The Plan Vivo experience with carbon service provision and the potential lessons for watershed service projects

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Developing markets for watershed protection services and improved livelihoods

Based on evidence from a range of field sites the IIED project, 'Developing markets for watershed services and improved livelihoods' is generating debate on the potential role of markets for watershed services. Under this subset of markets for environmental services, downstream users of water compensate upstream land managers for activities that influence the quantity and quality of downstream water. The project purpose is to increase understanding of the potential role of market mechanisms in promoting the provision of watershed services for improving livelihoods in developing countries.

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Acronyms and abbreviations

BR&D	BioClimate, Research and Development
CDM	Clean Development Mechanism
DBH	Diameter at breast height
EC	The European Commission
ECCM	The Edinburgh Centre for Carbon Management
ECOSUR	El Colegio de la Frontera Sur
ECOTRUST	The Environmental Conservation Trust of Uganda
EPA	Environmental Protection Agency (USA)
FIA	Federation Internationale de L'Automobile
ICRAF	International Centre for Research in Agroforestry
IIED	International Institute for Environment and Development
NFPC	Not-for-profit company
NGO	Non-governmental organisation
PES	Payments for environmental services
RENAMO	Resistencia Nacional Mocambicana
RUPES	Rewarding Upland Poor for Environmental Services
UFSCS	Uganda Forest Sector Coordination Secretariat
UNFCCC	United Nations Framework Convention on Climate Change
UK-DFID	Department for International Development
World Bank-IBRD	World Bank International Bank for Reconstruction and Development
WSD	Women for Sustainable Development, India

Executive summary

This report provides a detailed description of the Plan Vivo system for generating carbon services from rural communities for sale in the voluntary carbon market. The objective is to provide project developers of water service projects with a model for possible application to their sites. Carbon services are generated either by sequestering carbon through afforestation and reforestation activities, or by reducing greenhouse gas emissions through efficient, cleaner energy or fuel generation or usage. The carbon market is rooted in the 1990 US Acid Rain Program, where SO_2 and NO_x were traded under a "cap-and-trade" program, resulting in successful reductions of atmospheric concentrations of these pollutants. This was followed by the 1997 Kyoto Protocol which set forth binding targets in emissions reduction for all developed countries to approximately 5% below 1990 levels. The Kyoto Protocol went into force on 16 February 2005. With this foundation, a voluntary market for carbon was originated, where buyers seek to offset their carbon emissions for reasons of corporate social responsibility and example-setting.

The Plan Vivo is a set of procedures and administrative systems for managing carbon assets across a mosaic of numerous small-scale farmers or community groups. The system includes a standard institutional framework consisting of a project administrator, a technical team, The Edinburgh Centre for Carbon Management Ltd. (ECCM), BioClimate Research and Development (BR&D), and farmers. The administrator is responsible for maintaining a project database, managing a carbon trust fund, administering carbon sale agreements to farmers and co-ordinating monitoring. The technical team is responsible for developing discreet land use systems, providing agroforestry extension support, collecting data, and managing the supply of tree seedlings. ECCM helps in project design and development, provides training to all stakeholders, takes the lead in carbon modelling and development of technical specifications, assists in project promotion and marketing (of carbon), and provides general support whenever necessary. BR&D is responsible for issuing carbon certificates to buyers, maintaining Plan Vivo standards, and ensuring that projects meet these standards. The farmers are responsible for producing and delivering the carbon services. They must engage in a planning process through which land use systems are selected and implemented for a specified length of time. Farmers must enter into contractual agreements with the projects for carbon service delivery.

The Plan Vivo system includes a project cycle with various steps that must be followed to ensure credible project delivery. Project sites are first chosen based on suitability in terms of organisational capacity, desire and viability for tree planting, and demonstrable land tenure. Interested farmers are then provided with targeted training which is followed by a participatory planning process designed to identify the most suitable land use systems. Land use systems should provide multiple benefits including livelihood improvements and environmental protection. Farmers put plans into motion by following detailed technical specifications for their chosen land use system. Each participating farmer enters into carbon sale agreements with the project, which indicate the total saleable carbon and the corresponding monitoring and payment schedule. Once planting has occurred, project technicians conduct initial monitoring to ensure specified survival rates and adherence to technical specifications. Monitoring is repeated periodically throughout the project lifetime. If monitoring results meet expectations, carbon payments are administered. Farmers receive carbon funds in instalments over several years.

The Plan Vivo system also provides for stringent administrative and technical procedures to ensure credible carbon service delivery. Administrative systems include a standard paper trail of documentation and the maintenance of a project-wide carbon risk buffer. The technical components provide for the development of technical specifications for each land

use system. These specifications read somewhat like a recipe, and if followed will correspond to a specific carbon sequestration estimate. Carbon sequestration is estimated using a simple carbon accounting model, and carbon is credited against a baseline.

The Plan Vivo system is currently applied to four projects in Mexico, India, Uganda and Mozambique. The project in Mexico was the first Plan Vivo project; it began in 1995, and is where the system was developed. The project included over 600 farmers located in the states of Chiapas and Oaxaca. After initial donor funding for four years, the project is now self-sustaining through carbon finance alone. Land use activities focus on high-value timber production that would otherwise be inaccessible to farmers with carbon finance. The India Plan Vivo project includes both dry-land fruit orchards and small-scale biomass gasification for heat and electricity generation in Karnataka. Both types of activities are providing small-scale farmers and communities with income and livelihood improvements. The Uganda project is located in Bushenyi District and is focusing predominantly on development of multi-use woodlots. Currently there are approximately 120 participating farmers. The Mozambique project is the most recent addition to the Plan Vivo portfolio. The Plan Vivo system is only one component of a large project including education, forest management, and development of various non-timber forest product markets. The Plan Vivo system here is focusing on fruit orchards, interplanting and intercropping for soil improvements, and boundary planting.

Main lessons learned from Plan Vivo projects include maintaining transparency, flexibility and simplicity when working with farmers/communities. It is also clear that credibility of carbon services is extremely important, therefore rigorous methods must be used in quantification and estimation of carbon benefits. Participants must be provided with clear benefits which will provide incentives to maintain their commitment to land use systems. It is especially useful to work through an intermediary on the ground who has local expertise and understanding of project area conditions. Furthermore, it is essential to pilot activities on a small scale to reduce risks and allow for learning.

1. Introduction

The purpose of this paper is to provide a detailed description of a system used for generating carbon services in projects at four locations around the world. The system is called Plan Vivo and comprises a set of guidelines and procedures for generating carbon offsets from rural communities in a way that improves livelihoods and promotes sustainable land use practices. The system provides a structured methodology and administrative framework for implementing carbon service projects. Plan Vivo could be, at least in part, applied to water service projects as it provides a framework tool for planning any type of community-based activity.

1.1 Emergence of the carbon market

The origin of environmental markets is generally marked by the emergence of the 1990 Acid Rain Program in the United States. This program committed to reducing emissions of SO_2 (sulphur dioxide), the main gases responsible for acid rain, below 1980 levels by 2010. The program provided a market-based cap-and-trade program, whereby the country's biggest emitters could elect the most cost-effective manner to reduce emissions. Power plants that exceeded their emissions quotas could buy permits, while power plants that took cost-effective measures to reduce emissions could sell their excess permits. By 1995, SO_2 emissions had been reduced by over 4 million tons.

Backed by the successes of the US Acid Rain Program, the international community tackled the issue of greenhouse gases, with emphasis on the most abundant gas, carbon dioxide (CO_2). The emergence of a carbon market is rooted in the UN Framework Convention on Climate Change (UNFCCC), which resulted from the Rio Earth Summit in 1992. Subsequently, the Kyoto Protocol was signed in 1997. The Kyoto Protocol sets forth legally binding reductions in greenhouse gas emissions for governments in developed countries (Annex I countries) to be accomplished during 5-year commitment periods, with the first commitment period set for 2008-2012. Annex I countries would be subject to an average of a 5% reduction below their 1990 emissions levels.

The Kyoto Protocol required ratification by 55 countries before entering into force. After much waiting, Russia ratified in early 2005 and The Kyoto Protocol went into force on 16 February 2005.

The Kyoto Protocol has spurred the development of a robust market for CO_2, although much of the activity to date has not been directly tied to the Protocol *per se*. For example, the UK Emissions Trading System has been in effect since 2000, the European Union Emissions Trading Scheme went into effect in January 2005, and several US state-wide cap-and-trade initiatives are in place. Moreover, several small-scale forest-based and energy projects have been selling carbon in the voluntary market since the mid 1990s.

1.2. Why carbon sinks?

Atmospheric concentrations of carbon dioxide (CO_2) have increased by over one third since the industrial revolution. This increase is primarily attributed to fossil fuel combustion and also significantly from changes in land use cover (e.g., conversion of forests to agriculture). There is broad consensus among scientists that CO_2 is linked to climate change and global warming. Of course, reducing human dependence on fossil fuels and imposing legally binding targets for reduced CO_2 emissions are essential to curb atmospheric CO_2 concentrations and must be the central focus of any policy program. However, to stabilise

atmospheric carbon dioxide concentrations the international community must also slow the destruction of natural ecosystems that are important stocks and “sinks” of carbon. In addition to slowing the rate of land conversion, *increasing* coverage of vegetation (or carbon sinks) has been considered as a mitigation tool to stabilise the burgeoning concentration of CO_2 in the atmosphere. The concept of carbon sinks is based on the natural ability of trees and other plants to take up carbon dioxide from the atmosphere and store the carbon in wood, roots, leaves, and the soil. The theory behind land-based carbon trading is that governments or institutions that wish to ─ or that are required to ─ reduce their fossil fuel emissions can offset a portion of these emissions by investing in afforestation and reforestation activities, where trees sequester carbon.

The Clean Development Mechanism (CDM), Article 12 of the Kyoto Protocol, provides a flexible mechanism through which Annex I parties can meet their emissions reduction targets by purchasing carbon that is sequestered through afforestation and reforestation (and energy) activities being implemented in Annex II countries (developing countries). The idea behind this mechanism is to promote sustainable land use practices and energy usage in developing countries through the provision of carbon finance. CDM procedures and modalities have evolved significantly in response to strong criticism and debate. Several projects have been submitted to the CDM Executive Board, though none have been registered to date.

As previously mentioned, several land-use and forestry-based carbon management projects are in existence external to the Kyoto Protocol framework. These projects have been selling carbon offsets in the voluntary market to individuals, organisations and companies that would not be subject to emissions reductions through the Kyoto Protocol but that wish to offset all or some of their greenhouse gas emissions (e.g., those associated with travel, specific events, general operations). The main incentive for buying carbon through the voluntary market is for corporate social responsibility reasons. However, it should be noted that the development of these projects emerged out of the signing of the Kyoto Protocol and the subsequent creation of a carbon market.

2. The Plan Vivo system

The Plan Vivo system is a set of guidelines, procedures and standards to provide certified carbon offsets from rural communities through activities to restore ecosystems; prevent land degradation; conserve biodiversity; protect watersheds; and promote sustainable livelihoods. A carbon credit is a quantifiable, certified reduction in carbon emissions to which a credible claim of ownership can be made.

With the support of project technicians, Plan Vivo participants develop management plans that are evaluated for their potential to sequester carbon using evidence-based technical specifications, and the carbon offset is registered for sale in a carbon trust fund. The system provides a cost-effective and efficient framework through which carbon offset potential can be assessed across a large number of small-scale activities. The Plan Vivo system was developed with DFID funding in Mexico and has since been extended to projects in India, Uganda and Mozambique with funding from other sources.

Because the Plan Vivo system aggregates the carbon offsets across numerous small-scale activities, rural communities and small-scale farmers can participate in emerging carbon markets in a cost-effective way. Furthermore, the revenue stream generated by carbon sales can cover start-up costs associated with land use activities that would not otherwise be financially viable.

Many governments, companies and individuals are now taking steps to offset their greenhouse gas emissions. Plan Vivo certificates have been supplied to a variety of companies and organisations that want a credible measure of their sustainability investment.

Since the development of the Plan Vivo system in 1996, the system has evolved and developed substantially based on experiences and trial and error. The detailed description of the system that follows has emerged as the most efficient way to operate a Plan Vivo project.

2.1 Plan Vivo system: institutional framework

There are five main players in all Plan Vivo projects, each with distinct responsibilities and roles that are essential to the efficacy and success of the project: the project administrator, the technical team, the farmers (or carbon producers), ECCM and BR&D (see Box1). In order for effective and transparent delivery of Plan Vivo projects, the establishment of a credible structure to co-ordinate delivery of Plan Vivo projects is vital. A credible structure gives confidence to overseas investors and institutions and facilitates transparent accounting for the participants in Plan Vivo, such as farmers.

1. ***The project administrator***. The project administrator is responsible for co-ordination and management of the project on the ground. The project administrator's role can be divided into two areas that are linked: service provision and trust fund management. The administrator acts as the intermediary between farmers (carbon service providers) and carbon buyers. As the primary service provider to participating communities, the administrator mobilises and organises community members for training and subsequently registers the farmers into the project. Once farmers are registered, the project administrator will review the land use plans of each individual farmer, conduct carbon sale agreements with farmers, administer all carbon service payments, and organise monitoring.

The project administrator is also responsible for the management of the carbon trust fund, which is essentially a bank account where the carbon finance is held. Funds from carbon purchases enter into the account, from which a percentage is used to cover administrative costs, and the remainder (approximately 60% of all carbon funds) is administered to farmers. Furthermore, the project administrator maintains a database that contains information about participants, carbon sequestration per hectare, carbon payments, monitoring results, and carbon purchases. The project administrator is usually an existing organisation with extensive understanding of the local conditions and project experience in the targeted communities. Different models can be considered for the structure required to administer Plan Vivo projects. These include:

- A governmental department or affiliated body acting as host and project manager. (We are unable to provide an example of this because we have never worked under this model. Indeed, we believe that working with a government agency in this capacity ─ i.e., administering a carbon fund ─ is potentially risky as it can sometimes be difficult to track finances entering into government institutions. Moreover, changes in government and policy are more likely to have a direct, possibly negative, effect on the project.)

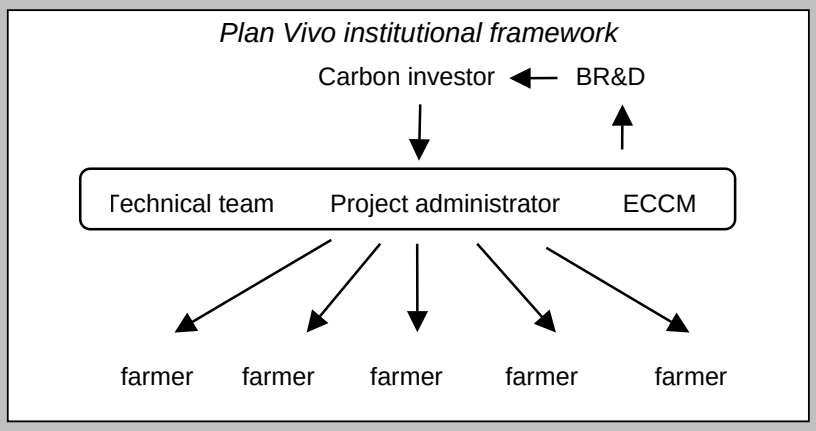
- An existing non-governmental organisation (NGO) acting on a regional basis as host and manager. The Uganda and India projects were developed under this model. In Uganda, a Ugandan NGO, The Environmental Conservation Trust of Uganda (ECOTRUST), manages and administers the project. They have a great deal of experience in grant management for rural development in the project area. In India, a Karnataka-based NGO called Women for Sustainable Development (WSD) manages and administers the project. WSD has extensive experience working on poverty-reduction projects (with an emphasis on women) focused on land use and energy in the project area.

- An independent trust fund/not-for-profit company (NFPC), established specifically to deliver Plan Vivo, with technical support delivered through partnership with an NGO. In Mexico an independent organisation was created with the sole mission of managing and administering the Plan Vivo project. The organisation is called Ambio, and consists of two full time staff members and approximately 3 part-time staff.

  (More about project administration will be covered in Chapter 3.)

2. ***The technical team***. In a Plan Vivo project, the technical team is responsible for aspects related to the development of forestry systems, data collection, and making measurements associated with calculating carbon sequestration. It is preferable that the technical team is an institution or organisation based in the host-country. The technical team must design agroforestry systems that meet the needs of participating farmers, and provide extension support and training concerning these systems to participants who implement them. Often the technical team will take the lead in obtaining seedlings, collecting germplasm, and developing tree nurseries (if needed). Furthermore, the technical team supports activities that require field measurements, such as for carbon baseline determination, and will also supply ECCM with necessary data where available (see Chapter 4 for more detail on technical work).

Box 1: Structure of the Plan Vivo institutional framework.



3. ***ECCM***. ECCM developed the Plan Vivo system in Mexico and has subsequently worked to expand the network of projects using the Plan Vivo system to India, Uganda, and Mozambique. To date, ECCM is involved in all Plan Vivo projects, although in theory the Plan Vivo system could be implemented without the involvement of ECCM, and the tasks taken on by ECCM could be undertaken by another project partner. ECCM is generally involved in project selection and design. ECCM provides training for project partners in Plan Vivo administrative systems, trust fund management and participatory planning methods. ECCM also provides training sessions to participating rural communities relating to climate change, carbon trading, and what participation in the Plan Vivo system entails.

   ECCM also provides technical support in the development of technical specifications (see section 4.1 for more detail on technical specifications), which includes data collection, carbon modelling, and development of a carbon monitoring program.

   ECCM frequently plays a large role in attracting carbon buyers and by promoting the project to clients.

4. ***The farmers***. Farmers, of course, play a crucial role in the success of a Plan Vivo system as they are responsible for delivering the ecosystem service, in this case carbon. The key responsibility of farmers is to engage in a land use planning process that is both sustainable and economically beneficial. Farmers must then commit to implementing a specified land use system. Feedback from farmers regarding the relative success of land use systems in terms of seedling availability, growth, survival, and market structures for products is key to the development of a Plan Vivo project. In this way each project is an ongoing learning process with numerous iterations between relevant stakeholders.

5. ***BioClimate, Research and Development (BR&D)***. BR&D is an independent non-profit organisation that oversees the development of the Plan Vivo system and standards. BioClimate Research and Development (BR&D) also provides escrow service (an escrow is when money is held in trust by a third party to be turned over to the grantee only upon fulfilment of a condition) between carbon investors and projects and issues all Plan Vivo carbon certificates to buyers.

2.2 The Plan Vivo project cycle

The project cycle is a chronological sequence of events that take place in Plan Vivo projects providing the context in which the project tasks occur. A graphic of the Plan Vivo cycle is shown in Box 2.

2.2.1 Introduction

Before beginning any project activity on the ground it is first necessary to conduct a feasibility study. The primary objectives of a feasibility study are to identify possible partner institutions and make recommendations about the institutional structure and roles. It is also important to identify risks associated with land tenure, forest law, and laws surrounding the creation of trust funds. Furthermore, it is necessary to scope out the availability of technical data and information and also useful to make an estimate of the extent and magnitude of ecosystem service that is possible (e.g., potential carbon storage; extent of watershed protection; pollution controls; riparian restoration). Ideally, at this stage some initial community consultations could be made to assess the level of interest and elicit general opinions concerning specified activities such as tree planting.

Once project partners are identified, the target groups or communities must be selected. Often local partners will already have experience working with communities and so can provide insight into this process.

A. ***Organisational capacity***: It is generally easier to work with communities that have some existing organisational capacity, though this is not always possible and can result in the exclusion of some communities that otherwise would be good candidates.

B. ***Land tenure***: The main requirements when selecting groups or communities are an interest in tree planting or agroforestry systems, and proven tenure or title to the land where the trees will be planted. Land tenure is very important so that a claim of ownership can be linked to carbon offsets. While finding communities with an interest in tree planting may be straightforward, finding groups that can demonstrate land tenure can prove to be more difficult. In many cases the land tenure of rural communities is difficult or impossible to prove as land laws are informal or not properly enforced. In many countries land reform laws have been passed but are not yet adopted at the local level. In some cases there is a traditional system of land allocation among locals, though deeds will not be formalised. Working with local institutions and government agencies is critical to understanding the local land tenure system and assisting participating communities in obtaining proof of land tenure. At times it is not possible to obtain actual titles, though if it is very clear that tenure is lawful and widely recognised this should not be an obstacle. It should be noted that Plan Vivo often operates on communal land. In these cases the communal land tenure must be proven, and the partitioning of carbon payments among the community members must be transparently agreed upon in advance.

C. ***Complementary to government policy***: It is very useful to ensure complementarities with the programmes of government agencies and institutions. This may open doors for possible collaboration, and ensures transparency of the project. Often, project activities will fit into local policy frameworks, which greatly facilitates uptake of project goals. For example, in the Plan Vivo Uganda project, it made sense to work with the local forest department to develop a tree nursery because the collection of wildlings and identification of suitable mother trees in the nearby forest reserves were activities largely embedded in their existing mandate.

D. ***Baseline***: It is also necessary at this stage for baseline information to be collected. This generally includes both a socio-economic and a carbon baseline to establish pre-project conditions. A socio-economic survey includes information such as income levels; sources and type of income-generating activities; land use and agriculture practices; level of education; and energy use. In addition, it is necessary to establish a carbon baseline. This is essential in order to measure subsequent carbon benefits (i.e., increased carbon sequestration). The carbon baseline work involves developing a methodology that effectively characterises the carbon sequestration at the start of the project, and also the projection of carbon sequestration that would have occurred in the absence of the project. This is necessary to enable long-term measurement of benefits relative to a baseline. For water services some information about pre-project hydrological factors (e.g., flow, water quality, and sedimentation rates) would most likely form the basis of a baseline. The general approach to setting a project baseline is as follows:

   1. Establish a starting point (e.g., the initial stock of carbon in project lands, or the initial water quality, flow, and sedimentation rate).

   2. Identify future changes in these parameters in the absence of the project based on prevailing (land use, watershed management) practices in the region.

   In terms of identifying the most likely future scenario, the UNFCCC Clean Development Mechanism (CDM) requires the use of one of three approaches to determine the baseline (for forestry projects):

   - Existing or historical changes in carbon stocks within the project boundary.
   - Changes in carbon stocks within the project boundary from a land use that represents an economically attractive course of action, taking into account barriers to investment.
   - Changes in carbon stocks in pools within the project boundary from the most likely land use at start of project.

   A baseline should take into account the project boundary, leakage potential, and relevant national and/or sectoral policies and circumstances ─ such as sectoral reform initiatives ─ that would influence the initial situation in the absence of the project. In carbon projects, the project boundary encompasses the area in which all greenhouse gas emissions under the control of the project participants are attributable to the CDM project activity. Further, it is necessary to assess all potential causes of “leakage”. In the case of carbon projects, leakage is defined as the net changes in greenhouse gas emissions occurring outside the CDM project activity boundary, which are measurable and attributable to the CDM project activity. In simple terms this means that leakage is the indirect effect of project activities that lead to a change elsewhere (e.g., the displacement of activities that are destructive, polluting, and/or resource intensive to areas outside of the project boundary). These sources of leakage must be identified, monitored, and quantified throughout the life of the project.

2.2.2 Training

Individuals and communities who express interest in participating in the project, or those who are targeted for pilot activities, must first receive training. It is absolutely essential that participants enter into the project voluntarily, and that they understand precisely what is involved in the most transparent manner possible. This is of particular importance when

individuals are selling ecosystem services, and thus are responsible for meeting specified targets in terms of some other environmental parameter (e.g., tree growth and survival). At this stage it is imperative that participants understand the following:

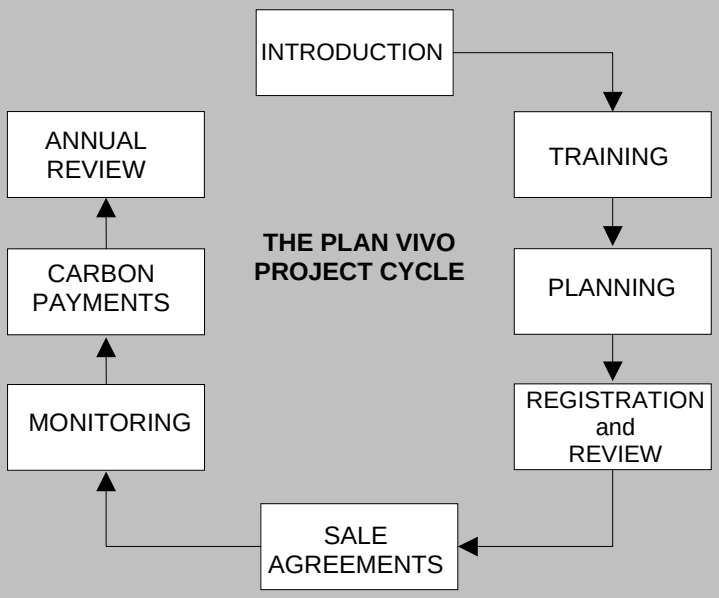
- What they are selling? In the case of carbon services it is necessary to convey the concept of carbon (for which there is often not a word in local languages); how trees store carbon as they grow; and how carbon can be quantified and sold.

- Why they are selling it? It is necessary for participants to understand the impetus behind the market for ecosystem services. In the case of carbon service projects, training sessions are used to explain the problem. Background information about climate change and global warming is provided, and the associated international efforts to mitigate high concentrations of atmospheric CO_2 are covered in this session. The basics about carbon trading are explained – specifically how countries from the north pollute more and thus will buy carbon from farmers in the south who are planting trees for this purpose.

- What are the conditions for making the sale? Participants are informed that if they wish they can sell carbon by planting trees. At this stage all participants must clearly understand that in order to benefit from ecosystem service payments there are certain requirements that they must meet. For example: land use activities must be implemented according to specific management plans that are approved by the project; all activities are subject to periodic monitoring on a fixed schedule; and no payments will be made if conditions are not met (e.g., to keep trees alive).

It must be made very clear to participants that they are not being given trees (or another environmental service) to use entirely as they wish, but that they are selling something that is like other commodities in that maintenance and quality assurance are required.

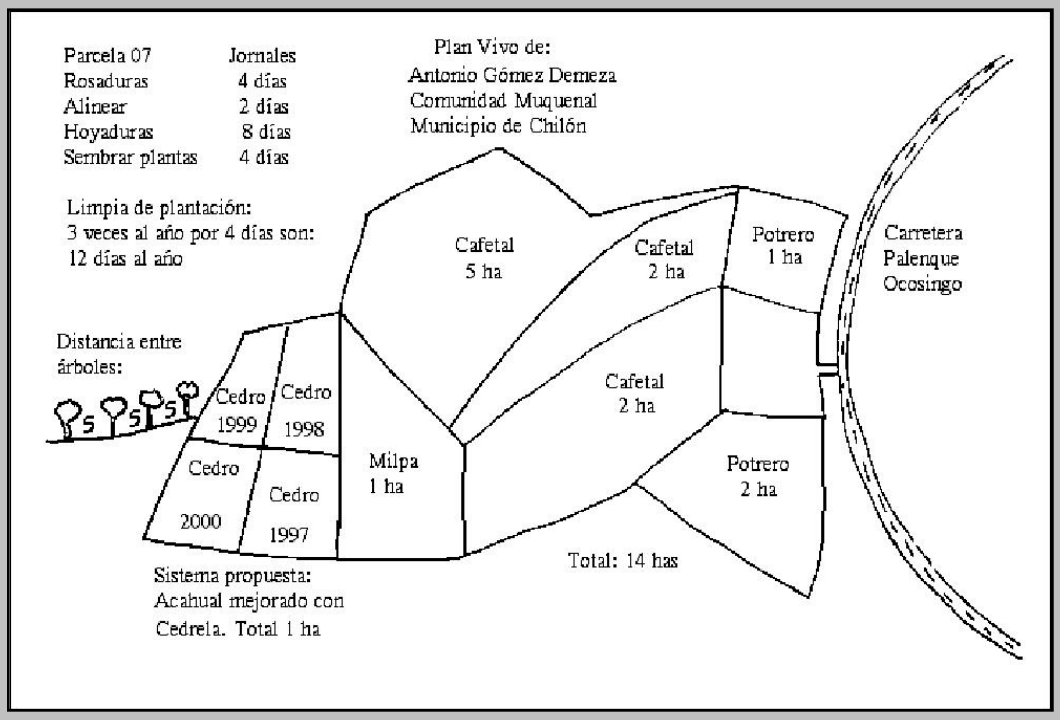
Box 2: The Plan Vivo project cycle



2.2.3 Planning

The planning stage is crucial to the success of an ecosystem service project. During this stage the project implementers consult with the community in a fully participatory manner to establish what land use systems are most suitable based on their needs and requirements, and the ecological viability. This stage is particularly crucial when dealing with entire communities, as opposed to individual farmers. It is critical to achieve consensus across the community before entering into sale agreements for the provision of carbon services. This is of particular importance as the agreements generally include management plans for land that is communal. The requirements, conditions, and benefits must be conveyed to the community in the most transparent manner possible.

Box 3: A Plan Vivo management plan



When working with individuals, farmers must decide exactly how much land they wish to register into the project, and then they must specify which land use system they plan to implement on each portion of this land. As will be mentioned in more detail later in this document, based on consultations with participants the project establishes a short “menu” of land use systems for which technical specifications exist. Farmers then choose which of these systems s/he would like to implement.

Both individuals and communities must elaborate their land management plans on paper in the form of accurate Plan Vivo maps which specify the intended land use systems (see Box 3). A Plan Vivo map is tool for planning, managing and monitoring agroforestry activities and carbon service provision. It is also a means of communication between the producer and the trust fund/project. A ‘Plan Vivo’ map shows all the different land that the producer owns and the land use or vegetation type of each area. On this the producer marks where he/she will implement new activities and provides a work programme showing activities, dates and necessary inputs (in terms of labour and materials) based on the producer’s work

expectations. The project team should recommend that producers elaborate these plans together with their family as the work required and resulting benefits may affect the entire household.

2.2.4 Registration and review

Once they are completed, individuals and communities must submit their Plan Vivo maps to the project implementers for review. If plans seem viable and do not show any potential for leakages and risks they will be formally registered. (Leakages are when activities are displaced as a result of project activities. For example, if farmers submit plans to establish wood lots on all or most of their existing agricultural land, it is almost certain that these farmers would, in turn, convert new areas of forest for agricultural production. Obviously, this situation should be avoided.) At this time all of the farmer's details are entered into the project database, including a carbon sequestration value corresponding to the land use system each farmer has elected to implement.

2.2.5 Planting

As project participants are formally registered they will be eager to begin planting. Before farmers begin planting there are some important things to ensure:

- Identification of the carbon buyer**.** It is preferable to identify a carbon buyer prior to planting. Otherwise the main risk is that once planting has occurred farmers will expect carbon payments, resulting in undue confusion and scepticism if the project is required to withdraw the promise of carbon payments after participants had invested in seedlings and gone through the hard labour of planting.

- High quality supply of seedlings. Clearly it is necessary to consider the quality and production of seedlings prior to the planting stage. This is a critical component for a successful afforestation initiative. In many places the supply of seedlings is limited or non-existent. Furthermore, in many regions it is becoming increasingly hard to find native seedlings, as the widespread popularity of eucalypts and pine has changed the face of local tree nurseries. Therefore, seedling supply is a challenge which must be considered from the outset. Seeds and wildling sources must be identified and proper nursery management techniques implemented.

- Provision of training and extension. As participants become registered it is necessary to provide training on agroforestry techniques such as planting and establishment; maintenance (e.g., pollarding, pruning); management (thinning, harvesting); and nursery management (where applicable). Sometimes the community members themselves emerge as experts on these topics.

2.2.6 Sale agreements

All farmers and communities that register into the project must enter into sale agreements with the trust fund manager once carbon purchases are identified. The sale agreements specify the amount of carbon to be sold (in tonnes), the price of carbon per tonne, the total payment amount, and the payment amount at each instalment according to a schedule. The sale agreement can also specify requirements to re-plant after harvest, or any penalties if contractual conditions are not met.

In the case of a community-wide collaborative agreement, it is necessary to define clearly, and in consultation with the community, the rights and responsibilities of all parties involved. This helps to avoid possible misunderstanding and conflicts in the future. The collaborative agreement states that involvement with the Plan Vivo project is a voluntary action. The agreement is signed by all parties and sets out a work plan specifically defining:

1. The producers, families and groups who are interested in participating in the project.

2. Whether the work is to be carried out by individuals, groups, or the whole community and specifying which activities will be done by which parties.

3. Who is the contact point with the project (this could include a village. leader/chief/mayor/councillor, community technicians, or other representatives).

4. When planning activities will be carried out.

5. When meetings will be held in the community/group to discuss progress.

In the Plan Vivo system, carbon sequestration is estimated into the future and sold on the basis of this future projection. In the case of Mexico, carbon estimates are generated from models that run 100 years into the future. Therefore the individual farmers are technically committed to maintaining the land use systems for that length of time. In the case of the other projects, commitments were shortened to 25 years (Mozambique and India) and 50 years (Uganda) to lower the risks associated with project failure.

2.2.7 Monitoring

The purpose of monitoring is to verify the carbon sequestration by assessing the survival and growth of the agroforestry systems relative to expected survival and growth, in order to evaluate the quality of management by the producer and to identify technical problems and possible solutions.

Monitoring is carried out by community technicians specially trained by project technicians. Monitoring is carried out periodically at 100% of the plots registered with the Plan Vivo project. For example, in the Mexico project monitoring is conducted in years 0, 1, 3, 5, 10, 15 (and every five years subsequently). Data collected during monitoring is entered into the project database.

Monitoring targets for each agroforestry system used by farmers registered with the project are defined in the relevant technical specification for that land use system. Monitoring targets are defined with the aim of ensuring that the estimated carbon sequestration potential is being achieved as expected. Although the exact parameter used for each agroforestry system differs depending on the project and land use system, in general monitoring indicators are as follows:

- In the first 3-5 years monitoring indicators are based on the successful establishment of the agroforestry system specifying the minimum required planting density, maximum allowable mortality, and the condition of seedlings.

- From year 5-10 onwards, indicators are based on the growth of trees in terms of diameter at breast height (DBH) and tree height, in addition to the number of trees surviving per hectare.

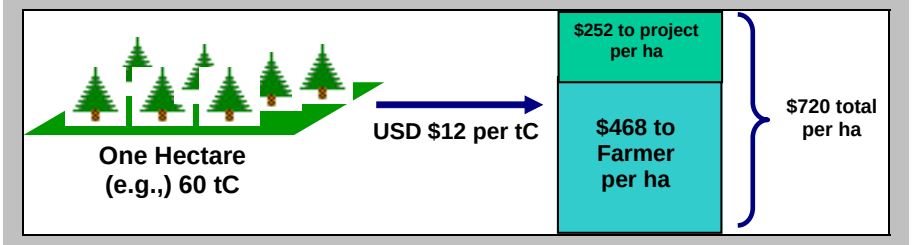
In order to cut costs and build capacity in local communities, most of the monitoring is conducting by community technicians who receive training on the methodological requirements and protocols. Training of these technicians is ongoing, and requires the development of a set curriculum to ensure some level of standardisation across communities. Each year the members of the project staff re-monitor 10% of plots that have been monitored by the community technicians in order to assess the quality of monitoring data collected. If the results as recorded by community technician and project technician differ by more than 10%, a review of the community technician's data collection is conducted. If the review indicates that errors were due to a lack of training or support then the project will accept the result, re-train the technician, and verify that results are correct in the next year.

2.2.8 Carbon payments

Carbon payments are made to farmers/communities on the basis of the results of technical monitoring, and thus in instalments that follow the monitoring schedule. In order for funds to be released from the project trust fund a payment authorisation must first be approved by trustees.

Furthermore, it is important to note that approximately 60% of the total carbon finance is paid to the farmers/communities. The remainder is retained by the project implementers to cover project costs. This breakdown and price per tonne of carbon is pre-arranged, and generally project-wide. Box 3 shows an example of a carbon payment on a per hectare basis. It is important to note that farmers will often have more than one hectare registered into the project. It is also important to note that payments are administered to farmers in instalments over several years. For example, in Mexico and Uganda farmers receive payments in years 1, 2, 3, 5 and 10. In Mexico each payment is equal to 20% of the total amount, while in Uganda the first two payments are slightly higher proportions of the total. In Mozambique the carbon payments are administered on a yearly basis over 7 years, with the first payment equalling 30% of the total and the subsequent years equalling either 10% or 12% of the total.

Box 4: A Plan Vivo carbon payment



In India the carbon payments are administered quite differently. The carbon funds are used to fund the operational and direct costs associated with tree planting and biomass

production. For example, funds are used to develop nurseries and irrigation systems, and to grow seedlings.

Carbon finance is held in a trust fund and managed by the project administrator. This “trust fund” can also be a simple bank account, though generally trust funds offer better interest rates.

2.2.9 Bi-annual meetings

The project organises bi-annual meetings, which representatives of all communities and groups involved with the project may attend to discuss progress and problems with carbon provision activities. In these meetings, representatives present plans for development of activities in their groups, and progress reports from the last 6 months. Monitoring visits are planned and various aspects of the project administration are discussed.

3. Plan Vivo administration

Implementation of a Plan Vivo project requires administrative systems to be in place to ensure that the ecosystem services are administered properly. A few key aspects of the Plan Vivo administration systems will be described in this chapter.

3.1 Documentation

Formal documentation is essential to ensure that sales are officially recognised by all parties and that the conditions are transparent. Furthermore, using the documentation allows for strict adherence to the standards and requirements, and provides a paper trail in cases of misunderstanding and external verification. The most significant documents are summarised in the table below.

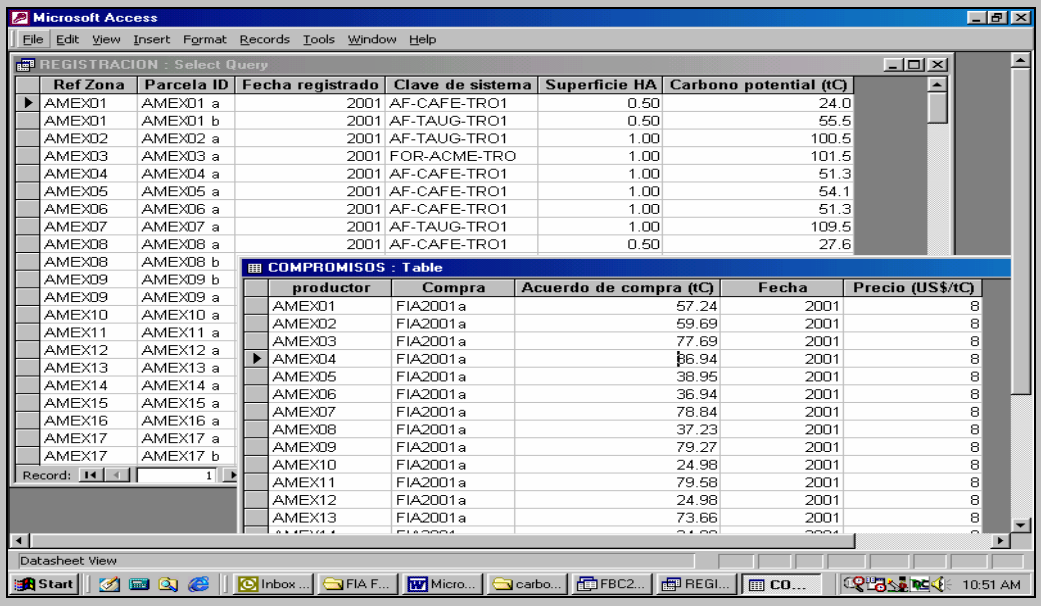
Table 1. Summarisation of documentation required for Plan Vivo project administration

Document	Information contained in document
Letter of registration	Land use system; land area (ha); number of plots; amount of carbon offset (tonnes); saleable carbon; and portion of carbon for risk buffer.
Sale agreement	Principle rights and obligations of the farmer, including monitoring and payment schedule. Details about carbon sales, information regarding the requirement to pay 5% of their carbon sales to another farmer for replanting if they fail to replant their own land after timber felling. Obligations: make all possible efforts to maintain registered land use system for a specified number of years, allow for periodic monitoring of plots to enable crediting of carbon stocks.
Carbon sales booklet	Held by farmers/communities. A detailed description of each transaction between the farmer and trust fund with reference to dates, monitoring, carbon crediting, carbon sales, payment.
Payment authorisation	When payments are made to farmers, the release of funds held in trust must be authorised by two or more trustees of the fund.

3.2 Database description

In order to ensure accurate and reliable recording of transactions with carbon producers, all details of registration, monitoring, sale agreements and carbon payments are recorded in a single project database. The details of each producer are recorded along with all the details of plots registered for carbon offset provision (including carbon offset potential). Monitoring data, amounts carbon accredited to the producer, and details of each individual carbon sale and payment are recorded. A screen shot of a project database is shown in Box 4.

Box 5: A Plan Vivo database



3.3 Carbon risk buffer and other risk mitigation

Though the entire amount of carbon sequestration potential per hectare is calculated, the sale agreements with communities and individual farmers state that only 90% of the total sequestered carbon is actually sold. The remaining 10% of carbon is maintained in an unsold risk buffer. This serves as a contingency fund for the project in the case of carbon loss from already allocated and agreed upon carbon purchases as a result of unforeseen natural disasters or events such as drought or fire. Sale agreements provide the details of how much carbon for each plot will be retained to the risk buffer contingency fund. Carbon in the risk buffer is recorded in the project database so that the project has accurate information of the total size risk buffer carbon.

Risks associated with project failure should be dealt with at the design phase, though it must be said that often risks are not known at this early stage. The Plan Vivo system attempts to incorporate various mechanisms that address the main risks. Still, it is clear that some risks are difficult to mitigate and the true degree and outcome of these risks is yet to be understood. In addition to maintaining a risk buffer, constant monitoring and project presence is believed to provide incentives for prolonged participation and adherence to land use commitments. It is hoped that the benefits of the land use system will foster a desire for long-term adoption. In particular, if markets for products such as timber persist into the future it is likely that land use commitments in Mexico and Uganda will be maintained (i.e., stocks will be replanted after each rotation). In India and Mozambique the land use systems focus on fruit trees and soil-improving trees. Fruit trees are likely to be maintained as long as they yield fruit.

It is also important to note that carbon sequestration estimates are extremely conservative. Rather that crediting farmers for total cumulative sequestration the average sequestration is credited. When data is available in ranges, the most conservative figure is always used. In addition, most Plan Vivo planting occurs on degraded or barren land. Therefore,

afforestation activities would result in increased soil carbon, though in all projects this figure is assumed to stay fixed at zero.

3.4 Plan Vivo standards: issuance of certificates

All carbon that is purchased from Plan Vivo projects is issued to buyers in the form of Plan Vivo certificates. These certificates are issued to buyers only if the projects are meeting the Plan Vivo standards, or are making demonstrable efforts to move towards compliance.

4. Plan Vivo technical work

Before any carbon sales can be made through the project it is necessary to estimate carbon sequestration potential in a transparent way to ensure that the project is technically sound and credible. For this to be possible there are a few aspects to be considered. These are described below.

4.1 Technical specifications

The carbon sequestration potential of proposed agroforestry activities is assessed using a set of technical specifications for that land use systems. As mentioned previously, land use systems are designed in consultation with the participating communities. A technical specification is analogous to a recipe for a land use system. It includes information about growth, establishment, and maintenance of a system. It also specifies the species composition, planting density, and harvesting requirements. These specifications are evidence-based documents that define the carbon sequestration potential of a given land use system that meets certain minimum management requirements within a range of ecological conditions. Technical specifications also define monitoring targets for the verification of this estimated carbon potential. If land use activities are implemented according the management requirements outlined in technical specifications for a given land use system, the corresponding carbon sequestration estimate for that land use system will be accurate.

One main benefit of using technical specifications to describe land use systems is that they allow accurate assessment of the carbon sequestration potential that conforms to these specifications without requiring costly biomass surveys for each area. Biomass (carbon) accumulation depends on the productivity of the species/area and the management regime. It is therefore necessary to define both the agroforestry practices that will be used and the environmental conditions that will affect productivity.

The agroforestry systems that are designed for the project should be simple for many reasons. In order to generate robust carbon sequestration estimates good data about growth must be obtained for all tree species. This is very commonly a major limitation and can pose a problem when developing technical specifications. It is best to keep the number of species to a minimum to reduce the overall requirement for data. Furthermore, supplying seedlings can be difficult in areas where native tree planting is not commonly practiced; this is further complicated if the number of tree species is high. Finally, participating farmers and communities often need initial training and extension support to properly establish and maintain land use systems. Again, simple land use systems make this process far easier.

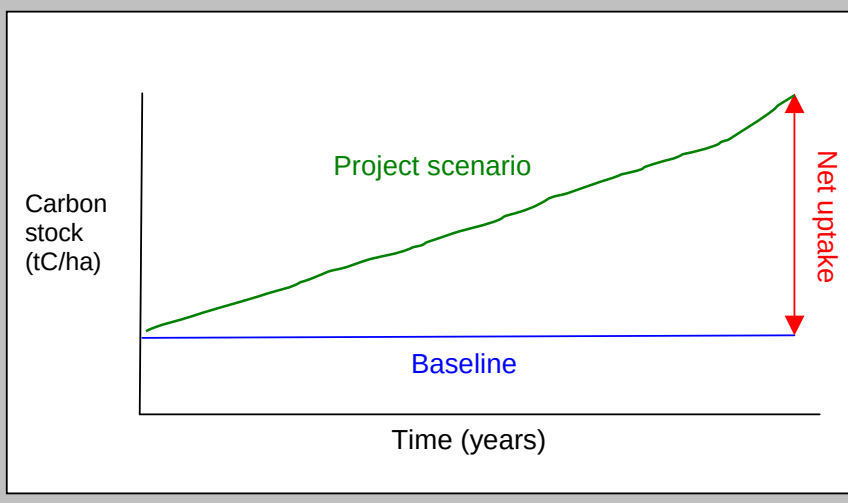
4.2 Models and baselines

Potential carbon sequestration for each land use system is calculated by using a simple carbon accounting model. Information about the species growth rates, density, and composition of each land use system is inputted into the model and these data are converted to estimate carbon sequestration on a per hectare basis for each land use system. (See Appendix 1.)

To accurately assess total carbon benefits of a project a carbon baseline must be established (see Box 5). A carbon baseline must assess what extent of carbon sequestration is present at the start of the project and also into the future under the non-project scenario. Future conditions can be predicted by analysing past trends in deforestation and land use.

Often, data obtained by remote sensing are analysed to determine past trends in land use. The same principles would most likely apply for trends in water usage.

Box 6: Graphic of a carbon baseline



4.3 Nursery management and seedling supply

Supplying seedlings to participant farmers can present a problem and should be considered from the outset of the project design phase. Often there is very little variety in local nurseries and the seedlings themselves can be costly and/or of questionable quality. Nursery development can be part of funded project, though the local community must be part of the process to enable handover when funding sources diminish. It is often possible to encourage participant farmers to develop small nursery operations to respond specifically to the market resulting from the project. It can sometimes be possible for the project to subsidise the cost of seedlings by providing some form of support for these small operations. In addition, it is sometimes possible to develop partnerships with government-run nurseries. This type of collaboration can result in dedicated supply of tree species required for the project.

5. Plan Vivo case studies

This chapter will provide brief descriptions of four Plan Vivo projects.

5.1 Scolel Té, Mexico

The Scolel Té project in Chiapas, southern Mexico was one of the first projects in the world that addressed carbon service payments with small-scale farmers and communities on a pilot basis.

In 1994 researchers from the University of Edinburgh and El Colegio de la Frontera Sur (ECOSUR) in Chiapas received funding from the European Commission and the Mexican government to conduct an initial appraisal of the technical options for sequestering carbon in agroforestry systems. The researchers established a stakeholder group of interested farmers drawn mainly from one of the farmers' unions operating in the region – the Union de Crédito Pajal Ya Kac' Tic.

Following a six-month feasibility study in 1996 by Mexican and British researchers in collaboration with representatives of indigenous farmers from the northern highlands of the state of Chiapas, the project began on the ground. A trust fund, the 'Fondo-BioClimatico', was established at a local branch of the national development bank to pool both carbon benefits from multiple agroforestry activities and the finance to support these actions.

In 1996 the funding was obtained from UK-DFID's Forestry Research Programme to research and develop the requirements of a system for planning and administering the production and sale of carbon services from small-scale landowners in a way that would be consistent with the improvement of rural livelihoods.

The project operates in over 30 communities, among seven different indigenous Mayan and mestizo groups of Chiapas and Oaxaca. More than 600 individual farmers are registered into the project, and there is a permanent waiting list for entrance. This region is one of considerable biodiversity, containing some of the largest North American tropical rainforests, most of the remaining cloud forests, and many endemic species. The region is populated predominantly by smallholder farmers producing maize and beans for subsistence under the traditional agricultural system known as *milpa*, plus coffee, fruits, firewood, textiles and wage labour for cash.

In 1997 the project was boosted by the Federation Internationale de L'Automobile (FIA) Foundation, who committed to an ongoing purchase of approximately 20,000 tonnes of CO_2 offsets per year to compensate for greenhouse gas emissions associated with the Formula 1 and World Rally Championships. Since 1997 the project has gradually expanded, improving its administrative and technical systems through experience and a number of external reviews. Since 2000, the project has diversified its list of clients to include the World Bank International Bank for Reconstruction and Development (World Bank-IBRD), the rock group Pink Floyd, and the World Economic Forum through Future Forests.

This project has been self-sufficient through funds from carbon purchases since 1999. The organisation that administrates the project and trust fund is called, Ambio, and was created to fill this role. ECOSUR and ECCM have provided technical support since the beginning of the project and continue to offer periodic guidance when needed.

The general consensus among the participants of the project is that without carbon payments they would not have been able to implement the land use systems. At present, some farmers have 7 or 8-year old trees that will be worth considerable money in ten more years.

Land use activities include woodlots (for timber from taungya) and shade coffee systems; boundary/live fence planting; and improved fallow and communal forest enrichment planting. The main product of these systems is timber, as the prominent species are high quality mahogany and Spanish cedar, although there are numerous co-benefits such as erosion control and watershed protection.

AMBIO also works with communities to facilitate uptake of livelihood improvements that can be gained from carbon payments including fuel efficient wood stoves; improved pasture; improved livestock and livestock health; and orchid production. The project also works with communities to mitigate fire risks and reduce erosion.

5.2 Plan Vivo India

The Plan Vivo project in India works with rural communities in the southern state of Karnataka, focusing on agroforestry and fruit orchards, and community renewable electricity generation.

This project began in 2000. The local project administrator is an NGO called Women for Sustainable Development (WSD). WSD has trustees and staff who have worked in Kolar District, Karnataka for 20 years. They have organised farmers in five Taluks of the district for dry land development, primary health care, and primary education as well as working on overall empowerment issues. They have trained coolies (marginal farmers or landless families engaged in daily agricultural labour) to run a coolie credit fund, a women's fund, and small livestock-rearing activities. WSD makes use of contacts and infrastructural improvements already made in the district by NGOs, as well as contacts with Forest Department officials and Panchayat members at all levels if necessary.

In Karnataka, more than 33 percent of the population lives below the poverty line. Women are often faced with particularly difficult conditions and many of India's women are malnourished. In Kolar District, WSD is working with low-income and marginalised farmers and their families to plant orchards with mango, tamarind, fuel wood, and other trees. The sale of carbon credits gives farmers the capital needed to establish the orchards, which provide long-term income from tree products (mostly fruit), building up regional self-reliance in agriculture. Another benefit is increased local employment opportunities for agricultural labour, often scarce in the Kolar District, where many farmers have to leave for the city or face severe food shortages. Other important components of this project are training (including grafting techniques), certification of organic fruit, plot assessments, and biomass estimation.

Due to low rainfall, only one crop is cultivated during the rainy season. Introduction of suitable horticultural tree crops such as mango and tamarind can enhance carbon sequestration and provide fruit, timber, fodder and fuel. High investment costs involved in establishing these crops hinders their expansion but provision of carbon finance to the farmers, as well as financial returns from the crops, can encourage uptake of tree planting.

WSD also organises biomass energy projects by helping communities set up small-scale gasifier plants that convert biomass to gas that is used to run converted diesel engines. These either replace diesel engines as electricity generators or wired into grids where connections are absent or unreliable. The project focuses on two biomass gasification projects. One is used to generate heat for marigold drying (used to make dyes), while the other is used to power a water pump used by a vanilla growers' co-operative. Local communities benefit by selling biomass wastes such as coconut husks.

The community also benefits from household biogas burners which efficiently burn cow dung for cooking purposes. Through the project families can also "rent" a cow for both dung and milk.

It is important to note that this project differs significantly from the other Plan Vivo projects in the way that it is run. In this project, 100% of the carbon finance entering into the project is used to cover project costs and to invest into community infrastructure to facilitate the project activities. In this way community members to not receive any direct payments, but collectively they benefit from project activities

5.3 Trees for Global Benefit, Uganda

During 2002-2003 the Uganda Forest Sector Coordination Secretariat (UFSCS) funded a feasibility study to determine the potential for the production and sale of climate change mitigation services within the activities of Ugandan forestry and agricultural sectors.

In May 2003, ECCM held a training and capacity-building workshop at the Ryeru sub-county headquarters in Bushenyi District. In June 2003, implementation of a pilot phase Plan Vivo project was initiated. Project partners were identified: ECCM, ECOTRUST (a Ugandan NGO), and ICRAF (International Centre for Research in Agroforestry). ECOTRUST is an organisation with a great deal of community-based projects in Uganda. Indeed, they have many activities in Bushenyi District, which has proven to be an asset in terms of entry points and access.

Thirty-one farmers who own small land holdings were chosen to participate in the pilot phase. All farmers are members of community agriculture co-operatives, and in most cases are actively involved in local community groups established to participate in local

development projects. By utilising established community structures for communication, the project's ability to maintain consistent contact with these farmers will be greatly enhanced.

All farmers registered between one and two hectares of their land into the project. A tree nursery was established on land beside the local Forestry Department field station in Bushenyi. Project partners from ICRAF worked with the Forestry Department to collect native tree seedlings from the nearby Kalinzu forest reserve, and to obtain seeds from various sources. In order to facilitate the successful and timely implementation of the pilot phase Plan Vivo, farmers were given seedlings in the first instance. However, in subsequent planting seasons, participating farmers have been required to purchase their own seedlings.

Tree species were chosen after assessing the needs and interests of farmers in Bushenyi, as well as conducting an economic evaluation of markets for forestry/agroforestry products in Uganda. The seedlings that were available from the nursery for pilot phase planting include several native and naturalised agroforestry and timber tree species. Farmers then entered into carbon sale agreements with ECOTRUST acting as the project administrator and trust fund manager.

Carbon payments are administered to farmers in five instalments over a ten-year period, and are paid into community savings co-operatives where all participants must start accounts (most already have accounts). Each payment is conditional on the farmer meeting specified targets for each of five scheduled monitoring periods over ten years. Additionally, farmers are required to apportion 10% of their total carbon offset potential into a project risk buffer.

The first 30 farmers will be paid USD $24,000 in instalments over five years. First payments have already been made and second payments are now in progress. The first 30 farmers had exceptionally good rains and thus experienced almost no tree mortality.

Currently, additional farmers are being recruited, with 112 applications being reviewed at present.
Some of these farmers have already begun to plant, though this initial planting was met with high rates of plant mortality due to drought. Farmers are looking into inexpensive ways to make up the shortfall in seedlings this year (due to mortality) by developing very small-scale nurseries on their own farms. The seedlings for this second set of farmers were initially supplied by private nursery operators in the area. The cost of seedlings from these nursery operators is a bit high, and the project is looking into ways to subsidise seedlings and improve nursery management techniques.

Tetra Pak UK (a major packaging company) has supported the project for two years by offsetting their internal CO_2 emissions. Future Forests has also recently made a significant purchase which will allow for the inclusion of several additional farmers into the project.

5.4 Nhambita Community Carbon Project, Mozambique

The Nhambita project seeks to achieve sustainable land use and livelihood improvements within the buffer zone of the Gorongosa National Park, located in Sofala Province. The Gorongosa National Park was once rich in wildlife and miombo woodland. During the civil war tourism stopped completely and the park was heavily impacted by hunting for bush-meat, land mines and encroachment. The resistance party Resistencia Nacional Mocambicana (RENAMO) was based in the park headquarters. At the end of the civil war many displaced communities from the area began to move back, increasing the demand for land and forest resources such as charcoal. The communities practice subsistence shifting agriculture, and due to phosphorus- and nitrogen-limited soils in the region, forests are converted to new agricultural land every three or four years.

The project aims to provide sustainable alternatives to slash and burn agriculture through intercropping and interplanting. The project is also creating community focus groups for cane rat domestication, bee-keeping, timber utilisation and sustainable charcoal production. In this case, the Plan Vivo activities are part of a much larger agroforestry and forest enrichment project.

The project began in 2003, and has a 5-year grant from the European Commission (EC) to fund activities. Furthermore, small initial carbon purchases have been made to get the Plan Vivo component running. The project has greatly benefited from the secured EC grant by having funds to pay agroforestry and nursery technicians, and also to develop and maintain a large nursery. In the long run, the human resources and infrastructure specifically needed to manage the Plan Vivo component of the project will be funded by carbon finance. By that time (2008) the administrative systems will be well established and local staff will be trained. The project is also working with, and building capacity in, local institutions, NGOs and government agencies.

ECCM, Envirotrade (a private company based in Mozambique) and the University of Edinburgh are involved in the project. Currently, the Plan Vivo project is still in the initial stages. 63 farmers are currently registered into the project. Land use systems include taungya, woodlots, fruit orchards, boundary planting, and dispersed interplanting.

5.5 Plan Vivo livelihood benefits

It was not possible to compile quantitative information on livelihood benefits for the purposes of this report. However, it is possible to qualitatively discuss the potential for livelihood benefits. The extent of livelihood improvements will vary from project to project quite widely depending on local conditions such as average per capita income. For example, in Mexico the average income in the project area is four to five times greater than that of the participants in Mozambique. Therefore, the overall impact of the carbon payments is likely to

be greater in Mozambique. Furthermore, within each project site the impact on livelihoods will depend on the farmer's current activities and the positive changes made to their landuse system. It should also be stressed that the carbon payments are intended to facilitate investment into land use systems that would otherwise be impossible or inaccessible due to financial constraints. This is certainly the case in Mexico, where the carbon payments themselves are low relative to participants' annual income, but are still enough to invest in new land use systems.

To date, the full impact of the carbon payments on these communities has not been sufficiently studied or analysed, though it is predicted that when land use systems begin to generate marketable high-value products the income will be considerable in some places. This is especially true in Mexico and Uganda, where the emphasis is on high-value timber species; farmers are setting aside these trees as a type of long-term investment. Many farmers from these projects have been heard saying that money from this timber will be used to finance such things as education for children.

In the case of Mozambique, the impacts of the carbon payments themselves are likely to be more significant due to the very low annual income in this region (c.a. USD $100 per annum). However, the products that the land use systems will generate (e.g., fruit) are of lower value than timber. In Mozambique there is also a large focus on providing alternatives to slash and burn through interplanting and intercropping agroforestry techniques. These systems have indirect positive impacts on livelihoods by reducing the amount of labour associated with agriculture (not to mention the significant environmental benefits).

6. Plan Vivo lessons learned

The experiences from Plan Vivo projects have resulted in the identification of several key principles to inform the design of subsequent projects. It is likely that these lessons can apply to the design of water services projects as well. The main lessons learned are highlighted below:

- *Transparency*. Both farmers/communities and purchasers of ecosystem services require a clear understanding of their roles, rights, and responsibilities. Understanding is critical to success. For instance, participants must understand that payments are made in exchange for a commodity, and not simply aid/development money. Trust among market participants is critical. It is essential to highlight the possible risks with participants, and to avoid raising expectations.

- *Simplicity*. Farmers/communities involved in ecosystem service provision require simple, standardised procedures for planning, registering, implementing, and monitoring their activities.

- *Flexibility*. Farmers/communities must be able to have input in how the system works. Furthermore, the system may need to be adapted to varying local conditions and requirements (e.g., payment schedule, training needs, feasible land use systems, and capacity). Payment mechanisms (individual or community) can be allocated differently depending on the stakeholders involved.

- *Credibility (rigorous, evidence-based)*. The overall quality and credibility of the system should be based on verifiable, documented evidence in the form of field data, accounting records, published literature, and official statistics.

- *Incentives.* Participants must gain benefits from activities that are additional to ecosystem service payments. This provides incentives to join the project, maintain the carbon stocks (or other ecosystem service), and to contribute to the overall goals of sustainable development and livelihood improvement. The success of ecosystem service payment mechanisms can depend largely on the genuine interest of participants. Co-benefits can include timber, fruit, fodder, shade, medicinals, soil improvements, and erosion control. When the benefits are commodities themselves, it is often necessary for the project to facilitate access to markets for these products.

- *Permanence.* Ecosystem service activities (e.g., watershed, carbon) should provide long-term and sustainable changes in the lives of participants in a manner that results in the “permanent” adoption of activities.

- *Intermediary*. Experience in Plan Vivo projects has shown that working alongside an intermediary with extensive local knowledge and experience in the project area is a key to success. A good intermediary (i.e., a local NGO) can liaise between stakeholders, represent small-scale holders/farmers, organise training and implementation, and manage the aggregate benefits across numerous small-scale activities.

- *Neutrality.* It is essential to maintain a neutral position in terms of politics, religion and law. This might mean leaving the project area during times of conflict, elections, or significant religious occasions.

- *Scale.* It is extremely important to start project activities at a very small scale. This reduces the risks while allowing for extensive learning. Once systems are established and project activities are clearly defined and conveyed to local communities, scaling up can occur.

7. Key challenges

In this chapter, the main challenges that have been faced during the development and implementation of Plan Vivo projects are summarised. This is not an exhaustive list. If further information is required, IIED partners are encouraged to contact Plan Vivo project administrators directly.

A. Deforestation of native forests due to conversion to agriculture, encroachment, and development is clearly a world wide issue. There are enormous efforts to conserve remaining forests, restore degraded forests, and encourage local communities to plant native tree species rather than the ubiquitous eucalypts and pines. However, there are cases where it is not easy to strike a balance between native forest conservation and restoration and the needs and requirements of the communities living alongside these forests. In some places in the world there is such rampant destruction of native trees and forests that planting these same species on farms is not desirable to local communities. This was the case in Mozambique, where farmers are converting large tracts of old native forest every three or four years. It therefore emerged that they do not see any benefit in growing the same trees on their farm land that they had just cut down. In this case, consultations with the community revealed that the interest in tree planting was focused on fruit and soil improvements, which includes predominantly non-native agroforestry species. Project staff will focus on these systems for the on-farm planting, and will also include some planting of native trees on fallow land and on degraded forest land, as well as introducing a small-scale timber production operation to enable the marketing of native timber.

B. The supply and provision of specified and high quality tree seedlings has been a challenge in the Uganda project, and also at times in Mexico as well. At the start of the Uganda project, farmers in Bushenyi only had access to eucalyptus and pine seedlings. There were no nurseries that supplied native seedlings. When the project began to consult with the local communities it emerged that, indeed, there was significant interest in planting some of the faster growing high-quality native species, as well as *Prunus africana*, which has high-value medicinal bark. The initial challenge was to find seeds and quality germplasm. With the help of ICRAF and the Forest Department this was possible and the first year of planting was a success. Unfortunately both ICRAF and the Forest Department ceased to be involved in the project shortly after the first phase of planting. This posed a problem for future planting. The project team worked with private nursery operators by placing orders for specified seedlings. Seeds were collected in an *ad hoc* manner. The main problem was that the seedlings were quite expensive, and represented a large initial investment to farmers, which excluded many of the poorer community members. It continues to be a problem, although the project team is now working with some of the registered farmers to develop small-scale nurseries to supply the project with seedlings. It is clear that the project will need to provide training on nursery management and also subsidise the nurseries to some extent so that the price of seedlings can be lowered.

C. There is a perception that carbon finance alone is sufficient to develop a carbon service project. This is not the case and has proven to be a challenge for Plan Vivo projects. Indeed, the initial stages of project design and development are quite costly and require significant investment or donor funding. The first phase of the project includes significant technical work (i.e., baselines, technical specifications, and agroforestry extension), community consultation, training, service provision, and establishment of administrative systems. Moreover, carbon sales are generally not possible until the project has been initiated. We have found that for the first two or three years of a project lifetime (the pilot phase) donor funds are necessary for successful project implementation.

8. Watershed services

Water resources problems are faced throughout the world. Flooding, industrial and agricultural pollution, colonisation of invasive species, sedimentation, and reduced flow rates are among the problems and issues facing water users and suppliers globally. Many of these problems are directly linked to poor land use practices, and in many cases government policy fails to deal with local water resource problems, causing localised innovations to be necessary.

Referring to watershed services as markets is somewhat of a misnomer. It appears that instead of true markets, watershed "markets" are often localised bilateral, mutually-negotiated agreements between water users and suppliers. At the small-scale or community-level, these are often in the form of co-operatives or water users' associations. Furthermore, it is difficult to generate competition between the watershed service producers because potential buyers are unable to go to another watershed for required services.

This is significantly different from the carbon market, which is indeed international, and which has prices that are negotiable to some degree (particularly in the volunteer market). Additionally, the market itself is driven by an internationally-recognised urgency to reduce atmospheric CO_2 levels, which stimulates a range of buyers such as governments, private individuals, and corporations. In contrast, while water resource problems are also widely recognised, the market for localised watershed services generally does not extend beyond a given watershed.

In contrast to carbon services, the actual watershed "commodity" can vary greatly from project to project. Watershed commodities can be based on parameters such as water quality, pollution loading, flow rates, habitat or biodiversity protection, sedimentation and/or erosion control, and water table maintenance. As the commodity varies, so too will the monitoring criteria and indicators.

Because the commodity itself can vary in watershed service systems, identifying who pays for services and who supplies the services can also be a challenge. Sometimes it can be different stakeholders, while at other times the users themselves are also providing the services.

There are many examples of models that have been used in watershed PES (payments for environmental service) systems. Some examples are listed below.

- Water utilities (or some other big water user) pay for water services. Often watershed service agreements are a cost-effective alternative to an otherwise large investment (e.g., in the case of New York City, a new water treatment plant). Currently there are about 17 further water utility companies in the USA developing similar approaches to the New York City, especially where water pollution is the core problem.

- Government bodies (e.g., EPA (USA), the New South Wales Department of Land and Water Conservation) introduce market mechanisms such as "cap and trade" schemes (where an authority sets a cap on pollution and allocates tradable permits up to this limit) and offset systems (where the polluter must offset excessive pollution by purchasing water quality credits) as part of their regulations (e.g., salinity credit trading, water quality credits).

- Government bodies impose levies and/or taxes on water users (generally large industrial, agricultural and municipal users are targeted), and revenue is used for watershed management purposes.

- Water-user associations (community run) where member contributions (or dues) are linked to water consumption. These funds are then used for watershed protection (e.g., soil stabilisation, control of grazing). Participatory watershed management such as this will almost certainly require donor start-up funds.

- Upstream supply for downstream users, whereby downstream users pay for watershed services to be supplied by communities living upstream (RUPES - Rewarding Upland Poor for Environmental Services model). This is similar to the initial point above, though in there are cases where downstream users will be smaller-scale users rather than utility companies.

- Trust fund payment systems where industrial, municipal and agricultural users pay fees which are held in trust with an intermediary co-ordinating the supply of funds for different kinds of watershed protection.

It seems that the types of watershed service activities that IIED is trying to develop will most likely emerge as a series of localised consensus agreements. However, it will be essential that participation be voluntary. This is of particular importance as there is a risk that users may lack the willingness to pay for services they had historically received for free.

In addition, because the structure of watershed agreement can vary significantly from site to site, it is essential to convey the requirements in a very transparent manner, and obtain consensus among stakeholders (as has been our experience in Plan Vivo projects). While there are certainly some inherent differences between carbon and watershed services, it is clear that many of the lessons learned from Plan Vivo carbon service projects are applicable to watershed service agreements.

While tree planting is not necessarily a feature of all watershed service projects, it certainly is quite a common component. In this way, the Plan Vivo participatory land use planning approach followed by training and extension support, and the development of technical specifications for land use systems, could be applicable to many watershed service scenarios. Similarly, in the case of both types of ecosystem service systems there is a strong requirement for community consultation and consensus building. As a result, both systems face the challenge of conveying complex concepts and organisational structures that differ from other activities with which participants are familiar. In both systems participants will be subject to a specified set of conditions or contractual obligations that are linked to the payment or supply of services. Also, in both systems an intermediary will play a crucial role in the success of the project. This intermediary could simply be a facilitator.

A risk that seems inherent to both systems is the reality that in many cases benefits are not shared equally or evenly distributed. In the case of watershed services this could happen if, for example, landless farmers ─ who do not benefit from enhanced flows for irrigation ─ might lose grazing or agriculture access to previously ‘common’ lands. One way to avoid this is to provide everyone with the same rights to water, allowing the landless farmers to benefit from the sale of their water rights. In the case of carbon services not all farmers can be registered at once. There is often a waiting list that is limited by the quantity of carbon sales made through the project. Furthermore, women are often excluded from (direct) participation due to local perceptions of gender roles and rights. Finally, sometimes some of the poorest

farmers are excluded because they are farming on land that they have no legal rights to (e.g., squatting on government land).
In both systems some evidence of land tenure should be demonstrated. This is very clear in the case of carbon as the actual commodity is grown on land, and is thus directly linked to land ownership. In the case of watershed service agreements, watershed protection activities will often take place on land to which ownership must be defined in order to clearly identify roles and stakes. Furthermore, if water rights are to be doled out to users based on, for example, agricultural irrigation and evidence of tenure for this land would probably be a requirement.

In summary, it is clear that many of the experiences gained from Plan Vivo projects are indeed applicable to watershed service projects, especially the type of community-based projects that IIED is exploring. The water market is yet to be well defined, and will operate on localised scales. Meanwhile, the carbon market is well established (albeit small), and operates on an international scale. However, the carbon market (particularly under the Kyoto Protocol) is somewhat rigid. Projects must meet difficult requirements that are technically complex and costly. In the case of watershed service projects there is still a great deal of flexibility and very few guidelines or rules that dictate implementation. It is possible that activities that are implemented now will shape future activities and/or policy in this area, which offers a very real opportunity to set an example for the world to follow.

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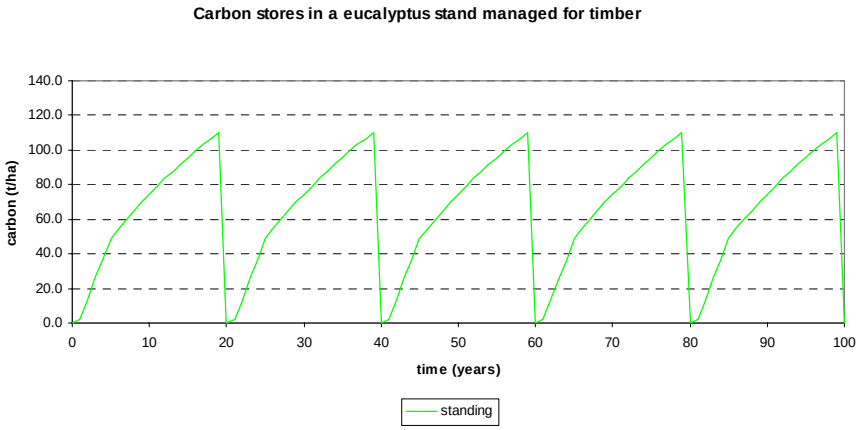
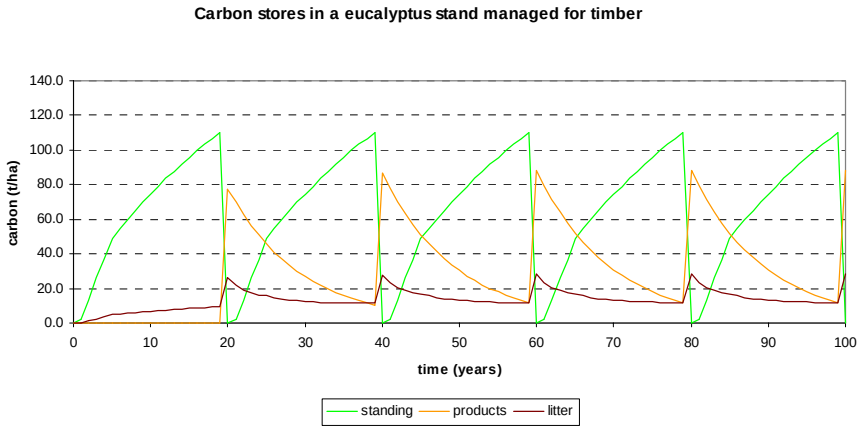
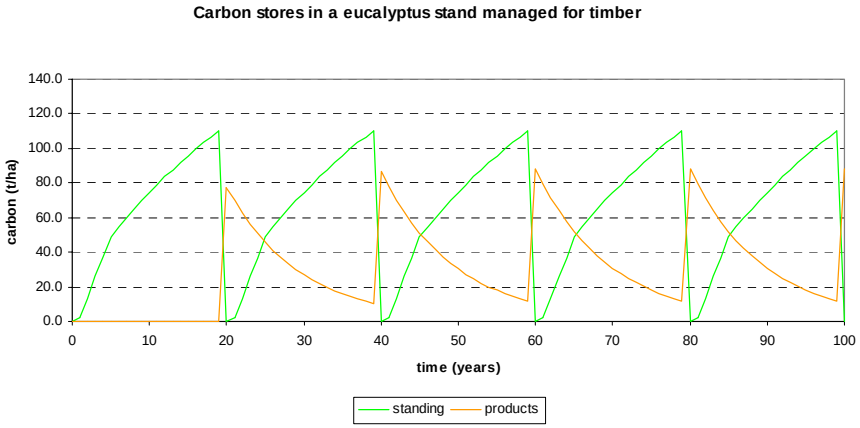
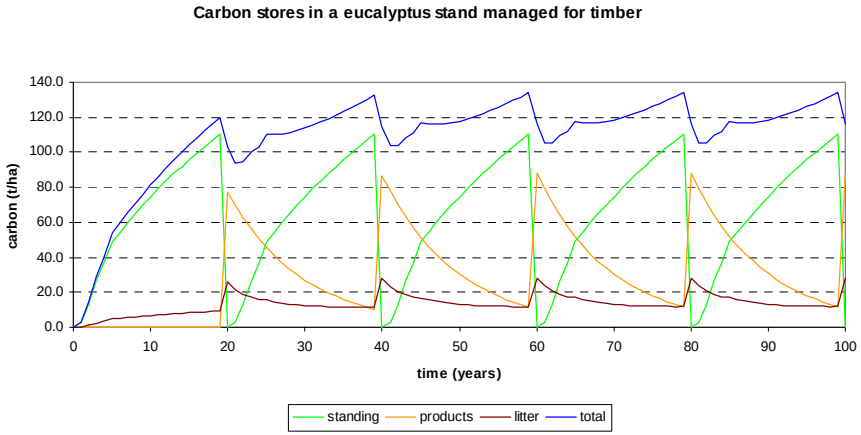
http://ecosystemmarketplace.net

Appendix 1. Quantifying (modelling) carbon uptake using empirical data, conservative estimates and default data



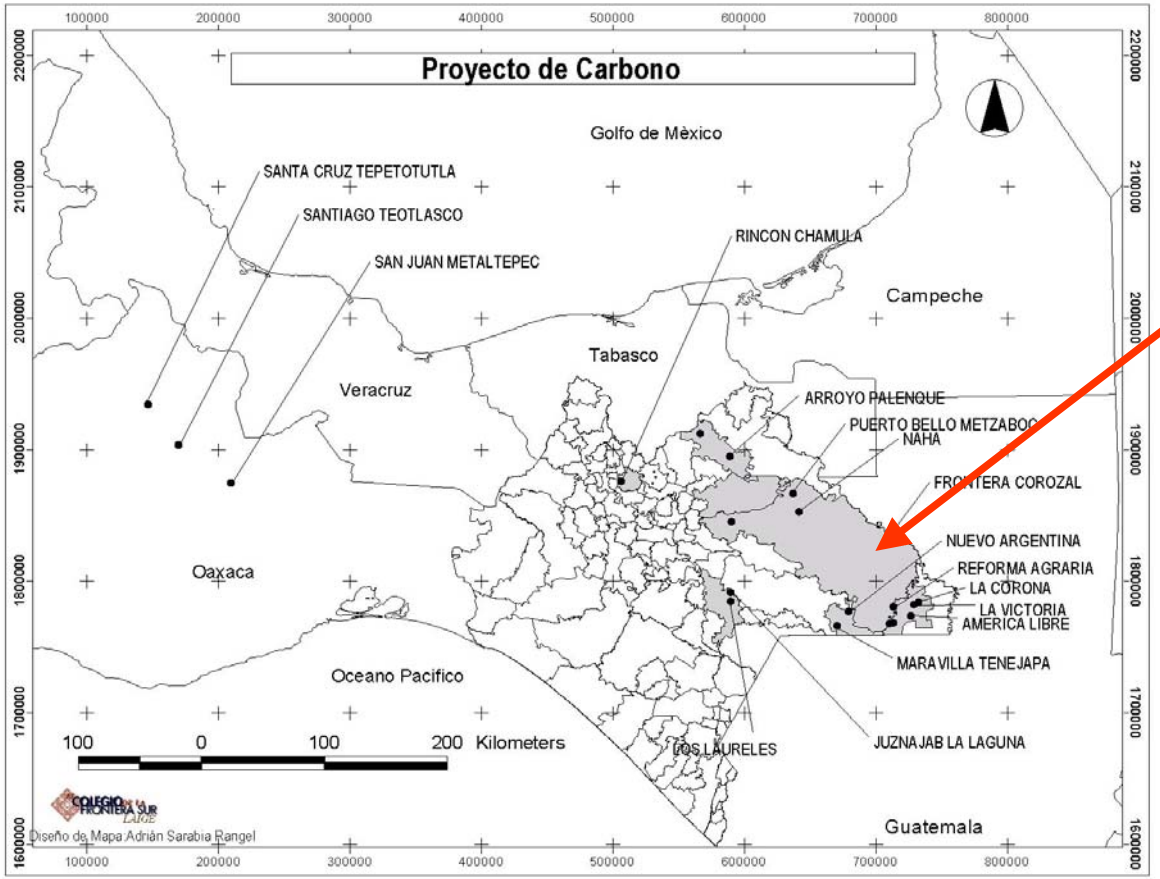






Appendix 2. Locations of case study sites

Location of Scolel Té, Mexico



Location of Women for Sustainable Development, Karnataka, India

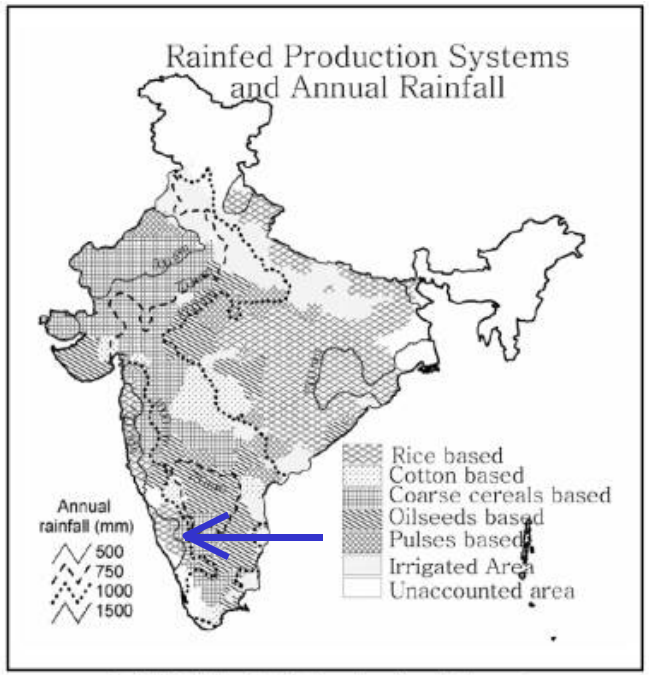


Fig.1. Distribution of rainfed crop based production systems under different rainfall zones

Location of Trees for Global Benefit, Bushenyi, Uganda

Location of Nhambita Community Carbon Project, Gorongosa, Mozambique