–35 kg bag of charcoal for Ksh 280 (US$3.50) to middle men to transport to Nairobi for cooking fuel

Source: Adapted from World Resources Institute et al 2005

Table 2. Forest reliance levels		
LOW RELIANCE Those with plentiful opportunities for market engagement and off-farm employment.	MEDIUM RELIANCE Those who rely primarily for their livelihoods on agriculture, and for whom forest is an essential complement.	HIGH RELIANCE Those whose primary source of both income and subsistence is the forest itself.
9-18% of income comes from forests	**25-35%** of income comes from forests	**50%** of income comes from forests

Source: Shepherd 2012

Table 3. Dependence on forest ecosystems	
Dependent on forests in some way	1.6 billion
Smallholding farmers who grow farm trees or manage remnant forests for subsistence and income	500 million to 1 billion
Indigenous people wholly dependent on forests	60 million

Source: Adapted from World Resources Institute et al 2005

However, the reliance of forest dwellers on wild resources may also put a strain on the sustainability of forest ecosystems and their ability to naturally regenerate, if it were to continue supplying the environmental goods and services that are indispensable to the survival of rural, even urban communities. Clearly, there is an inextricable link between the sustainability of rural livelihoods and the sustainability of forest ecosystems, which presents an even stronger motivation for forest dwellers to maintain and protect the health and productivity of their forest environment.

The changing landscape of forest ecosystems

Forest ecosystems are undergoing massive changes. According to the Food and Agriculture Organization of the United Nations, some 13 million hectares of forests were lost to land conversion or natural causes every year from 2000 to 2010. South America suffered the largest net loss of forests, around 4 million hectares per year, followed by Africa, which lost 3.4 million hectares

Box 1. Consequences of deforestation

- Shortage of forest commodities and services, including timber and NTFPs
- Impacts on agriculture, including erosion, soil compaction and desertification, and irregular water flow for lowland irrigation
- Impacts on downstream communities, including floods, landslides and other disasters
- Destruction of natural biological habitats and loss of biodiversity

Source: Baguinon et al 2007

annually. Large losses of forests in Australia have been recorded owing to severe drought and fires, while continued high rates of net loss occurred in many countries in South and Southeast Asia (FAO 2010).

The main drivers of change in tropical forests include exploitive activities such as agricultural expansion, wood extraction and infrastructure construction. Population growth, industrial development and urbanization collectively inflict undue pressure on forest resources and ecosystems. The total wood extracted from the world's forests was estimated at 3.4 billion cubic meters for the period 2003–2007 (see figure 2). This estimate does not even include illegally removed wood and fuel wood, which could increase the figures substantially (FAO 2010).

Trends of tropical deforestation and forest degradation have related impacts on biodiversity and the climate regulation capacity of forests (Lasco 2008). Climatic conditions in forest ecosystems are rapidly changing with marked increases in temperatures and declines in precipitation. As the water regulation capacity of forests becomes compromised, the likelihood of severe droughts increases which, when combined with occurrences of forest fragmentation, increases the risk of forest

For every tree harvested using conventional logging techniques, 35.8 additional trees were damaged, 20% of usable timber volume was left to rot, and less than 35% of the timber was actually converted to usable boards.

fires. In 1998, for example, the El Niño[1] weather effect induced droughts and sparked forest fires across the Borneo rainforest, emitting up to 2.5 billion tons of carbon to the atmosphere. Annually, more than 50 million hectares of forests are burnt, which significantly contributes to global atmospheric pollution (ESA 2006) (see also figure 3).

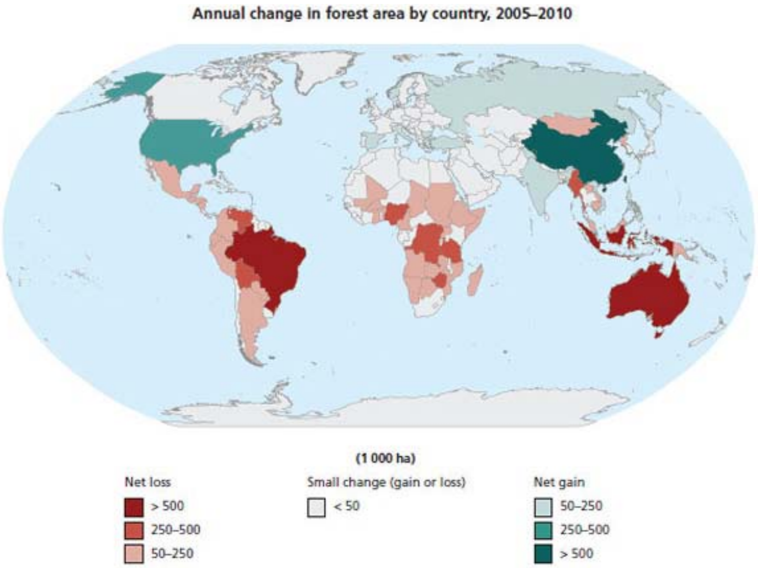


Figure 2. Annual change in forest area by country, 2005–2010
Source: FAO 2010

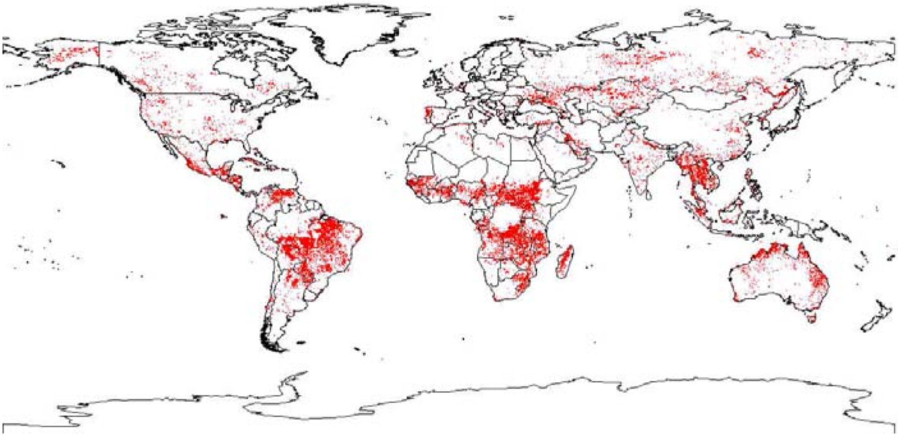


Figure 3. Global map of forest fires
Source: ESA 2006

[1] For more information about this phenomenon, see http://www.elnino.noaa.gov

Apart from fires, severe storms, blizzards and earthquakes have also damaged large areas of forests since the year 2000. Some 35 million hectares of forests are damaged annually because of insect pests and other invasive species (FAO 2010). Variations in the climate in forest ecosystems affects plants growth and yields and may even promote plant diseases and pathogenic outbreaks (Easterling et al 2007).

Degraded forest ecosystems are a source of vulnerability

Alongside the degradation of forest ecosystems comes the increase of vulnerability of forest-dependent human communities, who derive a significant portion of their total income from forest products. Owing to their dependence on forest resources, the widespread decline of forest ecosystems and their productivity becomes a serious restriction on income sources and livelihoods of rural communities.

Households residing in degraded forest areas are particularly vulnerable to natural disasters and environment-related risks. Furthermore, the adverse impacts of climate change will further aggravate the vulnerabilities of rural communities in developing countries, both because of their high dependence on natural resources and also their limited capacity to adapt to a changing climate (World Resources Institute et al 2005).

Climate change and the role of forests

Since the industrial revolution, the burning of fossil fuels and the destruction of forests has caused concentrations of heat-trapping greenhouse gases to increase significantly in our atmosphere (The Nature Conservancy 2009). As greenhouse gas concentrations increase, the Earth's climate is affected: average weather changes and average temperatures increase (Seeberg-Elverfeldt 2010). This is what is often referred to as climate change.

Greenhouse gases (GHGs) such as carbon dioxide (CO_2), methane (NH_4), nitrous oxide (N_2O) and chlorofluorocarbons (CFCs) absorb thermal radiation emitted by the Earth's surface. Figure 4 shows the percentages of global greenhouse gas emissions by type of gas. If more GHGs are emitted into the atmosphere they absorb more heat, which, in turn, results in a change in the world's climate: the Earth's average surface temperature is increasing and could rise by 1.8–4 ºC or even more before the end of this century atmosphere (The Nature Co º nservancy 2009). Among the GHGs, CO_2 is the most abundant, representing 77% of all GHG emissions responsible for the greenhouse effect, with 17% caused by deforestation and other land-use changes and around 75% from use of fossil fuels (IPCC 2007).

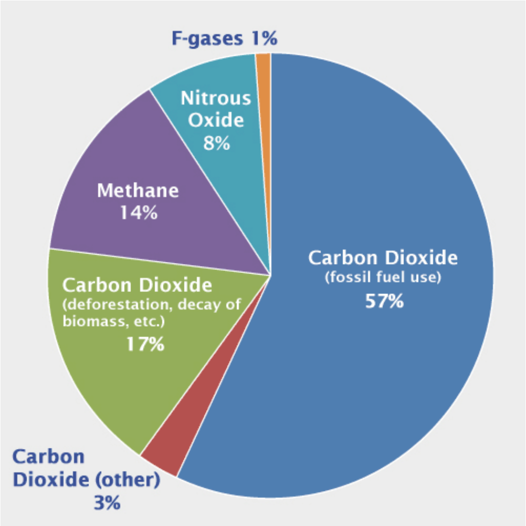


Figure 4. Global greenhouse gas emissions by gas
Source: Adapted from EPA 2012

Box 2. The 'greenhouse effect'

Energy from the sun reaches the Earth's surface in the form of visible light. Approximately 30% of the energy from these rays is emitted back into space almost immediately but the remaining 70% stays in the Earth's atmosphere and is absorbed by greenhouse gases, such as carbon dioxide, nitrous oxide and methane. The absorption of this energy by the greenhouse gases acts like an insulating blanket, which results in a rise in temperature, enabling life to exist on Earth. This is known as the greenhouse effect.

The vital role of forests

Tropical forests are vital in regulating climate change, acting as storehouses or reservoirs for vast amounts of carbon in the biomass, necromass and soil (Lasco 2008). Trees absorb large quantities of carbon dioxide gas from the atmosphere during photosynthesis and, in the process of growing, transform the gas to the solid carbon that makes up their bark, wood, leaves and fruit (The Nature Conservancy 2009). Decomposing organic materials also increase the amount of carbon stored in the soil in even greater amounts than that found in forest vegetation (Seeberg-Elverfeldt 2010). The world's forests store more than 650 billion tons of carbon, 44% of which are stored in live biomass, 11% in dead wood and litter, and 45% in the soil (FAO 2010).

Box 3. How do forests affect climate?

(I) When forests are growing (new growth and young forests), they absorb CO_2 from the atmosphere in large quantities and store it in the form of carbon in tree trunks, branches and roots, as well as in soil and leaf litter.

(II) When forests are in equilibrium, their stores of carbon remain intact and the impact on climate change is relatively neutral.

(III) When forests are felled and replaced by crops or grazing land, all of the stored carbon is released into the atmosphere.

Forest ecosystems play an important role in the climate-change problem because they can be both a 'sink' (absorbing carbon dioxide) and a 'source' (emitting carbon dioxide). When forests are converted to agricultural land and the trees are felled, a source of CO_2 emissions is created (Seeberg-Elverfeldt 2010). When trees are cut down and burned or left to decompose, the solid carbon chemically changes back to carbon dioxide gas and returns to the atmosphere. The majority of the forest vegetation ends up as waste, and whether burned or left to decay, emits carbon dioxide gas as it breaks down (The Nature Conservancy 2009). Figure 5 illustrates how trees play a part in the carbon cycle.

Over the last several centuries, substantial amounts of carbon have been released into the atmosphere as a result of forest clearing for permanent croplands, pasturelands and wood harvest. It is estimated that globally, carbon stocks in forest biomass decreased by 1.6 gigatonne of carbon (GtC) per year, owing to continued deforestation and forest degradation (Lasco et al 2010). An estimated 17% of global GHG emissions are attributable to forestry; the third largest contributor following the energy and industry sectors (IPCC 2007).

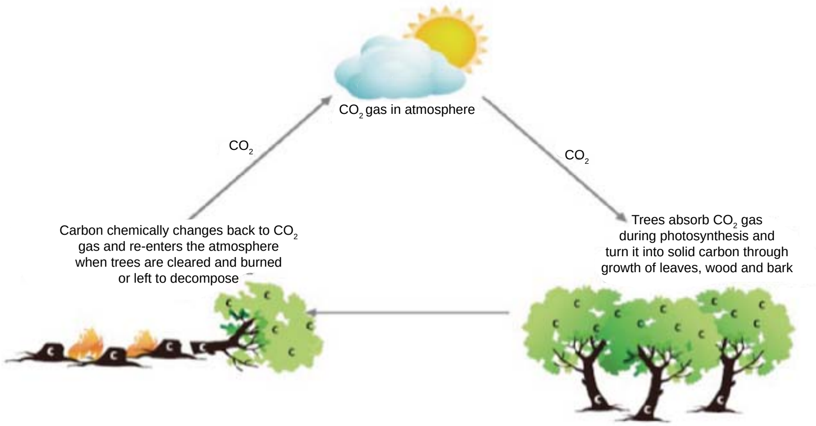


Figure 5. Trees and the carbon cycle
Source: Virgilio et al 2010

Forest conversion and changing land use

The practice of converting forest to agricultural lands is widespread, particularly in developing countries. The majority of carbon emissions from land use, land-use changes and forestry come from tropical countries, the largest sources being Indonesia and Brazil, with significant contributions from Malaysia, Myanmar and the Democratic Republic of Congo. For developing countries collectively, carbon emissions from forests constitute 30% of total emissions, while for the least-developed countries they account for more than 60% of total emissions (Baumert et al 2005). A breakdown of global greenhouse has emissions by sector could be seen in figure 6.

Mitigation potential of forest ecosystems

Owing to their large land coverage, forest ecosystems are an immense portion of the global terrestrial carbon sink, with approximately 750 million hectares of land suitable for establishing forest restoration and regeneration projects (Thomas et al 2010). Apart from their size, the world's forests store 283 GtC in their biomass alone. If you add to this the carbon stored in dead wood, litter and soil then you have about 50% more than the amount of carbon found in the atmosphere (Pulhin et al 2010). In the absence of major disturbances, forests have the biggest long-term potential to sequester atmospheric carbon for 20–50 years or more, depending on the species and site conditions (IPCC 2000).

By protecting and conserving forest ecosystems, it is possible to enhance their natural function of sequestering and storing carbon and at the same time limit their role as a source of carbon emissions in order to help reduce the effect of climate change. Curtailing deforestation, thereby lowering emissions that result from such activities, can contribute significantly to the effort to abate global warming. Furthermore, restoring degraded forests and converting croplands to tree-based systems are effective approaches for expanding terrestrial carbon sinks, along with reforestation and agroforestation (combining forestry and agriculture to grow trees on farms). Protecting existing carbon stocks, reducing logging and deforestation, planting new trees and rehabilitating logged-over areas, and substituting bioenergy for fossil fuels, could potentially reverse the climate-change equation in the long-term.

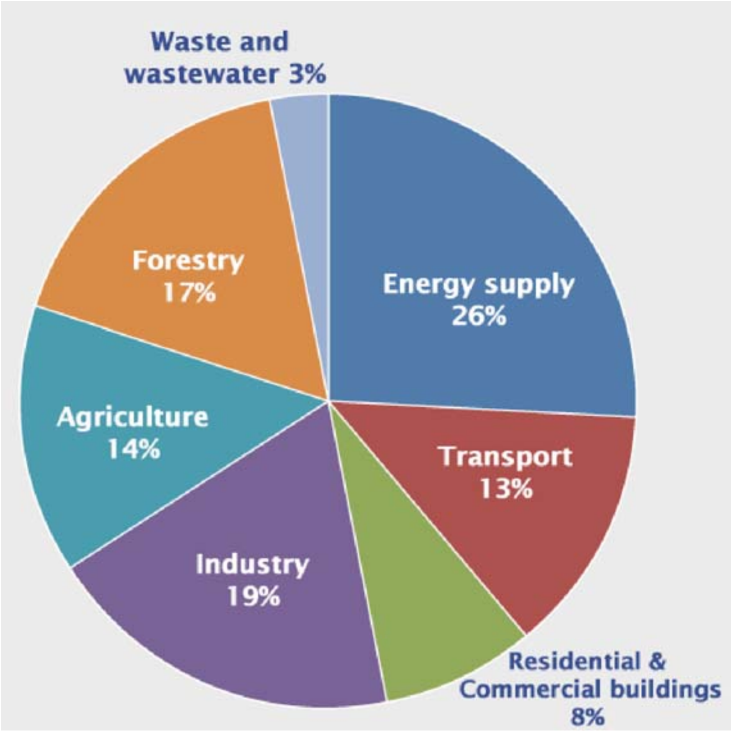


Figure 6. Global greenhouse gas emissions by sector
Source: Adapted from EPA 2012

Smallholders in forest settings

Nearly 25% of forest lands in developing countries are either owned (14%) or officially administered (8%) by indigenous and rural communities (Scherr et al 2002). Many of these rural people are also forest producers, who cultivate or collect wild products like fruits, mushrooms or medicinal herbs, or plant trees along their farm boundaries. These forest producers, referred to here as 'smallholders', are characterized by low, seasonal income from forest products, proximity to forest boundaries, and high vulnerability to environmental risks or events.

Smallholders may belong to any of the following categories:

- indigenous or community groups who manage common forest resources;
- individuals or groups who harvest products from public forests;
- farmers with small lots who plant trees in or around their fields or pastures;
- individuals or groups who engage in small-scale processing of forest products; or
- employees of forest production or processing enterprises (Scherr et al 2002).

Millions of these smallholders throughout the developing world are growing trees and cultivating forest resources, acting as responsible stewards over their sole source of livelihood and helping to meet the rising global demand for forest products (Scherr et al 2002).

Engaging smallholders in forest conservation and restoration

The potential and capacity of smallholders as effective managers of local forest resources are often overlooked. There is much concern about how low-income forest populations tend to exploit wild resources and jeopardize ecosystem conservation. Conversely, there is considerable evidence that local people can—and do—protect forests and ecosystem services of local value (Scherr et al 2002). Given the number of smallholders in the world, their importance to forest management and their vulnerability to the effects of climate change, engaging smallholders is imperative if conservation of forest ecosystems is to succeed.

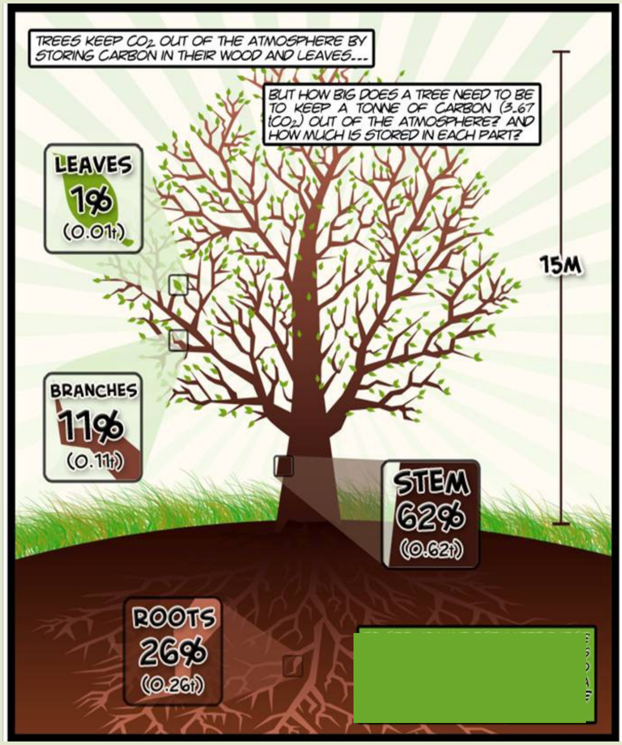
The benefits of improved management of forest ecosystems include both environmental and economic outcomes for rural communities. Smallholders are aware that preserving forest productivity could sustain, if not substantially increase, local incomes. Involving smallholders presents opportunities for the sustainable and long-term protection of forest resources by local stakeholders themselves who stand to gain the most from forest resources. The dual goals of ecosystem preservation and rural economic stability can be achieved by engaging smallholders. Their main motivation would be ensuring the sustainability of forest ecosystems, which is the principal source of their livelihoods.

CHAPTER 2

UNDERSTANDING CARBON FINANCE MARKETS

Box 4. How is carbon sequestered in trees?

As trees undergo photosynthesis, they combine carbon dioxide from the atmosphere with water and nutrients from the ground to form carbohydrates, which make up the tree's biomass: 50% of the total biomass is carbon stored in woody stems, branches and roots.



Source: www.ecometrica.com

The 15-metre-tall sycamore tree in the illustration stores approximately 1 ton of carbon in its roots, stems, branches and leaves. If this tree is cut down, most of the carbon stored in its biomass will eventually be returned to the atmosphere in the form of carbon dioxide, amounting to around 3.67 metric tons (tCO_2).

In keeping this one-ton carbon tree alive, we can potentially lock up more than 3 tCO_2 from the atmosphere. And by protecting more and larger tree species in forests throughout the world, we can ensure that vast amounts of carbon dioxide are locked out of the atmosphere for as long as these forests survive.

The growing recognition of the dangers posed by climate change has spurred efforts to reduce carbon dioxide emissions. These efforts in turn paved the way for the establishment and growth of the international carbon market.

From carbon sequestration to carbon credits

Carbon sequestration and storage has made carbon a precious economic commodity. The amount of carbon absorbed by forest ecosystems, for instance, or the amount of CO_2 released when forests are cut down are now accurately measurable, thanks to recent technological advancements.

Carbon credits, or carbon offsets, are the currency in which carbon is traded on so-called 'carbon markets'. Each tradable unit represents one metric ton of carbon dioxide equivalent (tCO_2e) that is sequestered and removed from the atmosphere or is stored and prevented from being emitted or released.

Carbon credits are generated by the sequestration of CO_2 from the atmosphere, such as when planting new trees. Or in the avoidance of CO_2 emissions through activities, such as forest conservation or avoided deforestation. Carbon credits are tradable commodities that can be bought by governments, industries, corporations or individuals to offset their generation of harmful GHG emissions. These entities can invest in projects that will sequester or reduce CO_2 emissions on their behalf. Alternatively, they can purchase credits already generated by past projects which were validated to conform to established carbon standards.

This trading system works on the premise that the effect on the global atmosphere is the same regardless of where carbon sequestration is happening or where carbon emissions are being reduced. Carbon credits generated by reforestation projects in developing countries, for example, can be utilized by industrialized nations to offset their own GHG emissions. The carbon forestry sector in developing countries, where most tropical forests are found, is therefore a significant source of valuable carbon offsets that are in demand by GHG-emitting industries and nations.

Basics of the carbon market

The demand for carbon offsets has evolved to create a global trading platform where carbon credits can be earned, traded, bought and sold in so-called carbon markets.

Carbon markets exist because of governments' requirements to offset the carbon emissions of entities which fail to meet their mandated target reduction of GHG emissions; or for entities that purchase carbon offsets voluntarily in order to mitigate their own GHG emissions or as a way to promote their corporate social responsibility.

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Carbon markets are segmented into two general classifications: 'compliance' and 'voluntary'. Compliance markets, sometimes called regulatory or legislated markets, involve entities with mandatory emission-reduction targets under international agreements or national policies. The Kyoto Protocol is one such agreement where industrialized countries (Annex 1 countries) are compelled to reduce their GHG emissions by an average of 5.2% below their 1990 emissions level. Regional compliance markets also exist, such as the European Union Emissions Trading Scheme, as well as sub-national compliance markets like the New South Wales Greenhouse Gas Reduction Scheme in Australia and the Regional Greenhouse Gas Initiative in the USA.

In compliance markets, local and international carbon-reduction regimes place a legal obligation on countries and traditionally large emitting industries (for example, in the manufacturing or energy sectors) to reduce their GHG emissions by placing a limit on the total amount of carbon dioxide they are allowed to emit.

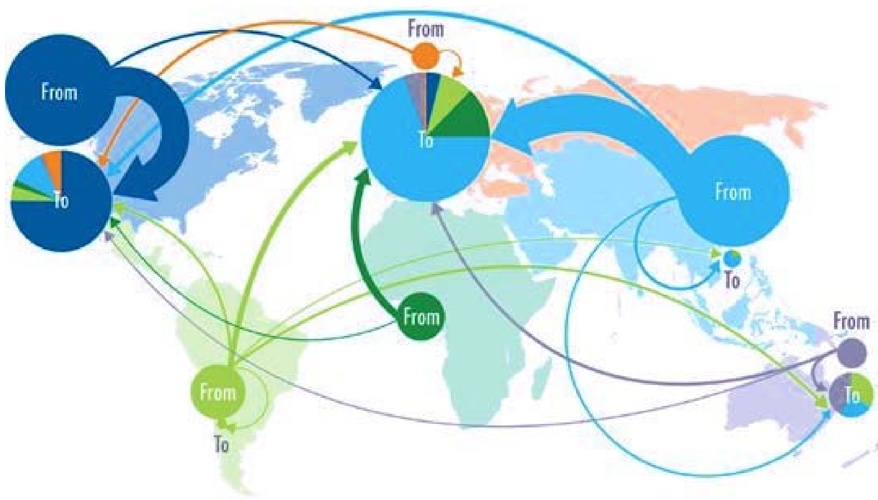
A regulatory body establishes the maximum level of emissions for a certain country, sector or entity: this is called a 'cap'. This cap or quota is divided among different entities and each must ensure that the total emissions they produce falls within the quota allocated to them.

Entities must achieve this emissions target by reducing their own emissions. Or they can participate in the so-called carbon 'trade'—by either buying credits on the market from other players with excess credits or buying credits generated from carbon-offset projects—to cover any emissions that are above their legislated cap.

This is known as the 'cap and trade' system. Its goal is to encourage market forces to drive industries and other commercial entities to reduce their emissions by placing a cost on emitting GHGs into the atmosphere by creating an economic incentive to reduce emissions.

In voluntary markets, entities without mandated obligations can still engage in the carbon trade. These entities buy carbon offsets to neutralize their own GHG emissions for any of the following reasons: i) in anticipation of forthcoming regulations (‘pre-compliance’); ii) for philanthropic reasons; or iii) to project a ‘green’, ’ethical’ or ‘socially responsible’ image or brand.

Carbon credits can be voluntarily purchased through a private exchange, such as the now-discontinued US-based Chicago Climate Exchange or on an over-the-counter marketplace, where buyers and sellers transact directly. Figure 7 shows global transaction volumes in OTC markets where offsets flow from major supplier regions, Asia and North America, to overseas buyers, particularly European countries.



From ↓ To →	North America	Latin America	Asia	Oceania	Europe
North America	20.3 M	-	-	-	1.2 M
Latin America	1.1 M	0.2 M	0.3 M	1.5 M	2.8 M
Africa	0.7 M	-	-	0.03 M*	3.9 M
Asia	2.5 M	-	1.3 M	1 M	21.5 M
Oceania	0.3 M	-	-	1.8 M	1.7 M
Europe	1.5 M	-	-	-	0.4 M

*Values smaller than 0.1 Million (M) are not shown on map

Figure 7. Flow of carbon credit transaction volumes by offset supplier and buyer region (2012)
Source: Peters-Stanley, 2013

Carbon forestry projects in the global carbon market

The first carbon credits ever transacted were generated by a forestry project in 1998. Since then, carbon markets have grown steadily, fuelled by increasing investment from various sectors and the emergence of new buyers, sellers and other market players. The overall market value of forest carbon offset transactions reached US$237 million in 2011.[2] Since its inception until 2011, the *State of the Forest Carbon Market* report series has tracked 106 $MtCO_2e$ of accumulated forest carbon offsets, valued at more than US$600 million, from 451 carbon forestry projects worldwide (see figure 8).

Each carbon forestry project is as unique as the forest landscape where it is situated. As such, credits generated by carbon forestry projects fall into a number of typologies: (i) improving forest management (IFM); (ii) afforestation and reforestation (AR); (iii) sustainable agricultural land use (SALM) and agroforestry; (iv) avoiding deforestation and forest degradation (REDD); or (v) a combination of these different project types. As shown in figure 9 below, AR projects had historically been the most prominent among all project types, with the popularity of tree planting and forest conservation activities. REDD projects came into the picture only fairly recently, as technically complex methodologies were refined and demand for such projects increased in 2010.

Figure 9 also shows that the total number of new and unique carbon forestry projects entering the market has consistently grown, except for a brief dip in 2008. Carbon forestry projects are appealing because of their potential to provide multiple social, economic and environmental benefits. The most significant of which is the potential cash payments to be derived from the generation of verifiable carbon offsets. The average price of forest carbon credits in 2011 is US$9.20/$tCO_2e$. This price point, however, varies greatly by location, standard and many other factors, and could, in fact, range from less than US$1/$tCO_2e$ to over US$100/$tCO_2e$.[3]

Despite the sector's relative growth, carbon forestry projects currently represent only a smaller proportion of the total global carbon market with respect to renewable energy. Carbon forestry projects are transacted in both voluntary and compliance markets but feature more prominently in voluntary markets. Figure 10 shows the percentage of carbon forestry projects in voluntary markets.

[2,3] Peters-Stanley et al, 2012

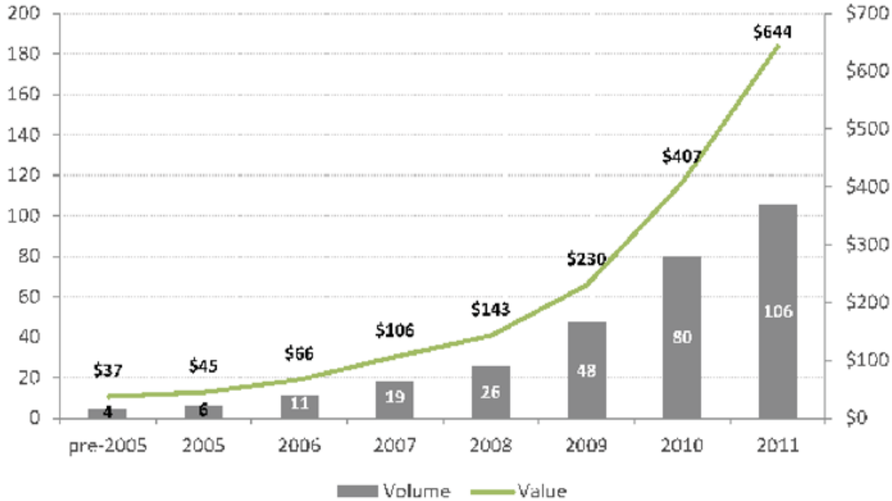


Figure 8. Cumulative volume and value of global forest carbon market transactions
Source: Ecosystem Marketplace

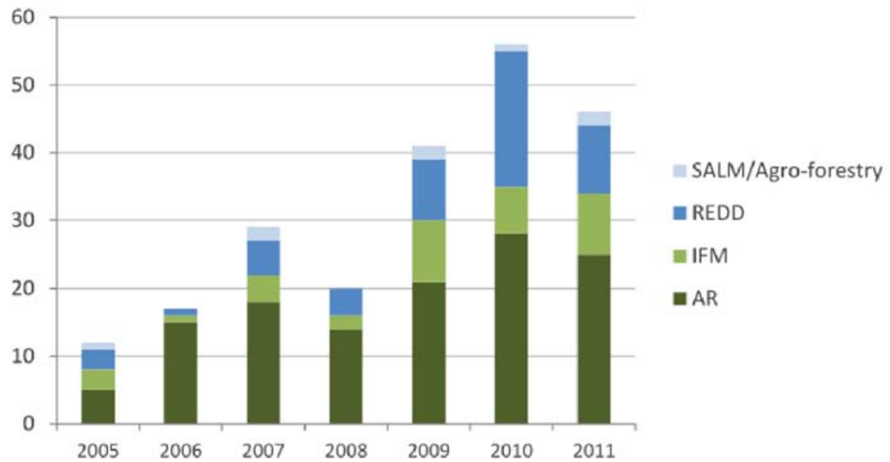


Figure 9. Number of new carbon forestry projects, by type
Source: Ecosystem Marketplace

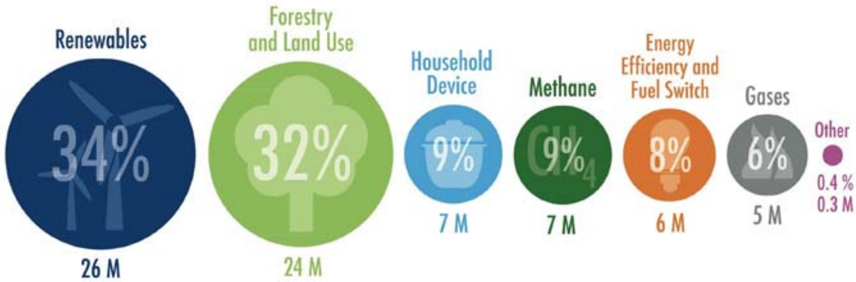


Figure 10. Market share of carbon credit transaction volumes in voluntary markets. Source: Peters-Stanley and Yin 2013.

Geographical distribution of carbon forestry projects

At the time of writing, there were more than 450 carbon forestry projects being implemented around the world. The supply of credits from carbon forestry varies highly by region, depending on the size of forest regions, threats to forest resources, and whether the country provides an environment conducive for the implementation of carbon projects (see figure 11).

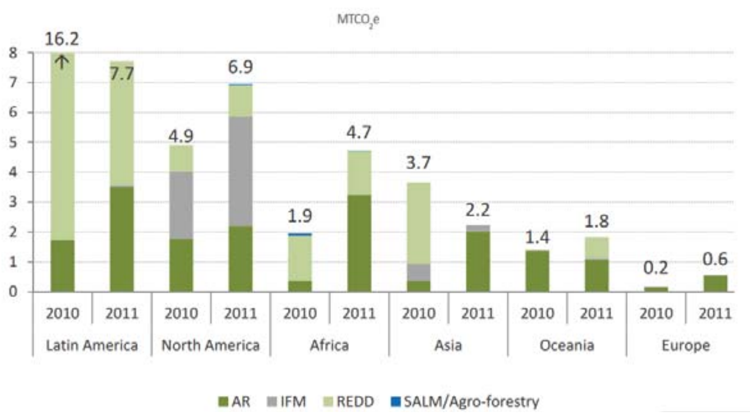


Figure 11. Transacted volumes by region, 2011
Source: Ecosystem Marketplace

The largest volume of forestry credits originate from projects based in Latin American countries, with 30% coming from Brazil alone (see figure 12). North America was the second largest supplier of forestry credits, with the USA and Canada ranking 2nd and 3rd in the world's top locations for carbon forestry projects. This was followed by Africa, then Asia, with Oceania and

Europe lagging farther behind. The fact that three of the world's major forest basins—the Amazon, Congo and Mekong—are found in Latin America, Africa and Asia respectively, helps to explain the great potential for forest carbon projects in these regions.

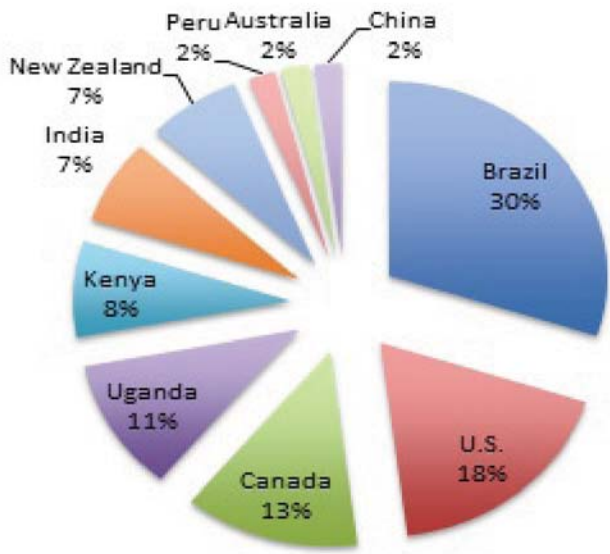


Figure 12. Market share of top 10 country suppliers of forestry credits
Source: Ecosystem Marketplace

Buyers of carbon forestry credits

Buyers of carbon credits can be generally classified into two: 'primary' buyers who purchase carbon credits to be able to comply with their own GHG reduction targets; and 'secondary' buyers who purchase carbon credits on behalf of others and for resale.

Private sector buyers include companies that are concerned with meeting their carbon emissions targets usually at the lowest possible cost. Motivations for private companies to invest in forest carbon projects, aside from compliance, include achieving a 'green' or environmentally friendly image and demonstrating corporate social responsibility. By buying forest carbon credits, these companies hope to enhance their public reputation and build good will with their clients.

Government buyers include state and national governments that are signatories to the Kyoto Protocol or have legislated their own national emissions reduction policies. Governments may purchase credits internationally through various trading exchanges or locally from domestic forest carbon initiatives. There are governments that choose to accrue more credits than their current requirements and bank these credits for future commitment periods or trade them in international carbon markets. Some governments have also established funds that can be used to support the development of new and innovative carbon projects, for example, Norway.

There are also secondary buyers who purchase credits from various sources, aggregate them and resell them to interested buyers. These intermediary organizations may also play the role of brokers who facilitate transactions between buyers and sellers of forest carbon credits. While they normally charge a fee for their services, brokers provide technical and legal guidance to assist local project developers to penetrate global carbon markets. In some cases, they may even provide upfront funding for initial project development in return for first option on the resulting carbon credits.

There are many international organizations that offer valuable information and technical assistance for developing and implementing forest carbon projects free of charge.

CHAPTER 3

BENEFITS OF FOREST CARBON PROJECTS

Triple Bottom Line: environmental, social and economic benefits

Carbon sequestration in forests is one way to cope with the adverse impacts of climate change. But to communities dependent on forest ecosystems its benefits are often unclear. As positive outcomes from forest conservation have long been established and accepted, recognizing the gains from forest carbon projects is only emerging. Smallholders' communities need to understand the revenue-enhancing and risk-reducing benefits of forest carbon projects before they will participate in carbon sequestration initiatives (Havemann and Muccione 2011).

Achieving sustainable development alongside mitigating climate change is among the challenges meant to be addressed by the Kyoto Protocol (Murdiyarso et al 2005, Smith and Scherr 2002). This forms the basis for developing carbon projects that not only generate valuable carbon offsets but at the same time create opportunities for improving quality of life. Forest carbon projects deliver three types of benefits: environmental, economic and social, which represent the interrelated dimensions of the so-called 'triple bottom line' to measure sustainable development goals (The Nature Conservancy 2009).

The environmental, social and economic importance of forest ecosystems can be harnessed by designing forest carbon projects with maximum benefits to local communities in mind. Such benefits come in tangible forms, such as income, or intangible forms, such as political representation, which may directly or indirectly benefit forest-dependent communities (Havemann and Muccione 2011). The creation of project benefits, however, is shaped according to various factors such as carbon sequestration technologies, location, scale and community involvement. It is often difficult to ensure that all potential benefits are simultaneously derived from a single project. Optimizing the benefits that can be gained from a particular undertaking will depend on how forest carbon projects are designed, managed and implemented (Harvey nd) (learn more about developing carbon projects in chapter 4).

Environmental benefits from forest carbon projects

Carbon sequestration is the main environmental objective of forest carbon projects. Nevertheless, positive environmental outcomes from such projects go beyond mitigating climate change to include biodiversity conservation, soil rehabilitation and watershed protection.

Box 5. The triple bottom line: What is it?

Traditionally, the 'bottom line' refers to a measure of profits or the financial performance of an organization, business or project. Today, however, complex and diverse social and environmental problems exist that need to be factored in to ensure the success and sustainability of any undertaking. The triple bottom line (TBL) expands the traditional measure of profits to take into account environmental and social variables. The dimensions of the TBL, also called the 3Ps, are: people, planet and profit. People refer to social capital and equity within a particular community, country or region. Planet refers to natural resources and the preservation of environmental quality to allow for the sustainable use of these resources. Profit refers to the economic value that is created that can be accessed by various stakeholders.

These three bottom lines represent the recognition of broader sustainable development issues that cannot simply be addressed by achieving profitability and economic prosperity. It works within the context that the global economy, society and environment are intertwined and that businesses, organizations and activities must endeavor to achieve each of these three bottom lines to ensure long-term sustainability.

Sustainability, sustainable growth and sustainable development are the new measures of success. While measuring the degree to which sustainability is being pursued is rather difficult, the TBL attempts to strike a balance among economic, social and environmental objectives. Hence, an entity that has achieved a triple bottom line protects the interests of the people dependent on or affected by it, does little or no harm to the planet, and realizes profits that account for financial, social and environmental benefits and losses.

Sources: Slaper and Hall 2011, The Economist 2009

Biodiversity conservation

By their very nature, reforestation activities help conserve biodiversity. Given their structure and composition, forests are rich in various species of plants, mammals and birds (Smith and Scherr 2002). Planting native tree species and creating diverse, multi-strata plantations increases the potential for restoring local biodiversity (World Bank 2011). Forest carbon projects can be strategically located in areas considered to be critical habitats for certain species to enhance the viability of endangered wildlife populations (The Nature Conservancy 2009).

Planted forests, such as those resulting from afforestation and agro-forestation projects, supply fuel wood, timber and other forest products to local communities, which tends to reduce pressure on natural forests and their biodiversity (Smith and Scherr 2002). Potential threats to biodiversity—such as human interference, invasive species and forest fires—are lessened. One of the main positive impacts generated by forest carbon projects is assuring greater control over accidental spread of fire, which is the principal source of damage to biodiversity in the tropics (May et al 2004).

Biodiversity-rich ecosystems are predisposed to have high carbon content; such is the case with tropical forests. These areas could be considered for forest carbon projects, particularly avoided deforestation, because of their potential to reduce both climate change and loss of biodiversity (The Nature Conservancy 2009).

Watershed protection

Forest carbon projects can be implemented in watersheds, which can result in significant hydrological benefits. Forested watersheds absorb rainfall and slow storm runoff. Trees planted in riparian zones filter sediments and pollutants and keep them from waterways. Improving water quality is one important benefit: forested watersheds have the potential to supply relatively pure water. Forests play a part in regulating water flows and play an even larger role in flood prevention (Stolton and Dudley 2007).

Protecting watersheds is a compelling motivation for farmers to participate in carbon forestry projects. More than others, producers are aware of the importance of preserving the source of their water system, which they need for agricultural production.

As there are clear links between forests and the quality, quantity and regularity of water, some forest carbon projects developed in watershed areas have been integrated into local or regional watershed management plans (World Bank 2011).

Soil rehabilitation

Increasing forest cover helps to protect and restore soil resources (Chenost 2009). The type of species used and methodologies employed in forest carbon projects can contribute to reducing soil erosion and sedimentation, improving soil health, fertility and nutrient cycling, and reducing desertification (Thomas et al 2010, World Bank 2011). In the case of agroforestry projects, the establishment of secondary forest fallows to replace pastures can improve soil rehabilitation (Smith and Scherr 2002).

Ensuring the integrity of environmental benefits

Protecting forests from further degradation and finding greater value in forest resources are incalculable benefits of carbon forestry projects to smallholders. Projects that create positive environmental outcomes achieve greater integrity, reliability and sustainability for mitigating climate change. Stakeholders can have confidence in the permanence of such a project's benefits, particularly in terms of carbon sequestration. Such forest ecosystems have better resilience in the face of threats, such as pests or disease or even climate change itself (The Nature Conservancy 2009).

Economic benefits from forest carbon projects

Forest carbon projects can be a source of additional and diversified revenue streams (Thomas et al 2010) as well as a strategy for reducing economic risks and vulnerabilities faced by small farming households.

By themselves, forest ecosystems already play a significant role in the livelihoods of forest communities (see chapter 1: income derived from forests).

They can also be leveraged further by carbon-offset projects through the introduction of conservation, protection and restoration measures. These can increase the economic value and productivity of standing forests compared to the utility and value of exploitive uses of the land.

Payments for carbon credits and other environmental services, employment generation and income from land and other forest products are among the economic benefits that can be derived from forest carbon projects.

Carbon payments and other ecosystem services

The most significant supplementary income to be derived from carbon sequestration projects are cash payments linked to the generation of carbon credits (Havemann and Muccione 2011). By avoiding GHG emissions or through sequestering CO_2, forest carbon projects help to mitigate climate change, which is a positive benefit that can be quantified and rewarded through carbon markets (Chenost 2009).

Forest carbon credits can be in the form of Certified Emission Reductions (CERs) or Verified Emission Reductions (VERs). A CER is a unit of greenhouse gas reduction that has been generated and certified under the Kyoto Protocol as the output of Clean Development Mechanism (CDM) projects. VERs are carbon credits traded on voluntary carbon markets and are usually certified through an independent or voluntary certification process (for example, see http://www.alternative-carbon.com).

Forest carbon projects can earn substantial revenue from the sale of carbon credits. While carbon payments are expected to be modest (Smith and Scherr 2002), part of the revenues accrued from most projects also pass on to smallholders and other local participants (World Bank 2011). Carbon payments can be made individually to participating farmers in regular monthly or annual intervals, depending on the contract with participants, once credits have been verified. Other models involve making payments to a community trust fund, which will be collectively managed by a group or organization of farmers. Payments derived from carbon projects can bring about income stabilization and, in some cases, are observably more stable than agricultural incomes (Richards 2011).

The average price of forest carbon credits varies significantly across markets and project types, from as low as US$1.18 per tCO_2e to as high as US$13 per tCO_2e (Peters-Stanley et al 2011).

In voluntary markets, where forest carbon projects are more popular, credits earned in 2011 for REDD and IFM projects had an average price of US$12 per ton and AR credits were priced at an average of US$9 per ton (TerraCarbon 2012). Table 4 shows how forest credit prices vary among different markets.

Carbon sequestration is but one among a variety of regulating services provided by forest ecosystems that may directly or indirectly affect human communities (Pant et al 2012). Like carbon markets, formal markets now exist for water and biodiversity services in countries around the world. Where ecosystem services such as clean water and biodiversity habitat would otherwise have little to no value (Forest Trends et al 2008), forest carbon projects present a unique opportunity for maintaining and consolidating the ecological services that well-preserved forest ecosystems provide within an inclusive environmental portfolio. The bundling of environmental services' payments is a plausible route for developers of forest carbon projects, especially if such projects are located in areas with high ecosystem values like watersheds or biodiversity hotspots.

Table 4. Average prices in forest carbon markets		
Market	**Average price (Historical) US$/ tCO_2e**	**Average price (2010) US$/$tCO_2e$**
Voluntary OTC	5.46	5.63
CCX	2.83	1.18
CDM	4.28	4.49
NSW GGAS	12.26	-
NZ ETS	143.91	12.95

Note: NZ ETS = New Zealand Emissions Trading System

Source: Diaz et al 2011

Employment and sources of cash incomes

Apart from periodic cash payments for carbon credits and other ecosystem services, the implementation and management of forest carbon projects entail upfront financial investments, a portion of which can be funneled to smallholder participants in the form of land rentals, employment and subsidized or free planting inputs (Havemann and Muccione 2011).

Forest carbon projects will often involve vast tracts of land that may include farmlands owned and cultivated by smallholders. Some projects enter into land-use contracts with farmers where they receive annual lease payments in exchange for use rights of the land for the project within a specified timeframe. Depending on the contract, farmers could engage in project activities over a given land area, such as tree planting or forest protection, and receive financial and/or technical assistance for their participation in project implementation (Cacho et al 2003). Regular cash payments made to farmers in exchange for planting and tree maintenance services are especially important during the initial stages of the project. During this time, farmers' opportunity costs are high as income from customary production activities is lost when projects are sited on formerly agricultural land.

Job creation is another major economic benefit of forest carbon projects that is well-received by local communities (World Bank 2011). AR projects, in particular, have high labor requirements, especially at the time of forest establishment (May et al 2004). Short-term employment can be granted to local residents for project preparation activities, which include nursery establishment, land preparation and planting. Meanwhile, some projects are able to sustain local employment over a longer period by delegating roles in project management and monitoring or by contracting labor for the continuous planting or rotational thinning and harvesting of trees (Smith and Scherr 2002, World Bank 2011).

Forest carbon projects tend to have a multiplier effect in terms of economic opportunities made available to local communities. Besides contracting for short-term employment, which is a direct compensation source, there is stimulus for increased local economic activity with the accompanying demand for inputs, such as seeds or seedlings, or equipment that can be purchased or produced locally (May et al 2004). The management of tree nurseries, which were established through carbon forestry projects, become a potential source of income of local participants.

Income from timber and other forest products

Timber and other forest products are major services supplied by forest ecosystems (Pant et al 2012). Products that can be obtained from forest timber include sawn wood and wood panels for construction purposes; fuel wood as a primary or alternative energy source; and paper, paperboard and wood pulp for various industrial and household uses (UNECE and FAO 2010).

Photo : © World Agroforestry Centre/ Charlie Pye-Smith

Timber and non-timber products are collected by forest dwellers for subsistence uses or for selling to markets as direct sources of cash income (Smith and Scherr 2002). The most substantial income from forest products can be derived from timber as this commands high market prices (Smith and Scherr 2002, SCBD 2001). Choosing tree species of economic value are important when developing carbon forestry projects because this is one way of encouraging farmers to take interest. NTFPs have less economic value than conventional timber but are strikingly appealing to low-income households because NTFPs are easily collected without requiring any special skills or equipment (Smith and Scherr 2002) and can be sold to nearby communities and markets for immediate local consumption. Income from fruit harvest in some agroforestry models is particularly enticing for farmers. Fruit trees that are harvestable after a short period of 3 to 5 years can be prioritized to ensure that farmers' participation in carbon forestry projects remain an economically viable option.

Some forest products are collected for use in the farming system rather than for human consumption. Examples of these are grass and leaf fodder that are fed to livestock, leaf litter and other biomass for mulching or composting, and tree branches for fencing or fabrication of simple farming tools (Pant et al 2012).

Forest products are not only sources of cash incomes for rural communities but they also help reduce costs by providing alternative materials for construction or inputs for agriculture. They can also increase food and energy security: by improving nutrition through accessible food sources; and providing cheaper and sustainable sources of fuel (World Bank 2011).

Forests are large resources with significant economic value to rural dwellers and a tendency to exploit or over-extract resources can be expected. Forest carbon projects, therefore, function as an important control mechanism to ensure that forests are sustainably managed and that a continuous supply of products can be harvested over an extended period of time.

Forest carbon projects can promote careful management of resources to avoid over-harvesting, for example, through appropriate or reduced-impact logging, and encourage continuous forest regeneration (Sasaki and Cheng 2011).

Agroforestry projects in which products like resins, fruit and latex are extracted present an opportunity for further development because these practices have little or no impact on carbon sequestration (Smith and Scherr 2002).

Increased forest productivity and reduced risk

The opportunity to generate several revenue streams from a single parcel of land is a clear economic benefit that can be achieved by forest carbon projects, be it from wood, NTFPs, carbon payments, income from employment or a combination of each.

It is the creation of new uses for land that increases both the productivity and value of forests to the advantage of households and communities in their vicinity. Take, for example, carbon projects situated in areas that were formerly degraded or with low productivity (Smith and Scherr 2002). Through such projects, soil health can be improved through an increase in organic matter or nitrogen-fixing organisms. With the selection of the right tree and plant species, and proper management, yields can be increased through the creation of a favorable microclimate. The provision of various services, such as windbreaks, fencing or erosion control, by forest trees can further reduce production risks and enhance productivity (Smith and Scherr 2002).

Box 6. Commercial opportunities for small-scale forest producers

New opportunities are opening up for small-scale producers of forest products to participate in commercial markets and augment local incomes.

Commodity wood. The growth of urban settlements, industry and infrastructure is accompanied by the growing demand for wood commodities like construction-grade wood, poles and fuel wood. This particular segment offers the most potential for community-managed forests and farmers to participate as reliable suppliers for such products.

High-value timber. Natural and regenerated forests planted with high-quality timber can be profitable sources of appearance-grade lumber. Opportunities exist for smallholders to trade high-value timber from agroforestry.

Certified wood. Forest producers can participate in export markets for certified wood products by joining together, or seeking external assistance, to comply with certification standards and expenses.

Non-timber forest products. Low-income producers may specialize in growing or collecting high-value forest products with specific cultivation patterns or market niches, for example, certain kinds of mushrooms or expensive oils extracted from plants.

Forest-product processing. Forest producers stand to gain more from pre-processing or otherwise increasing the value of raw materials. Finished products, such as decorative panels or ready-made furniture, can be sold for higher prices to higher-income markets.

Source: Scherr et al 2002

Diversified income reduces risk to livelihoods. Whether owing to climate or market factors, risks to livelihoods and income fluctuations could be avoided using a diverse portfolio of forest income sources that are established during the implementation of forest carbon projects (Smith and Scherr 2002).

Over time, as producers benefit from technical assistance and capacity-building components embedded in carbon projects, new markets for forest products can be developed wherein communities and smallholding farmers can participate as premium sellers or preferred suppliers (Scherr et al 2002, Smith and Scherr 2002). In some carbon projects, partnerships formed in a project have enabled local communities to supply forest products to formal markets. Market access and support for the sale of wood and non-wood products has become an important economic advantage for communities involved with such projects (World Bank 2011).

The business case for forest carbon projects includes technologies, capacities and networks that both enhance and protect the productivity and value of forest resources, thereby increasing the profitability and sustainability of both carbon and non-carbon income sources.

Social benefits from forest carbon projects

Smallholders' communities are at the forefront of climate-change impacts, which is part of the reason why they have become 'accidental' partners in climate-related developments (Rennaud et al 2012). Forest carbon projects often entail dynamic social changes involving the very communities participating in, and affected by, the projects. While forest carbon projects, when poorly designed, run the risk of having a negative impact on local communities (Richards 2011), there are a host of direct and indirect social benefits that can be integrated with climate-change mitigation and emissions reduction in order to generate 'development plus carbon' credits (Sen 2009).

Box 7. Nature as a diversification strategy

Income from nature is of crucial importance to low-income rural households. This so-called 'environmental income' is derived from a number of sources with each requiring minimal investment to undertake. Planting cash crops, collecting firewood and other wild products, raising livestock or producing handicrafts from natural materials are all risk-spreading strategies of poor households to survive an unending cycle of natural disasters, deaths and illnesses, and market failures. Diversification of income sources gives poor households a buffer in case of unexpected losses but cannot be relied on for wealth or asset accumulation. Without lucrative markets, enabling infrastructure and appropriate technologies, access to environmental income will remain only as a route for obtaining basic needs and survival.

Source: World Resources Institute 2005

Forest carbon projects place a premium on community participation in the various stages of project design and implementation. They create awareness and understanding on issues regarding climate and the environment and provide a venue for sharing climate-smart practices applicable to rural dwellers. Choosing areas where there is already strong collaboration among local stakeholders can ease some of the burdens of carbon forestry project development and implementation.

Carbon projects can empower local communities and stakeholders through attracting investments in health, education and other welfare services; establishing community organizations and collectively-managed forest enterprises; and facilitating access to, and ownership of, forest resources.


Photo: © World Agroforestry Centre

Creating venues for participatory and multi-stakeholder engagement

Developing forest carbon projects requires coordination and strong partnerships from various sectors: the project's leaders, community members, smallholders, governments, and local leadership, among others. Each of these groups of stakeholders has its own set of interests, expectations and motivations that arise at each stage of a project (Rennaud et al 2012).

The establishment of new linkages or structures are a natural course in the development of forest carbon projects. Inter-organizational linkages created within the current organizational structure of international project developers help streamline project administration processes and add value to the developer's expertise and experience.

Technical working groups are sometimes created composed of local government units, panel of experts and community implementers to help steer and provide greater depth to project development. These types of institutional dynamics help ensure that climate and environmental issues are reflected in local development plans and receive the necessary government support.

To gain support and cooperation from a wide group of stakeholders, it is crucial to gather local people's perspectives about the project and, in the process, ensure transparency from the project's inception through to implementation (May et al 2004).

When consulted, the community—and especially the people with a direct stake in forest resources—gains its voice, which is likely to influence the project according to terms acceptable to many: reflective of local social demands and development priorities. Participating organizations should have a say on project decisions, such as in the selection of tree species to be planted, in full consideration of their cultural and economic priorities.

But beyond consultation, forest carbon projects also engage smallholders and other community members to achieve larger-scale implementation, cost-effectiveness and sustainability. Participatory and multi-stakeholder processes are integrated into project planning, operations and monitoring, because local opinions, skills and institutions play an essential role in the success of forest carbon projects.

Capacity building, knowledge sharing and information exchange

In the same way that participatory processes are built into project development, capacity building is an integral component of carbon forestry projects.

'Carbon sequestration', 'greenhouse gas emissions' and 'carbon offsets' are terms rarely heard in many rural households. For projects anchored in climate-change mitigation and adaptation, building awareness on such complex concepts is necessary to achieve understanding and participation. Many forest carbon projects use environmental education as the entry point for engaging with local communities (Rennaud et al 2012). Environmental and climate-change issues form a recurring theme in discussions and educational material so that people increasingly recognize the value of forest resources and want to take conscious steps towards conservation. Knowing how to protect their forests from further degradation is valuable learning that is recognized by smallholders themselves.

Forest carbon projects also provide an opportunity to learn about planting techniques, farming practices, sustainable agriculture, agroforestry, farm management and enterprise development. Local leaders, organizations and policy makers gain knowledge of forest management and protection and how to integrate such learning into local development planning.

Furthermore, the implementation of forest carbon projects requires a distinct set of technical expertise such as that required to compile a forest inventory, carry out GIS analyses and conduct carbon accounting, to name but a few. Accordingly, part of a project's investment is building the capacities of communities taking part. For example, some community members might be assigned administrative and management functions, receiving training to be able to fulfill their roles. Capacity-building activities that are embedded in forest carbon projects foster the accumulation of local knowledge and increase social capital. In the long run, as people's skills increase, the community develops adequate internal capacity that allows it to continue with existing projects and even undertake new ones.

Photo: © World Agroforestry Centre

Securing ownership and tenure, access and use rights to forest resources

The current nature of carbon projects demands a certain level of security over the land where carbon sequestration is to take place. Legal recognition of land tenure, whether through individual or communal titles, is requisite to establishing the rights to carbon of individuals or communities (Richards 2011).

Insecure land tenure and a lack of clear documentation over carbon ownership pose a big challenge to developers of forest carbon projects (Rennaud et al

2012). As a response, some project developers facilitate land titling and the resolution of land-tenure conflicts in areas covered by forest carbon schemes. New institutional dynamics, such as Technical Working Groups mentioned above, can be effective in assisting smallholders to achieve tenurial security and resolve boundary conflicts through multi-stakeholder venues. Multiple-use forest management also have the positive effect of increasing access to forest resources for communities (Richards 2011).

Having security of tenure increases the ability of landowners to gain from the investments they put into the land (World Bank 2011). But more importantly, as the rights of smallholders become better defined, so are their responsibilities for management of forest resources and their accountabilities for preserving carbon stocks.

Investing in rural infrastructure, health and education

Carbon payments are a source of income not only for individual landowners but also for the community. Part, if not the entirety, of such payments might be channeled to community organizations or trust funds and are ordinarily spent on community infrastructure: farm-to-market roads, water facilities, health clinics, community halls, schools or day care centers (Richards 2011). In other cases, the establishment or improvement of rural infrastructure is borne directly by the project as part of an integrated ‘co-benefits’ package (Sen 2009).

For households, there has been observed improvement in health and nutrition thanks to forest carbon projects. Households increase their food spending as they receive additional carbon revenues and food products from forests become accessible to them, thereby increasing food security. Similarly, literacy levels among forest populations improve with greater community spending recorded on children’s education and easier access to school facilities.

As a result of carbon payments, diversification of income sources and external development investments received by communities, rural households gain better access to basic services such as health and education (Richards 2011).

Empowering communities, strengthening institutions and improving rural equity

Forest carbon projects are most productive when there is active participation from various stakeholders. Creating mechanisms for participation and investing in capacity building of smallholders and other community members increases social cohesion and coordination within the community and with institutions outside it.

Such mechanisms ensure that the interests of stakeholders are taken into account by a project's leaders. Projects in areas where there is informal organization of community members can assist these organizations to achieve legal status and to be able to get funding assistance from external sources. Carbon forestry projects covering larger jurisdictions, where a handful of community-based organizations already operate, will benefit from the creation of institutional alliances, which could provide the necessary checks and balances for a more transparent project implementation.

Where no such mechanisms exist, community-based organizations (rural cooperatives, resource management committees etc.) are best established to serve as governance structures for smallholders and other project participants. Once strengthened, these structures become vehicles for representation and negotiation in decision-making activities and in ranking local development priorities (Richards 2011).

Photo: © World Agroforestry Centre/ Nhung Bui-ICRAF

Forest carbon projects that are conceived in consultation with local community groups evoke a greater sense of ownership from all sectors involved. Participation issues that occur among stakeholders in the middle of implementation are resolved easier through constant dialogue and close cooperation among group members. Preserving the reputation of a community organization is another motivating factor for group members' active participation in a carbon forestry project.

In some cases, the communities themselves undertake forest protection measures such as reporting illegal activities or campaigning for logging bans or fire prevention (Arif nd). Some community groups have also lobbied for the enactment of local ordinances for forest protection, or those penalizing deforestation activities such as burning, charcoal making or timber poaching. Community-initiated efforts like perimeter fencing or fire line creation in project boundaries are carried out without much difficulty or objections from the majority—sometimes with the communities themselves shouldering the cost as they now have a deeper appreciation of the benefits of the project and related activities. Carbon forestry projects that are successful in community empowerment aspects have seen tangible outcomes such as reduced incidence of illegal logging and quicker response to forest fires, even before economic benefits from the project has begun to materialize. Lastly, when communities are empowered they fully recognize the need for fair and equitable sharing of a project's benefits (Kimbowa et al 2011).

CHAPTER 4

DEVELOPING FOREST CARBON PROJECTS AND SELLING CREDITS

Forest carbon projects are organized into different types, each with a distinct approach to reducing emissions or sequestering carbon, and recognizable differences in the timing and scale of investments and returns.

Depending on location, investment capacity and desired impact, smallholders' communities may choose to participate in any of four types of forest carbon projects.

1. Reducing Emissions from Deforestation and Forest Degradation (REDD)

Protecting existing forests from further degradation or deforestation is potentially the most cost-effective means of reducing global GHG emissions. Deforestation is a result of the conversion of forested land into non-forested land, such as when land is cleared for agriculture. When this happens, substantial amounts of GHGs are released into the atmosphere, either by decomposition, when trees are cut down, or by combustion, when land is cleared by burning.

Forest degradation occurs when practices such as unsustainable logging result in the incessant release of carbon, characterized by gradual land-use changes that exceed the natural regenerative capacity of the forest (Chenost 2009).

To counteract deforestation and forest degradation, REDD projects seek to remove a risk or threat to standing forests, such as illegal logging or production of plantation crops, and in the process avoid the creation of GHG emissions that would otherwise have happened if it was 'business as usual' (Diaz et al 2011). REDD projects may also incorporate conservation activities, like the establishment of protected areas or national parks, after the risk or threat to identified forest areas has been removed (Smith and Scherr 2002). Effective implementation of REDD projects demands a good grasp of the causes of deforestation and degradation; factors which are not always easily discernible and are highly dependent on existing land uses and practices within a given area. However, more than 90% of the total mitigation potential in tropical forests is expected to come from REDD projects (Lasco 2009).

2. Afforestation and Reforestation (A/R)

Following a growing interest in the implementation of REDD projects, the establishment of new forests through afforestation and reforestation is the next most favored type of forest carbon project. The benefits of planting more trees is crystal clear, making A/R projects an instinctive choice for project developers owing to the ease of conveying the climate-mitigation merits to potential stakeholders (Diaz et al 2011).

Both afforestation and reforestation involve converting non-forested land into forested land by increasing and/or maintaining forest cover to capture additional carbon in the soil and biomass. Afforestation refers to the process of planting and raising trees in areas that have had no forest for more than 50 years. Reforestation, meanwhile, alludes to planting trees in areas that were forested in recent history (less than 50 years) (Smith and Scherr 2002).

A/R projects can be developed as large-scale, commercial operations, which involve the production of timber or non-timber forest products like rubber. These projects can also be implemented on a small-scale or community level where the objective could be to restore degraded land or establish local sources of forest products for subsistence.

Photo: © World Agroforestry Centre/Charlie Pye-Smith

3. Improved Forest Management (IFM)

IFM projects focus on land management practices that increase carbon stocks in forests or reduce emissions brought about by the excessive harvesting of timber products. Examples of improvements applied in IFM projects include shifting from conventional harvesting methods to reduced-impact logging or rotational harvesting to preserve carbon stocks in existing forests.

4. Agroforestry

Agroforestry has been simply defined as 'trees on farms'. It is a land-use practice wherein trees or shrubs are incorporated on agricultural land to improve productivity and, at the same time, sequester additional carbon in trees and soil. Through agroforestry, farmland can produce a wider variety of crops and forest products as well as become a potential carbon sink.

Agroforestry systems can consist of a combination of trees and crops planted to increase diversification of NTFPs, such as fruits, rubber or leaf fodder; blocks of trees planted for timber production (for example, teak) on farms or community-managed lands; or trees or shrubs intercropped in cropland or pastures to enhance microclimate effects (Smith and Scherr 2002).

In particular, agroforestry practices that involve coffee or cocoa grown in the shade of fast-growing tree species are gaining appeal. Silvopastoral practices that combine trees, pastures and livestock are also popular for herding a small number of cattle or farm animals, where bushes and trees can provide food and shelter for the animals, while also sequestering carbon.

Table 5 shows examples of forest carbon projects from different countries, while table 6 presents the stakeholders in forest carbon projects, along with their respective descriptions, responsibilities and benefits as stakeholders.

Photo: © World AgroforestryCentre/David Wilson

Table 5. Examples of forest carbon projects		
Project type	**Intended impact**	**Time frame**
***Bolivia:* Noel Kempf Mercado Climate Action Project**		
REDD	To stop logging activities and initiate alternative income programs for communities	30 years
***Brazil:* Peugeot Project**		
A/R	To establish 10 million native and exotic trees on 5000 hectare formerly under cattle pasture	40 years
***Borneo:* INFAPRO Rainforest Rehabilitation Project**		
IFM	To re-establish 30,000 hectare of highly degraded, logged-over forests through IFM activities and enrichment planting	Started in the early 1990's
***Mexico:* Scolel Té Project**		
Agroforestry	To sequester carbon and reduce emissions through agroforestry, combining crops and timber trees or enriching fallow lands	Established in 1996. Reached commercial self-sufficiency in 2002

Table 6. Stakeholders in a forest carbon project

Stakeholder	Description	Responsibility	Benefit
Farmer or landholder	An individual farmer or association of farmers who have clearly defined rights over the land.	Establishment and/or maintenance and monitoring of forests/trees in project area	Establishment and/or maintenance and monitoring of forests/trees in project area
Project developer or coordinator	A local, national or international organization, ideally with established relationships with farmers, or which has the capacity to work with farmer groups	Overall management of the project, which can include supporting up-front project investments, preparation of relevant project documentation and disbursing carbon payments to farmers	Percentage of sales from carbon and forest products. Allocation from total project funds. Project management experience and technical capacity building
Validation or verification body	A third party organization or firm accredited by the chosen carbon standard	Evaluation of the project according to the identified carbon standard. Preparation and public release of validation and/or verification documents	Payment for the provision of service
Project financier or funder	A private investor, public fund, philanthropic organization or lending institution	Generation of funds for production requirements of projects. Provision of financial incentives or subsidies for project participants	Percentage of project revenues, Interest payments (in case of lending institution). Public relations
Buyer of carbon credits	Offset providers or companies looking to reduce their GHG emissions	Due diligence of the carbon project	Ownership of carbon credits that may be traded on global markets. Contribution to climate mitigation, biodiversity and local livelihoods' objectives

CHAPTER 5

OVERCOMING BARRIERS TO PROJECT DEVELOPMENT AND SUSTAINABILITY

This chapter identifies some of the challenges commonly faced by carbon forestry project developers, and the smallholding farming communities they work with, when attempting to establish a successful scheme which delivers multiple environmental, social and economic benefits.

Drawing on a growing body of evidence from academic journals, contemporary project documents and industry reports, we identify the main challenges and key learning points to assist future project developers and smallholders navigate the pitfalls and maximize the benefits of carbon forestry projects.

Three case studies have been developed specifically for this guide and are based on active, carbon-forestry projects in Latin America, Asia and Africa.

— Case study 1: Limay Community Carbon Project, Esteli department, Nicaragua.
— Case study 2: Quirino Forest Carbon Project, Quirino province, Philippines.
— Case study 3: Sofala Community Carbon Project, Sofala province, Mozambique.

These case studies highlight different challenges and how they were overcome. The studies are linked by the fact that they are all working with smallholders and include agroforestry components to enhance the multiple benefits for participants.

Carbon forestry projects are extremely site- and context-specific and local conditions must be well understood if positive impacts are to be maximized and negative impacts avoided.

Photo: © World Agroforestry Centre/David Wilson

Therefore, the challenges and insights provided here are not meant to be an exhaustive list. Rather, the intention is to serve as a general guide to the kinds of things to look out for when project developers and communities are considering implementing such schemes. Identifying problems in advance can help ensure that a project is equitable and financially, environmentally and economically sustainable.

Challenge 1. Meeting development and transaction costs

Often cited as a major barrier to participation, meeting the development and transaction costs involved with starting and running a project is one of the most difficult challenges for project developers and communities (Forest Trends et al 2008). This is particularly true for projects that aim for accreditation via one (or more) of the current international standards (see table 7).

Table 7. Typical certification and validation costs

Standard	Certification and validation costs
Clean Development Mechanism	US$80,000 – 250,000
Verified Carbon Standards	US$20,000 – 40,000
Community, Carbon and Biodiversity Alliance	US$8000+
Plan Vivo Foundation	US$7550–12,550

The highly technical and time-consuming nature of achieving validation for a carbon forestry project means that the initial set-up and continuing transaction costs can be high (Harvey et al 2010). A project which is not designed from the outset to meet such transaction costs over time—on-site management; associated monitoring, reporting and verification; registration, marketing and subsequent sale of resulting carbon credits—may struggle to ensure long-term sustainability.

Therefore, honest, accurate and conservative financial modeling is a key factor when considering the feasibility of a carbon forestry project.

Insight 1: Look for opportunities to build partnerships

Building partnerships: Identifying and collaborating with local development or environmental agencies that may already be active in the project area can help to reduce costs (Harvey et al 2010). There may also be benefits in building strategic partnerships with government agencies, international or local NGOs and private companies that either hold data relevant to carbon forestry project development or are in the process of gathering it, such as:

- biodiversity assessments and other conservation activities;
- tenure, land titling or agrarian reform programs;
- socio-economic data gathering, for example, census; and
- technical surveys, for example, GIS, or geological surveying associated with infrastructure or engineering projects (mines, roads and dams).

Insight 2: Reduce transaction costs by fully engaging smallholders

One of the most efficient ways to ensure carbon forestry projects are financially viable is to accurately identify and then reduce development and transaction costs by meaningfully engaging host communities and participating smallholders from the outset (Richards 2011b).

Community-based monitoring: Engaging community members in initial carbon-stock baseline activities and later in the monitoring of project activities may not only reduce transaction costs (Boyd et al 2007) but also increase ownership amongst participants (Lopez et al 2011d) In turn, this increased involvement can lead to the enhanced probability of long-term project sustainability.

An initial investment in training and capacity building can deliver significant cost savings for the project (Danielsen et al 2010) as well as develop the skills and knowledge of community members. For example, in the case of Quirino, Conservation International has developed a community-based manual with input from participating farmers. This will help participants meet the requirements of their management plans and also allow for community level inventories and monitoring to take place in the future (Y. Natori 2012, pers. comm., 8 Nov 2012).

Commitments from communities: Credit provided to smallholders to assist with meeting project development costs represents a commitment to communities (Tacconi et al 2010). In Limay, Taking Root requires a minimum of 1.5 ‘manzanas’ (equivalent to around 1 hectare) of underproductive land to be committed by each farmer wishing to join the scheme, although in reality the average area dedicated is around 2.9 ha. Taking Root provides interest free finance for things such as fencing, land clearance and tree nursery development which is recovered as a deduction from future carbon payments. This helps farmers to overcome initial capital costs and strengthens their commitment to the project, reflected in the low level of project abandonment.

Insight 3: Identify appropriate, diverse funding sources

Assistance with identifying suitable and sufficient sources of funding is one of the key roles of an intermediary organization that has knowledge of the target market, experience of accessing and managing grant funding and greater organizational capacity (Benessaiah 2012). Investors are increasingly attracted to projects that are able to demonstrate multiple environmental, socio-economic and conservation benefits (Harvey et al 2010).

Seed funding: Targeting more traditional sources of funding for initial project costs may be a useful starting point. Being able to demonstrate the financial viability of the project beyond initial 'seed funding' and using any available government funding as leverage to access and maximize grant funding can provide sufficient start-up finance to bridge the gap to a time when the project might be more self-sustaining (FONAFIFO et al 2012).

Figure 13. Community members work together to plant trees according to the boundary planting methodology in the Limay Community Carbon project, Nicaragua
Photo: Taking Root

Early engagement with the 'market': Developing relationships and associations with existing organizations selling carbon credits to the market may lead to investment based on a project's stated potential to deliver credits in the future (Harvey et al 2010).

It is important to establish conditions and safeguards for any such agreement so as to avoid smallholders being locked-in to long-term contracts which may limit resource access and use. Any potential impact on livelihoods should be carefully considered and accounted for as smallholders' circumstances and associated opportunity costs will likely change over time. Nevertheless, such 'pre-sales' to clients and carbon-credit aggregators can be a useful way to generate finance for early development costs.

Resource pooling: Use of aggregated community resources, shared income from co-operatives or pooling labor to meet initial time, cost and resource requirements can be a fruitful approach.

If there are already such established structures then developing and channeling them towards project activities is possible (Harvey et al 2010). If not, then considering the establishment of such structures may be worthwhile although this takes time and resources in itself and perhaps should be considered a longer-term objective.

Brokering direct investment: In a similar way to engaging carbon market actors, financial arrangements with private sector organizations can be brokered which meet some or the entire project costs (FONAFIFO et al 2012).

Many organizations have corporate social responsibility programs that invest in social and environmental projects in return for agreed outputs (Benessaiah 2012). This should not require the surrender of carbon rights for land owners but rather involve certain social or environmental outputs to be met and this should be made clear via an agreement or contract.

Transaction costs have been shown to be particularly high in the Philippines (Lasco and Villamor 2010). The development of a strong relationship with a donor (in this case, More Trees) has therefore helped the Quirino project overcome this challenge (Lopez et al 2011d). The donor has pledged funds for the entire duration of the 23-year crediting period, which was a welcome if not unusual arrangement. A well-established legislative and organizational framework as well as an already engaged community represented an attractive prospect for this investor but the association has also been maintained through consistent, effective communication.

Insight 4: Start small and expand

Learning through doing: Managing a collection of smaller land parcels spread out geographically may be inevitable owing to the variable nature of ecosystems, smallholders' land tenure and their decision making, eligibility and willingness to participate.

The use of 'pilot phases' across smaller scale, multi-site, land parcels provides an opportunity to test technical specifications under different circumstances and refine associated processes, mechanisms and management of the overall project (Harvey et al 2010).

Build on success: The projects described in the case studies have been able to recruit new participants by demonstrating the potential for social, environmental (especially the maintenance or restoration of vital ecosystem services) and, perhaps most importantly for poor rural communities, economic benefits. Starting off small and expanding, building on success year-on-year, will help to realize such benefits for a greater number of smallholders over time (Haskett et al 2010, Lopez et al 2011d).

Challenge 2: Establishing community and project governance

Governance issues are often cited as critical to the long-term success of carbon forestry projects (Benessaiah 2012, Forest Trends et al 2008, Lopez et al 2011b). Understanding the local context of land tenure, community structures and organizations as well as the political and legislative landscape of a project's area are important in establishing and managing a project that will be sustainable beyond the involvement of any facilitating organizations (FONAFIFO et al 2012, Lopez et al 2011c).

Insight 5: Securing land tenure can be both a barrier and a benefit

Secure tenure is crucial: Many accreditation standards require that project developers demonstrate that the participants have secure land tenure as a way of meeting 'permanence' requirements. This is not always easy in rural areas of developing countries where tenure may be ambiguous and land titles or legal documents are lacking to support claims of customary or historic ownership (Harvey et al 2012).

As well as being an accreditation requirement, the demarcation of land ownership is crucial in ensuring that benefits go to the deserving recipients as well as for the accountability of a project's activities and management (Lopez et al 2011b).

Insight 6: Develop local organizational capacity

Build on existing structures and capacities: An honest assessment of the level of community organization or potential for working together, either by a group of smallholders or the project developer, will help determine where capacity building is required and, indeed, whether a project is even possible (Forest Trends et al 2008).

Wherever possible, existing community structures should be developed. These could include people's organizations, community groups, minority groups (based on gender, ethnicity or kinship), agricultural or NTFP co-operatives and labor groups for agricultural activities (Lopez et al 2011b).

Communities that are able to collectively organize and mobilize resources more readily are more likely to participate fully and be more prepared for carbon forestry projects (Boyd et al 2007).

Develop capacity locally: Sensitivity to local conditions and past community experiences is important, especially because many communities may have had negative experiences with failed development projects, which could lead to a high level of mistrust (Forest Trends et al 2008).

Local organizations generally command greater trust amongst smallholders and can operate more effectively in a political and cultural context with local languages and dialects (Harvey et al 2010). If a project developer comes from outside the host community or even from another country, it is essential to develop the capacity of local organizations that will eventually manage the project's field activities in the long-term.

Figure 14. A member of the Limay Community Carbon project prepares soil for tree saplings ready for reforestation activities
Photo: © World Agroforestry Centre/ David Wilson

To institutionalize this approach in San Juan de Limay, Taking Root established a community organization, Association of Professionals for the

Holistic Development of Nicaragua (APRODEIN), and built the capacity of local community members through training and sharing knowledge. This led to the development of a team of community technicians, which now consists of six fulltime permanent staff from the local community who provide technical support to participating smallholders, monitor the project and recruit new participants.

Take an asset-based approach: Identifying the assets already present in a host community could be a useful approach and will also help identify and direct limited resources to where most assistance is required. This will be different for each location but in general, assets can be grouped into five 'capitals' (Boyd et al 2007).

1) Social: the relationships, structures and connections between community members that support livelihoods.
2) Natural: access to (and control over) resources, such as land, water and forest products.
3) Physical: existence and condition of infrastructure and access to equipment.
4) Human: interests, knowledge, experience and skills derived from an intimate understanding of the local environment.
5) Economic: individual and community savings and credit, formal or informal, monetary or embedded in possessions and livestock.

Any successful project must ensure that it is enhancing these assets overall even where it is limiting or changing access in one area, for example, to natural resources (FONAFIFO et al 2012).

Insight 7: Engaging local, regional and national authorities

Engage promptly and meaningfully: Understanding the local political and legislative context will help to ensure that conflicts are avoided and collaborative efforts maximized. Therefore, engaging with local, regional and, where necessary, national authorities early in the process of project design and development is crucial (Lopez et al 2011a). Developing partnerships with these agencies and institutions might provide on-going support to the project (Harvey et al 2010).

Engagement in the Quirino project area began in 2002 with a Clean Development Mechanism feasibility study and has continued to the present. Whilst this length of engagement might not be typical of most projects, the sooner a project developer can engage with not only potential participants but also local government institutions, civil society organizations and any other actors with vested interests, the better (Lopez et al 2011d).
Once engaged, clear roles and responsibilities for each partner should be

defined based on an assessment of their capacity and relative strengths and weaknesses. In the case of Quirino, this was clearly defined and agreed via a Memorandum of Agreement between all the partner organizations (Lopez et al 2011b).

Developing a local management structure that promotes clearly defined, robust project governance increases the probability of the activities becoming 'institutionalized', or part of the area's governance structure (Lopez et al 2011d). This can increase the likelihood of a project's permanence, which is a key requirement of carbon forestry projects.

In Quirino, the Palacian Economic Development Association Inc. (PEDAI) was identified as the local organization to oversee the long-term transition to management by local people's organizations with support from local government agencies

Institutionalizing improved land-use practices: If the project is targeting long-term improvements in the environmental and socio-economic situation of host communities then ensuring that the project is sustainable beyond the carbon finance period will be essential.

Institutionalizing improved land-use practices can only be achieved through engagement with local authorities, agents and stakeholders who will be involved in on-going management and oversight, whether this is through local ordinances, resolutions and legislation or less formally (Forest Trends et al 2008).

Photo: © World Agroforestry Centre

Challenge 3: Overcoming technical challenges

For organizations with limited experience in forestry or environmental projects and related accreditation schemes, overcoming the technical challenges that such projects present can be daunting. Conducting a carbon baseline assessment, developing technical specifications, drafting the project design document and creating and managing a complex data management system may require specialist skills or knowledge not possessed by the community or the project developer (Harvey et al 2010).

Insight 8: Select appropriate technologies and technical specifications based on site-specific conditions and capacities

Identify organizational strengths and weaknesses: An important early step is to analyze where an organization has the necessary skills, capacity and knowledge and, most importantly, where these may be lacking (Lopez et al 2011c).

Once any gaps are identified, the next step is to engage with partners, communities, agencies and other actors to secure the necessary assistance (Forest Trends et al 2008). This may be technical, financial, organizational or operational and come from organizations or individuals outside the project partnership which may incur additional costs. As the project develops, internal capacities can be built that will reduce the need for such support (Harvey et al 2010).

Figure 15. A community technician at work in San Juan de Limay
Photo: Taking Root

Provide smallholders with choice: Select relevant and appropriate technical specifications to offer smallholders over time. The physical conditions of each smallholder's land will vary. This will make some planting regimes, management plans and species more suitable than others. Equally, the farmers' preferences, available time (based on other agricultural and livelihood activities), physical, social and economic assets will vary (Tacconi et al 2010).

This approach was adopted by the project coordinators in the Sofala project, where smallholders who wanted to join the project were offered a 'menu' of nine technical specifications (Hegde and Bull 2011). This allowed smallholders to select activities that best suited their circumstances, needs and capacity. It also served to engage farmers as it required their participation and offered a greater sense of control. This increased sense of ownership perhaps was demonstrated most convincingly by the low withdrawal rate: fewer than 3% of the participating farmers have left the project since it began in 2002.

Box 8. Agroforestry in focus

Including agroforestry components in carbon-forestry projects can provide multiple benefits.

In addition to having a carbon sequestration rates similar to that of tree plantations in some cases (Lasco et al 2011), agroforestry can also provide additional benefits, such as:

- soil stabilization and restoration (using nitrogen-fixing species);
- provision of marketable products, including nuts, fruits and NTFPs;
- shade for grazing animals and other plants, for example, coffee; and
- buffers for agricultural crops against destructive winds

(Kaonga et al 2012, van Noordwijk et al 2011)

These multiple benefits suggest that including agroforestry components in carbon-forestry projects where appropriate, can help to overcome some of the challenges discussed here (for example, opportunity costs and smallholders' reluctance to fully participate).

Meet opportunity costs: In the Quirino project, smallholders were initially and understandably only willing to include their most underproductive land, which was often spread throughout the landscape. As the project grew and the benefits began to be realized, farmers contributed more contiguous plots of land which has helped achieve some of the biodiversity conservation aims (Lopez et al 2011d).

Being able to show real and achievable benefits helped to engage farmers and provided an incentive to gain their full participation. This could only be done if there was sufficient understanding of the baseline, or 'counterfactual' socio-economic conditions, which could be used to analyze the benefits of alternative land-use scenarios. In this case, cost-benefit analyses demonstrated that in the medium term adopting agroforestry components was economically more beneficial than the prevailing banana-maize cultivation.

Select appropriate technologies for measuring, monitoring, verifying and reporting: Demonstrating that a project's activities have taken place as planned and that associated carbon benefits are being achieved is an important aspect of any carbon forestry project.

Without being able to do this, carbon payments and co-benefits will prove elusive (FONAFIFO et al 2012). Therefore, it is important to select a robust approach that captures all the necessary information while at the same time being simple and efficient enough (Verplanke et al 2009) to be conducted in areas where technology—such as GPS, handheld computers and measuring implements—might not be widely used and where capacities of those conducting the monitoring may still be under development (Virgilio et al 2009).

Select appropriate carbon standards: There are a number of stakeholders involved with the Quirino project, which has allowed the project's developers to draw on a range of different technical expertise locally, nationally and internationally (Lopez et al 2011d).

Assistance from Conservation International staff in Japan, who have a good working knowledge of carbon standards, has helped in selecting an appropriate project design, such as a combination of the Verified Carbon Standard (VCS) and Climate, Community and Biodiversity Standards (CCBS), which is common amongst projects seeking to deliver multiple social and environmental benefits. This approach can help project developers incorporate biodiversity and community issues at the design stage and help to deliver multiple benefits.

Using an adaptive management approach: As with any project, despite meticulous and sophisticated risk planning, things will not always go according to plan.

Communities and ecosystems are dynamic and subject to social, economic and political changes that cannot be foreseen. Many carbon forestry project developers take an adaptive management approach that allows them to respond to challenges when they occur (Lopez et al 2011b). Continuous monitoring is the basis for adaptive management: if you're not aware of the issues, you can't respond to them (FONAFIFO et al 2012).

In Quirino, in order to tackle any issues as they arose in a collaborative and systematic way, a technical working group was established in December 2010. This group was made up of the chair people of three people's organizations, PEDAI, Conservation International and representatives of various local, provincial and national government agencies. They met quarterly to discuss and resolve technical challenges, such as boundary disputes and damage to young trees by non-participating neighbors' livestock, and assigned responsibility to a member of the group to tackle the specific problem.

Challenge 4. Delivering tangible, long-term, equitable benefits

Smallholders might only be willing to provide their time and effort if there are clearly defined benefits that deliver a satisfactory return on their investment, whether that investment be time, land, labor or foregone income.

As we will see, such benefits can be direct financial payments, conditional on meeting agreed targets, or they can be non-financial, such as assistance in securing tenure, community capacity building or employment.

In fact, direct payments from carbon-offset-generating activities are unlikely to represent a significant increase in households' income in most cases so 'co-benefits' should be prioritized and enhanced.

Insight 9: Benefits should be clearly defined, measurable and achievable

Be clear about the project's purpose: Projects that have targeted multiple benefits have generally been more successful at maintaining participation from partners with different interests but this should be clear from the start to avoid the risk of unmet expectations (Harvey et al 2010).

No matter whether the project targets poverty reduction, biodiversity conservation or environmental restoration, it should be clearly agreed by all stakeholders from the outset (Forest Trends et al 2008).

Establish a clear agreement: Once the project's purpose has been established, the roles and responsibilities of stakeholders should be formally agreed upon. The most appropriate instrument for this will vary depending on the situation but memoranda of agreement, of understanding or terms of reference are the kinds of terminology that are commonly used (Forest Trends et al 2008).

Smallholders' contracts: A direct agreement with an individual smallholder should be clearly laid out and easy to understand, explaining exactly what is expected from them and what they can expect from the project developer (FONAFIFO et al 2012). Box 9 contains more details of a typical contract's content.

Box 9. Sample carbon forestry contract content

Any contract between a project developer and a community or individual smallholder should ideally contain at least the following information (Pan Vivo Foundation 2012).

- ***Who*** *the contract is between:* names and addresses
- ***Where*** *is the land to which the project activity refers:* this could be a GPS or a codified reference but must be specific
- ***How*** *long the contract is for:* dates and periods covered
- ***What*** *the smallholder can expect:* any support, assistance and training
- ***What*** *the smallholder agrees to do:* including a management plan, maintenance and planting regime
- ***How much****:* A payment schedule, including amounts to be paid and when payment can be expected
- ***Non-compliance:*** What will happen if either party does not meet any aspect of the agreement, for example, any loss of trees, land being sold or transferred or payments missed?

Project phasing and benefit staggering: Making sure that there are tangible benefits for smallholders as soon as possible and at each stage in the project will encourage participation, ensure that opportunity costs are met to avoid any net negative impact on livelihoods or income (Haskett et al 2010).

Even if willing, smallholders might find that changing current and adopting new land-use practices is beyond them either technically (lack of knowledge or technology) or financially (lack of capital to invest). An assessment of risks versus benefits, either by the smallholder or the project developer should be made. Any project should be able to demonstrate that new activities will be at least as beneficial and ideally increase rewards (financial or otherwise) if it is to be successful. Adopting a phased approach to delivering project benefits and meeting opportunity costs in the short, medium and long terms (Boyd et al 2007) is one way to address this (see table 8).

Table 8. An example of a phased approach to carbon forestry project design		
Phase	**Activity**	**Benefit**
1. Year 1 onwards	Tree nurseries established; Planting of forest and fruit tree species	Direct employment in establishing nurseries, collecting seeds, preparing land and planting
2. Year 2–10	Nursery development; Maintenance and monitoring of trees planted in phase 1	Sale of seedlings First ex ante carbon payments are made and can be 'front loaded'
3. Year 5+	Maintenance continues; Fruit trees mature and are harvested	Carbon payments continue and additional income provided from sale of fruit cash crops
4. Year 10+	Commercial forestry species mature and are sustainably managed	Carbon payments may have ended but income from sale of fruit, nuts, timber or fuel wood from forestry species takes over

Note: Agroforestry components are commonly used to bridge any benefit gaps (Forest Trends et al 2008).

Securing tenure rights is not straightforward but represents a benefit: Tenure rights were a prerequisite for the Limay project but were not always easy to define.

Following the Sandinista revolution of 1979, large parcels of land were broken up and provided to cooperatives to manage via an agrarian reform process. Over time, the cooperatives dissolved and the land was informally divided amongst private landowners. In order to be an eligible participant in the carbon forestry project, smallholders had to demonstrate that either they or a family member had a legal land title. Where this was not available, Taking Root provides assistance and liaises with the local government to establish tenure on behalf of the smallholder.

Taking Root also helps smallholders register their tree plantations with the national forestry institute (INAFOR). This process would be almost impossible for smallholders to do on their own as it involves geo-referencing the plantation and creating and registering a forest management plan. This is a legal requirement for smallholders wishing to harvest and sell their forest products and helps to reinforce tenure rights.

Providing direct support in these ways represents an additional, concrete benefit and can be a lever to encourage participation.

Insight 10: Reduce the risk of negative impacts

If the local context is not fully understood and the socio-economic conditions of communities and farmers are not taken into account (with project activities accordingly tailored) then, even with the best intentions, projects might risk not only failing to deliver stated benefits but in some cases actually cause a negative impact (FONAFIFO et al 2012). Table 9 provides an indicative list of a few common negative impacts and steps to help avoid them.

In general, these negative impacts can be avoided if the risk is identified early in a project's development. This involves working with smallholders and other stakeholders, preferably using participatory assessments, and developing a detailed understanding of the local social, political and economic contexts as well as land-use and livelihoods' practices (Richards 2011).

Table 9. Possible negative impacts of carbon forestry projects

Possible negative impact	Action for avoiding the possible negative impact
Loss of, or reduced access to, natural resources or agricultural land	Creation of community maps to identify current land-use and livelihoods' activities. Where possible, carbon forestry activities should be on underproductive land.
Reduced income through opportunity costs not being met or disruption to local labor market	Gathering robust socio-economic data through discussion with, and surveys of, smallholders should be conducted to avoid competing with principle livelihood activities
Unequal access to benefits, creating or reinforcing power imbalances	Awareness of local power structures and institutional contexts can minimize the risk of benefits being captured by larger-scale landowners or distribution based unfairly on gender or ethnicity
Creation of inter- and intra-community conflict	Once benefits begin to be realized, non-participants might want to join. If the project capacity is limited, transparency about who is able to participate and why as well as a plan of how to manage points of potential conflict is crucial.

Source: White et al 2010

We would like to reaffirm that the aim of this guide is not to advocate for carbon-forestry projects as such but rather to highlight some of the challenges faced by project developers and host communities in ensuring that projects meet stated environmental, social and economic goals.

Accordingly, box 10 below provides a summary of a recent report which raised some concerns about one of the case studies. Excerpts from the response from the project developer are included.

This helps to demonstrate the complexity, inherent challenges and sometimes divisive nature of carbon-forestry projects and emphasizes that communities and developers alike should carefully consider the situation before starting any project.

Photo: © World Agroforestry Centre

Box 10: Criticisms and counter-arguments

The Sofala Community Carbon Project has been offered as an example of good practice, addressing environmental and socio-economic challenges through the development of a sustainable carbon-forestry project (Stern 2006). However, there have been a number of criticisms of the project. The most recent of these was a report published by Friends of the Earth and FERN, an NGO focused on the rights of forest people and the European Union's policies relating to forest. The report suggests a number of areas for concern, some of which are presented below.

1) Project monitoring and quantification of carbon benefits are not robust enough.
2) Unrealistic expectations of farmers, who receive all the payments in the first seven years but are expected to care for the trees for up to 100 years, which raises questions about permanence.
3) The long-term financial sustainability of the project is questioned because revenue generated from the sale of carbon credits is not sufficient to meet project costs.

Some of these criticisms are more fundamental to the effectiveness of carbon forestry and carbon offsetting as an effective carbon-mitigation tool whilst some are more specific to the project itself. The full document can be found here: http://www.fern.org/sites/fern.org/files/Nhambita_internet.pdf.

In a personal communication, Envirotrade representatives offered the following rebuttal.

1) The original project design was led by earlier project partners. Recent developments, such as an agroforestry contract monitoring database, have improved monitoring.
2) Carbon payments are not designed to provide long-term benefits to participants but rather agroforestry and conservation agriculture techniques supported by project technicians represent more sustainable benefits. Technicians have not noted an increase in tree cutting even after contracts end.
3) There is a shortfall in finance generated from the sale of carbon credits but that this has been met through injections of finance from Envirotrade itself, meaning that 72% of project costs are invested in the host communities.

You can read earlier criticisms and Envirotrade's official response to them here:
REDD Monitor report*
Envirotrade Response†

*http://www.redd-monitor.org/2012/07/11/envirotrades-carbon-trading-project-in-mozambique-the-nhambita-experiment-has-failed/;
†http://www.redd-monitor.org/2012/07/14/response-from-envirotrade-the-nhambita-project-has-not-failed/

ANNEX 1

GLOBAL CASE STUDIES

Case study 1: Limay Community Carbon Project

Location: San Juan de Limay, Esteli. Nicaragua
Number of participants: 235 registered producers
Size: 649.7 hectares
Carbon sequestration potential: 192,501 tons CO_2 (e)
Carbon sequestration activities: Mixed species plantation reforestation (494.5 ha), boundary planting (72.6 ha) and silvopastoral (82.6 ha)
Accrediting body: Plan Vivo Foundation
Project Status: The project design document and technical specifications were validated in 2011. Carbon credits are being registered and sold and payments made to participating smallholders.

Background
The project developer, Taking Root, is a Canadian not-for-profit organization assisting smallholders to develop livelihoods-enhancing forest carbon projects in rural Nicaragua. Taking Root's involvement with the smallholders of San Juan de Limay in the Department of Esteli in Northwest Nicaragua began in 2008 and the project was officially registered with Plan Vivo in March 2011. The site was initially selected by Taking Root after being identified by the local mayor's office as an environmentally critical area in need of reforestation to reduce alternating flood incidence and water stress. The prevalence of rural poverty in the area led to the development of the socio-economic livelihood support components.

Context
Small-scale cattle ranching and subsistence agriculture (principally beans, corn and sorghum with some coffee grown at higher elevations) are the main land-use activities undertaken by smallholders. The objective of the project is to enhance the participants' socio-economic conditions through payments for ecosystem services related to the carbon-mitigation benefits generated by reforestation activities. This is consistent with the requirements of Plan Vivo-registered projects and Taking Root's mission statement.

The project site sits within an important watershed providing water locally as well as feeding major rivers discharging to the Pacific Ocean, which are of economic importance. The area has suffered from widespread deforestation and soil degradation, which has led to a reduction in productivity and an increase in seasonal water stress and flooding. The project site was cleared of much of the original forest cover to make way for cotton production but following the world market collapse in the 1980s the heavily degraded land was abandoned. More recent forest degradation is the result of harvesting firewood.

Figure 16. The heavily degraded landscape surrounding San Juan de Limay, Nicaragua
Photo: Taking Root

Project activities

The project activities are aimed at reducing the pressure on existing forests from pasture land expansion and increasing overall forest cover, which it is anticipated will reduce water stress through watershed rehabilitation. The project is designed in three overlapping stages that aim to ensure long-term livelihoods' benefits for participating smallholders whilst delivering carbon-mitigation services.

Stage 1: The main carbon-credit-generating activity is through the reforestation activities in which mixed, native, hardwood forest species are planted with a density of 1667 trees per hectare, producing net carbon dioxide sequestration equivalence of 299.7 tCO_2/ha. The carbon credits are sold to the voluntary carbon market through aggregators as well as through direct sales managed and negotiated by Taking Root. Payments for ecosystem services are then made to farmers based on their performance against an agreed management plan written into their contract.

Stage 2: Faster-growing species are inter-planted in alternating rows alongside the hardwood species. These will be harvested after 8 years, to meet the local demand for fuel wood, until they are eventually crowded out by the maturing hardwood species. The sale of the fuel wood to surrounding communities will provide an additional source of income for the smallholders and the project developers are targeting the development of a co-operative organization to facilitate this activity. Taking Root is also exploring a variety of processing options to improve market access for the smallholders' fuel wood, such as charcoal or electricity produced by wood gasification.

Stage 3: Finally, as the commercial hardwood species mature and begin to be sustainably managed, timber will be sold to provide a long-term income for the smallholders. At current market value, it is anticipated that the sale of timber from these sustainably managed plantations will provide a greater income for smallholders than the ecosystem services' payments.

In addition to diversifying and generating additional household income through the activities mentioned above, the project also provides social and livelihoods' co-benefits, such as the construction of 25 fuel-efficient stoves and direct employment opportunities for some community members now working for APRODEIN.

Agroforestry elements

In 2011, in order to attract a group of new smallholders, Taking Root offered fruit tree species as an incentive to participation. In 2012, a new silvo-pastoral technical specification was offered, which has been well received by participants. This involves the planting of the hardwood forestry species at a lower density than previous activities (400/ha versus 1667/ha) and allows smallholders to use the land for pasture at the same time. Whilst this activity reduces the rate of carbon sequestration (and thus income from ecosystem services' payments)—to 191.9 tCO_2/ha compared with the mixed species plantation value of 299.7 tCO_2/ha—it provides additional benefits, including reducing the risks and opportunity costs for farmers, helping to improve soil condition through the selection of nitrogen-fixing species and providing shade for grazing cattle.

Payments for ecosystem services

A simple, clear contract is signed by smallholders, Taking Root and APRODEIN. This sets out the requirements for each farmer (for example, exclusivity to avoid risk of double counting) as well as what they can expect from Taking Root and APRODEIN in order to safeguard their interests. The contract is unique to each farmer and sets out their required planting regime and the related carbon payments they can expect, minus a risk buffer. The contract also includes a management plan and payment schedule.

Monitoring of these contracts is carried out by community technicians who are employed on a permanent, fulltime basis by APRODEIN. The community

Figure 17. Constructing a fuel-efficient stove in San Juan de Limay
Photo: Taking Root

technicians produce reports to confirm that the participants have met their contractual agreements and payments are made. Taking Root deposits 60% of the finances generated from sale of carbon credits in a trust for payment to participants, which is sent via APRODEIN for distribution direct to farmers via cheque, in line with their agreed payment plan. The remaining 40% is used for project development and operational costs and the process is reviewed regularly with both the participants and the Plan Vivo Foundation.

Case Study 2: Quirino Forest Carbon Project

Location: Maddela and Nagtipunan municipalities, Quirino province, Philippines
Number of participants: 110
Project area: 177 hectares across 141 land parcels consisting of 155 hectares of native forest species and 22 hectares of agroforests.
Carbon sequestration potential: 31,771 t/CO_2 over a 23-year crediting period: 2007–2029.
Project activities: Principally reforestation using native species with a small agroforestry component and the development of commercially viable plant nurseries.
Accrediting body: Verified Carbon Standards (VCS) and Climate, Community and Biodiversity Standards (CCBS)
Status: 2012 is the fourth planting season and VCS and CCBS project design documents have been submitted and validated by **Rainforest Alliance.** Verification is likely to take place by 2014.

Project description

The project is situated in the Quirino Protected Landscape within the Sierra Madre Biodiversity Corridor which covers approximately 1.7 million hectares and is one of the most biologically important areas of the Philippines. It includes 15% of the remaining closed canopy Dipterocarp forests in the country as well as 47% of the remaining mossy forests. This small-scale reforestation and agroforestry project is being coordinated by Conservation International and managed by PEDAI, a local NGO that is supporting upland smallholders.

The farmers have been engaged in marginal agriculture, principally banana and maize cultivation on largely degraded or underproductive land. The project aims to support the rehabilitation of watershed functions and improve the soil quality of degraded areas of this sensitive ecosystem, enhance biodiversity and augment and diversify the livelihoods of the local farmers.

Project development

An initial feasibility study conducted in 2002, supported by funding from the Japanese Ministry of the Environment, envisioned a much larger area for an A/R-CDM project but was reduced in size owing to challenges in securing development funding. Funding for the current project has been provided by More Trees, Japan Inc. a not-for-profit organization that has provided finances to support the entire project throughout the 23-year crediting period. Conservation International Philippines is the grant recipient, with strategic support, including a donor liaison function, provided by Conservation International Japan.

Figure 18. Native trees planted as part of the Quirino Forest Carbon Project
Photo: © World Agroforestry Center/David Wilson

Project partners and stakeholders

In 2009, a memorandum of agreement was signed between Conservation International Philippines, local government units, the regional office of the Department of Environment and Natural Resources and PEDAI.

PEDAI are the local delivery partner, a sub-grantee of funds from More Trees and hold a separate agreement with Conservation International. PEDAI's team of three field staff and one project manager co-ordinate local activity from planting and nursery management, monitoring the project as well as recruiting and supporting farmers. Conservation International provides oversight but also technical training for PEDAI and the farmers to build capacity and ensure the sustainability of the project beyond their direct involvement.

The main stakeholders are smallholders involved in the project, who are organized into local agricultural people's organizations[4] in three 'barangays' or villages.

Initial education and awareness activities and seminars conducted by Conservation International and PEDAI helped farmers to understand the links between their actions and environmental impact, such as soil degradation, and how the carbon forestry project could help to address some of the issues.

The participating smallholders received technical training in developing plant nurseries, including how to transplant wildlings of native species gathered nearby and how to graft fruit species. They also benefited from organizational capacity building, such as training in bookkeeping.

Participation and eligibility

In order to participate in the project, farmers have to demonstrate that they have secure tenure rights and commit a minimum of 1 hectare of land to the project.

Tenure rights are relatively straight forward because the majority of participants hold a Certificate of Stewardship Contract (CSC) that grants land access rights under the Integrated Social Forestry program of the Department of Environment and Natural Resources. Under the Integrated Social Forestry, stewardship certificates are granted for 25 years, renewable for a further 25 years and include a requirement that a minimum of 20% of total land area must be maintained as, or returned to, forest cover.

Conservation International and PEDAI were able to demonstrate that participating in the scheme would assist them in meeting this requirement at little or no direct cost to the farmers. Furthermore, Conservation International has provided an additional incentive through assisting smallholders in re-negotiating an extension of their 25-year leases, which are all due to expire in 2015.

Project activities

Project activities have been designed in phases, each aimed at providing support for livelihoods, conservation and carbon sequestration.

Stage 1: Establishment and maintenance of two plant nurseries that supply plants to meet most of the requirements of the project. There are

[4] Divisoria Sur Agroforestry Farmers Association, Sto. Niño Integrated Social Forestry Association and Sangbay Upper Basin Ecological Farmers Organization

plans to develop these commercially to supply other operations, including the Department of Environment and Natural Resources' National Greening Program, thereby providing additional income for farmers.

Stage 2: The agroforestry component has developed 22 hectares (27 parcels) of fruit species, including lanzones (*Lansium domesticum*), rambutan (*Nephelium lappaceum*) and pomelo (*Citrus decumana*), intercropped with maize and banana which, once they reach maturity, will provide further additional income.

Stage 3: The main carbon-credit-generating activity is reforestation using selected native species[5], management of which is the responsibility of individual smallholders as set out in the contract between them, Conservation International and PEDAI. Participating farmers are directly paid every 2 to 3 months on average for maintaining their plots and ensuring the health of the trees, once this has been validated by project staff. Verification of project activities is set to take place in 2014, at which point the sale of carbon credits can begin. Payments will be made every 5 years over the crediting period.

Views from the community in Quirino

Local NGO: Palacian Economic Development Association Incorporated (PEDAI)

This small NGO was established in the 1990s to aid farmers through agricultural extension, technical support and micro-lending in the Quirino province. Since becoming the local delivery partner for the project, staff admit that it was a steep learning curve to grasp the more technical aspects but with capacity building provided by partners they are now confident they can support the farmers adequately. PEDAI staff are mindful of a future when direct payments from the project are no longer available. They are keen to enhance livelihoods, something that is core to their organization's original function, and have identified commercial nursery development and processing of fruit from the agroforestry plots as possibilities. Whilst they admit that this will be the biggest challenge, with the good relations they have built with local government agencies they hope to be able to institutionalize the activities and positive changes brought about by the carbon forestry project.

People's Organization: Santo Niño Integrated Social Forestry Association (STISFA)

Originally founded in the mid-1980s as a loose group of farmers from the village, this people's organization was officially registered in March 2011 after

[5] Mainly *Pterocarpus indicus* (Narra), *Vitex parviflora* (Molave), *Dracontomelon dao* (Dao), Tuai, *Balakat gubat*, *Palosapis* and Yakal.

joining the carbon forestry project. At a meeting with some of the 52 members of STISFA, they offered the following insights.

1. Scheduling of activities: Farmers suggested that careful scheduling of carbon forestry activities with the existing agricultural calendar was very important. At harvest and planting times, farmers are often unable to find enough time to tend to the reforestation plots properly or attend project meetings. In some cases, members have chosen to subcontract the maintenance work to other members when they have no time themselves.

2. Frequency of payments: The payments for maintaining the plots are timed quarterly following the scheduled monitoring visits. However, some of the maintenance activities are more time-intensive at different seasons of the year (weeds grow fastest in the rainy season, for example). Members said that smaller, more frequent payments could help address this.

3. Organizational capacity: One of the key messages members were keen to stress was that a strong organization of farmers is important to a project's success. Members reported that a smaller organization of more committed members has helped to overcome the inevitable difficulties. The members trust and support each other and have even been able to convince those who were considering leaving the scheme to stay. Also, as a registered people's organization, STISFA is now able to apply for direct external finance and, with the support of PEDAI and Conservation International, is currently applying for funding for a water infrastructure project.

4. Farmer-to-farmer learning: PEDAI and Conservation International organized a visit for members to see an agroforestry farm producing the same crop as they hope to harvest: rambutan. As well as learning more about the technical aspects of agroforestry, they were also able to see first-hand what their plantations might look like on maturity. Members found this very useful in visualizing possible future benefits that are intangible at early stages of the project.

Smallholder: 'Danny'

Danny owns 3.4 hectares of steep, undulating land in the hills surrounding the barangay of Sangbay. A subsistence farmer, he rotates his crops of rice, corn and sweet potato and also grows banana for sale to market. Danny joined the project 2 years ago and has set aside, planted and managed 1 hectare of reforested land since then. Danny has chosen to inter-plant the forest species trees amongst some remaining banana plants. The banana plants not only serve as a 'nurse' plant—providing shade to protect the young seedlings in the critical first few years—but mean that Danny is still able to earn some income from the land. He estimates that he can still gather around 4000 pieces of banana in each of the 3–5 harvests per year. Danny receives payments based on his management of the trees on this plot. These payments are conditional and validated by a monitoring visit conducted by PEDAI and Conservation International staff to assess whether the area around the seedlings has been cleaned sufficiently, the survival rate and condition of the plants as well as his maintenance of a 5 m-wide firebreak. Danny estimates that it takes him three days every 2–3 months to maintain the reforested trees.

Figure 19. Danny and one of the project workers in an area of mixed reforestation and banana plantation, Quirino Province, Philippines.
Photo: © World Agroforestry Center/David Wilson

Case Study 3: Sofala Community Carbon Project

Location: Gorongosa National Park and Zambezi Delta, Sofala province, Mozambique
Number of participants: 2827
Project area: 11,744 hectares in total and the average smallholder's plot is 1.03 hectares.
Carbon sequestered: 1.2 million ex ante credits generated of which 409,000 have been sold on the voluntary carbon market.
Project activities: Agroforestry (cashew, 210 ha; mango, 56 ha), avoided deforestation (REDD, 9105 ha) and forest conservation (No-Fire, 2805 ha; woodlots, 276 ha).
Accrediting body: Plan Vivo Foundation and CCB Standards.
Status: Verified by Rainforest Alliance, November 2010.

Project description

The Sofala Community Carbon Project consists of two sites, Gorongosa and the Zambezi Delta, situated in the buffer zones of the Gorongosa and Marromeu national parks in central Mozambique.

The project includes some 3000 farmers engaged in over 7000 contracts covering 24 different villages: 17 in Gorongosa and seven in the Zambezi Delta. In a recent change the project is coordinated by a Mauritius-registered charitable trust, The Africa Carbon Livelihoods Trust[6], and is designed to enhance the livelihoods of smallholders as well as restore severely degraded forest lands and sequester carbon through planting and managing forest and agroforestry species. The site was chosen as a severely degraded ecosystem but also for social reasons as the developers were targeting a post-conflict area that would benefit from social reconciliation. Many of the local communities had been displaced during almost 20 years of civil war in Mozambique and remaining cultural and political tensions provided an additional challenge.

The project site is an ecologically sensitive area with a high biodiversity value with unique vegetative cover suffering from extensive deforestation, the result of land clearance for pasture, slash-and-burn agricultural practices, uncontrolled fires, selective illegal logging and charcoal manufacture. This has reduced much of the area to infertile, unproductive rangelands. Principal livelihoods include subsistence farming with community members reliant on forests through NTFP gathering and hunting.

[6] This new legal structure and entity replaced Envirotrade effective 1st February 2013

Project activities
A range of sustainable land-use management activities are offered to smallholders. Agroforestry activities form a prominent part of the project with farmers able to choose from a selection of nine Verified Emission Reduction (VER) activities, including seven agroforestry, one agricultural and one forestry specification.

Intercropping of nitrogen-fixing, fruit-bearing tree species is promoted as a means of increasing the soil fertility thus reducing pressure on nearby forests, traditionally cleared as agricultural lands became underproductive. Cashew and mango orchards have also been established as valuable cash crops that, on reaching maturity, will provide an additional income stream for smallholders.

REDD technical specifications have been deployed in the project area. This mainly involves the sustainable management of existing forests and the introduction of fire management regimes, including the installation and maintenance of fire breaks.

In addition to the main forestry activities, the project also supports a variety of additional livelihoods, including beekeeping, a local saw mill for the processing of timber extracted from sustainably managed lots, the development of a carpentry workshop for the manufacture of goods for sale and the establishment of a bakery, including training provided to women of the community. Some of these activities, in particular the saw mill and bakery, have been limited by the lack of mains electricity which is reportedly being addressed. The plant nurseries that were established to supply seedlings to the project have now been commercialized and operate as separate businesses providing plants to the project and further afield.

Project governance
In addition to the municipal and regional level government structure there is a complex system of community governance based on multiple-level, traditional chiefdoms. This complexity can create challenges operationally with power differentials dependent on kinship ties and authority transferred on a hereditary basis. There are also loosely affiliated common-interest groups aligned with livelihoods such as charcoal manufacture, bee keeping and collection of NTFPs.

Community associations have been developed in each of the villages that are part of the project. As well as strengthening local governance structures, these community associations also have a representative each with the Associação Envirotrade Carbon Livelihoods (AECL). This non-profit organization has been established to facilitate the distribution of payments locally and to institutionalize the project in Mozambique but it doesn't employ anyone directly.

The project is locally managed by Envirotrade Sofala Limitada (ESL), which currently employs 55 people, the majority of whom are Mozambican, as community technicians, extensionists and managers. This organization was established by the original project developer, Envirotrade to facilitate on-going engagement with local communities as well as to manage resulting ecosystem services payments to project participants.

Farmers enter into a contract with AECL and ESL, which sets out the requirements of their land-use management plan and a payment schedule. The payments to farmers are conditional and based on the results of monitoring conducted by community technicians and agricultural extensionists. An initial payment is made that represents 30% of the total payment over 7 years, after which a bi-annual inventory is conducted in which the tree health and mortality is recorded. Tree survival rates of 85% and greater trigger a full payment; discounts are applied to payments associated with a survival rate of 16–84% and less than 15% survival triggers a temporary suspension. Crucially, if farmers are able to rectify any underperformance they can recoup the discount.

The payments are made in cash as most participants do not have access to banking facilities, however, this does create a security issue with relatively large amounts of cash being distributed. At the time payments are made, the developers make arrangements for local merchants to be present to encourage investment in agricultural and infrastructure products, such as roofing and tools. Participants have also pooled income from payments for ecosystem services to invest in community projects, including the establishment of two schools and a health clinic.

Land tenure

Land tenure is secured through the issuing of a 'direito de uso e aproveitamento da terra' (DUAT) or land title. Since all land in Mozambique is officially owned by the state, tenure is granted based on traditional or customary land-use rights if people are able to demonstrate occupancy of greater than 10 years. Concessionary rights are granted for up to 50 years, renewable for a further 50 years. An initial European Union-funded pilot phase was instrumental in securing land-use rights for many participants. Since then, Envirotrade have developed a partnership with Iniciativa para Terras Comunitárias (ITC), a local NGO that focuses on helping Mozambican farmers achieve secure land tenure. Securing tenure is considered by the project developer and participants as an additional benefit.

Project development
Initial engagement with smallholders was supported via the pilot phase of the EU-funded project to improve the land-use practices in the area. This pilot, initiated in 2002, led to a more significant investment for further project development from 2003 to 2008. Since 2008, the project has sought to become self-financing through the sale of the ex-ante carbon credits that have been generated. However, the sale of the generated credits has been made more challenging by the performance of the carbon markets, particularly since 2008. On this basis, no new contracts with participating smallholder farmers have been issued since 2010 but rather the focus is on selling existing credits and supporting those farmers already involved.

The carbon credits generated by the REDD component have not been as popular in the carbon markets as those associated with the agroforestry methodologies. The proponents believe that this reflects the preference of clients (particularly organizations purchasing credits as part of a corporate social responsibility program) for credits that are associated with farmers directly planting trees and that can provide more tangible co-benefits. The REDD component, however, is designed to be supported by the agroforestry components, reducing the pressure on remaining intact forest.

The project has been designed in three phases from growth through steady state and finally the winding down of the carbon forestry elements. The long-term sustainability of the project is the current focus with many of the contracts coming to the end of their 7-year term. The idea is that the changes instituted via the project—the increased agricultural yield, diversification of livelihoods and secure tenure—should encourage the participating farmers to maintain their new, environmentally and economically more sustainable land-use practices.

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FURTHER READING AND ADDITIONAL RESOURCES

In addition to the information provided in this guide and the references, you may find the following selected resources useful if considering the development of a carbon forestry project. Please note that the World Agroforestry Center does not officially endorse these organizations but they are provided to assist with further research in this area.

Carbon standards and accreditation schemes

The organizations below are some of the most widely known providers of carbon standards for carbon forestry projects. In addition to the standards themselves, the websites provide examples of projects using their standards as well as some technical specifications:

- Climate, Community and Biodiversity Alliance (CCBA): http://www.climate-standards.org
- Plan Vivo: http://www.planvivo.org
- The Gold Standard: http://www.cdmgoldstandard.org
- Verified Carbon Standard (VCS): http://www.v-c-s.org
- World Agroforestry Centre's Forestry Voluntary Carbon Market Network Asia: http://worldagroforestry.org/forestryvoluntarycarbon/

Carbon market and finance information

- Forest Trends Forest Carbon Portal: http://www.forestcarbonportal.com
- Ecosystem Marketplace: http://www.ecosystemmarketplace.com
- Forest Carbon Partnership: http://www.forestcarbonpartnership.org

Forest carbon calculators and databases

- USAID's Agriculture, Forestry and Other Land Use (AFOLU): http://www.afolucarbon.org
- Globallomtree. Carbon stock assessment equations from around the world: http://www.globallometree.org
- CIFOR's Forest Carbon Database: http://carbonstock.cifor.org/user/HomeMap

Guides and toolkits

- CIFOR Forests and Climate Change Toolbox:
  http://www.cifor.org/fctoolbox
- Global Canopy Programme's 'Little Guide' Collection:
  http://www.globalcanopy.org
- ENCOFOR Project design toolkit:
  http://www.joanneum.at/encofor/tools/tool_demonstration/Tools.htm