

Smallholder Agricultural Carbon Projects in Eastern Africa **Trainers Manual**

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INTERNATIONAL
CLIMATE CHANGE,
AGRICULTURE AND
FOOD SECURITY



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Glossary

Adaptation: initiatives and measures to reduce the vulnerability of natural and human systems against actual or expected climate change effects. Various types of adaptation exist, e.g. anticipatory and reactive, private and public, and autonomous and planned.

Adaptive capacity: the whole of capabilities, resources and institutions of a country or region to implement effective adaptation measures.

Additionality: the requirement that the greenhouse gas emissions after implementation of a project activity are lower than those that would have occurred in the most plausible alternative scenario to the implementation of the project activity.

Afforestation: afforestation is the conversion of land that has not contained a forest in recent history (timeframe varies per standard)

Agroforestry: land-use systems and practices where woody perennials are deliberately integrated with crops and/or animals on the same land management unit. The integration can be either in spatial mixture or temporal sequence. There are normally both ecological and economic interactions between the woody and non-woody components in agroforestry.

Anthropogenic: resulting from or produced by human beings.

Baseline: the hypothetical reference case, representing the volume of greenhouse gases that would have been sequestered if the project activity were not implemented. Once established, the baseline can be used to determine whether a project activity is additional and the volume of additional greenhouse gas sequestrations achieved by a project activity.

Carbon credit: the product representing the amount of greenhouse gases that have been sequestered or mitigated.

Carbon dioxide (CO₂): a naturally occurring gas, also a by-product of burning fossil fuels from fossil carbon deposits, such as oil, gas and coal, of burning biomass and of land use changes and other industrial processes. It is the principal anthropogenic greenhouse gas that affects the Earth's radiative balance. It is the reference gas against which other greenhouse gases are measured and therefore has a Global Warming Potential of 1.

Carbon dioxide equivalent (CO₂e): the measurement unit for greenhouse emissions; based on the global warming potential of all greenhouse gases in terms of equivalency to that of carbon dioxide (CO₂).

Carbon sequestration project: activities designed to mitigate greenhouse gas emissions or sequester those already in the atmosphere.

Clean Development Mechanism (CDM): a flexible mechanism contained in the Kyoto Protocol that allows entities from Annex I (developed) countries to develop emission-reducing projects in non-Annex I (developing) countries, and generate tradable credits corresponding to the volume of emission reductions achieved by that project.

Climate: the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands or millions of years. The classical period for averaging these variables is 30 years, as defined by the World Meteorological Organization. The relevant quantities are most often surface variables such as temperature, precipitation and wind.

Climate change: a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. The United Nations Framework Convention on Climate Change (UNFCCC), in its Article 1, defines climate change as: 'a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.' The UNFCCC thus makes a distinction between climate change attributable to human activities altering the atmospheric composition, and climate variability attributable to natural causes.

Climate system: the highly complex system consisting of five major components: the atmosphere, the hydrosphere, the cryosphere, the land surface and the biosphere, and the interactions between them. The climate system evolves in time under the influence of its own internal dynamics and because of external forcings such as volcanic eruptions, solar variations and anthropogenic forcings such as the changing composition of the atmosphere and land-use change.

Climate variability: variations in the mean state and other statistics (such as standard deviations, the occurrence of extremes, etc.) of the climate on all spatial and temporal scales beyond that of individual weather events. Variability may be due to natural internal processes within the climate system (internal variability), or to variations in natural or anthropogenic external forcing (external variability). See also Climate change.

Credit: equal to a specified amount of sequestered CO₂ or prevented CO₂ emissions.

Diameter at Breast Height (DBH): a measurement of the diameter or width of a tree at breast height. The DBH is used to estimate rate of growth as well as carbon accumulation or sequestration of the tree. It is a standard indicator for rate of growth of a tree.

Ex ante: predicted, beforehand

Greenhouse gases: gases in an atmosphere that absorb and emit radiation. Common greenhouse gases include carbon dioxide, chlorofluorocarbons, methane, nitrous oxide, ozone and water vapor.

Market potential: the mitigation potential based on private costs and private discount rates, which might be expected to occur under forecast market conditions, including policies and measures currently in place, noting that barriers limit actual uptake. Private costs and discount rates reflect the perspective of private consumers and companies.

Mitigation: technological change and substitution that reduce resource inputs and emissions per unit of output. Although several social, economic and technological policies would produce an emission reduction, with respect to climate change, mitigation means implementing policies to reduce greenhouse gas emissions and enhance sinks.

Mitigation potential: in the context of climate change mitigation, the mitigation potential is the amount of mitigation that could be—but is not yet—realized over time.

Metric ton: the equivalent of one megaton, or ~1.1 short tons.

Offset: credits issued in return for a reduction of GHG emissions through project activity and used to compensate for emissions by a non-project entity.

Project developer: the entity responsible for preparing a carbon project for validation and/or verification and supporting it through to the sale of credits in the market.

Stratified Random Sample: a form of random sampling that is based on characteristics on the ground. Stratifying refers to grouping of field characteristics during sampling. In socio-economic sampling stratification could refer to group women separate from men or children separate from adults. In a field sample, stratification could occur by size of tree, by species of trees and other elements or outstanding field characteristics.

Technical potential: the amount by which it is possible to reduce greenhouse gas emissions or improve energy efficiency by implementing a technology or practice that has already been demonstrated. No explicit reference to costs is made but adopting 'practical constraints' may take implicit economic considerations into account.

Technical specifications: the design for implementing the carbon project to achieve a target emissions reductions. They establish the rate of tree growth, socio-economic setting, and expectations of adoption, risk factors and managing arrangements. It is the implementation of technical specifications that is assessed by the project verifier, and is the basis for issuing Verified Emission Reductions (VER) certificates. The technical designs for Mt. Elgon area propose an agro-forestry system and a 10x10m tree spacing.

Validation: the process of independent evaluation of a proposed project activity by an accredited party against the requirements of a specific standard on the basis of the project design document.

Verification: the periodic independent review and ex post determination by an accredited party of the net anthropogenic greenhouse gas removals by sinks achieved, since the start of the project, by project activity. The verifier may also evaluate other requirements of a specific standard.

Introduction

This manual has been developed to help build the capacities of farmers, farmers groups, extension staff and project managers who are implementing agricultural carbon projects in Eastern Africa. The manual describes the steps for implementing an afforestation/reforestation voluntary carbon project based on the Plan Vivo Standard. It builds on experience gained by the Environmental Conservation Trust of Uganda (ECOTRUST), ENR Africa Associates, and EcoAgriculture Partners while undertaking a participatory action research project focusing on the institutional arrangements of smallholder agricultural carbon projects in Sub-Saharan Africa. This work was supported by the CGIAR Research Program on Climate Change, Agriculture, and Food Security (CCAFS).

The objectives of this project were to identify specific institutional challenges and solutions in carbon projects, implement solutions, and track the impact of these efforts. After conducting analyses to identify specific institutional challenges, carbon project managers jointly determined that the challenge they wanted to work on was that of building local institutions to manage carbon projects. Progress in this area would not only increase the development benefits of the projects, and reduce transaction, staffing, and consulting costs, but would also be necessary for the long-term success of the projects. For more information on the process of identifying action items, see CAPRI Working Paper No. 113, [Development of a participatory action research approach for four agricultural carbon projects in east Africa](#).

The manual was created specifically for use by trainers as part of the Trees for Global Benefits project in Uganda, managed by ECOTRUST, in order to facilitate capacity building among local actors in the project. It was piloted in the Mt. Elgon Region of eastern Uganda, and has benefited from the input of farmers and extension staff. The descriptions used in this manual are simple, with additional notes that describe the details in each training session. At the end of each module there is a set of questions that can be used by the trainers as well as learners to evaluate progress made. It is recommended that the trainers use this section to monitor and evaluate the level of knowledge and skills acquired during the training sessions. These same questions can be used to evaluate the capacity of learners after they have had a chance to implement what was learned from using the manual.

The manual is divided into four modules: Getting Started; Carbon Project Development and Implementation Cycle; Implementing the Carbon Project; and, Stakeholders and their Roles. These modules are further subdivided into sessions, which are an indication of progress from one stage of the training to another within a module. Not all modules will be appropriate for all learners. Within each session the training activities listed may have to change based on the expertise of the trainers, the experience of the learners, and materials at hand. For example, several field practice activities, including field demonstrations and practice with land use planning on a flipchart or black board are planned for the third module, which may need to be modified based on available materials.

The first module, “Getting Started,” introduces learners to the key concepts of the training, such as climate change, climate change mitigation, and the need to undertake climate change mitigation actions commonly referred to as carbon projects. The first module is intended for three target audiences: farmers, extension workers, and carbon project managers.

The second module, “Carbon Project Development and Implementation Cycle,” is more technically oriented, and it seeks to provide hands-on experience to learners on the modalities of designing and implementing a carbon project. The specific approach that is described in the module is for a Plan Vivo afforestation/reforestation project, although the information provided in the manual can be used for training on other carbon projects in agricultural landscapes. This module is targeted at project developers and, to a limited extent, extension staff.

The third module, “Implementing the Carbon Project,” focuses on afforestation/reforestation activities and the implementation plan for farmers. This module is targeted toward farmers and extension staff who will conduct farmer trainings. Even though the steps of the training process have been provided in the manual, the farmer groups and extension staff can subdivide the steps based on the resources, time, and level of knowledge in order to better target these training materials to their specific outcomes. Project managers can also benefit from this module by increasing their understanding of how the farmers and other carbon project implementers carry out their tasks. A field demonstration and a land use planning session are among the many activities planned during this module.

The fourth module, "Stakeholders and their Roles," is beneficial for farmers, extension workers and carbon project managers. However, the level of detail required in describing the key stakeholders and their roles will change based on the audience. For farmers, the most important stakeholders to consider are those clearly linked to farmer activities. In a similar way, extension staff may be interested in the project stakeholders or partners that help farmers supply inputs and manage benefits. For the project developers, the main focus should be on the carbon value chain, from farmer activities to the carbon market.

The manual is designed to improve the ability of the ECOTRUST staff and other training professionals to train farmers, extension staff and project developers on how to implement an afforestation/reforestation voluntary carbon based on the Plan Vivo Standard.

Preparations for Training

Time management

- Invite the participants well in advance, and provide them with reminder notes, where possible.
- Prepare an agenda to guide how the training will proceed. Ensure that the participants are part of the decision-making process about the time allocated to the trainings.
- Choose a time that is most appropriate for the majority of the participants, and agree prior to the training that a sufficient amount of time has been set aside. Training based on this manual will require between five to ten days for full effectiveness. Three hours are proposed for all presentation sessions, while sessions with field work should last no more than 4.5 hours.

Materials

- For modules in the classroom, suggested materials for trainers include a blackboard and chalk; flipchart, stand, markers, and masking tape; and a computer with strong battery and/or power source. For field demonstrations, trainer and participants need measuring tape, sturdy boots, gloves and pruning aids. Participants need pens/pencils and booklets for note-taking in both types of sessions. For each session, the manual indicates whether classroom or field materials are needed.
- Please be clear what materials are being provided by you, the venue, and what participants will need to bring.
- In some modules, it is indicated in the materials section that the trainer should bring copies of illustrations or annexes for the participants.

Venue, space and meals

- The classroom should be well-aerated and allow participants and facilitators to move easily in and out, as well as provide access to sanitation and convenience places. A field demonstration site, such as a farmer's field of at least 0.5 ha, is needed for the effective implementation of some parts of this training. All sites should be easily accessible by participants.
- Provisions for meals should be clearly indicated.
- Ensure all logistics are in place before the day of the meeting.

During the Training

- Allow as much participation during the trainings as possible.
- Module evaluation questions and discussion are aimed at helping the facilitator gauge progress gained by learners and identify any gaps for clarifications. Each participant must take part in the evaluation activities for a proper assessment of the training.
- Manage the time for the trainings properly. Always endeavor to keep time and work within the time limits provided for each session.

Module 1 Getting Started

Overview

This module aims at providing knowledge on the underlying reasons why action is needed to mitigate and/or adapt to climate change and its impacts. In the first session, learners are introduced to the objectives of the training, and they are asked to set their expectations of the training.

In the second session, the learners are introduced to or reminded of the linkages between the causes of climate change, the impacts of climate change and solutions to climate change. This session deals particularly with understanding reasons why action is needed.

The third session of the module deals with greenhouse gases that are responsible for human-induced climate change. This session should also enable farmers to understand the overall picture of climate change, including how specific actions can mitigate climate change and help adapt to its impacts.

By the end of this module, learners should appreciate why effort is needed to reduce the impacts of climate change and understand the contributions of different stakeholders worldwide that are needed to reduce the impacts of climate change.

1.1 Getting Started (1.5 hours)

Objectives

At the end of this session, participants will:

- ✓ Know each others' name;
- ✓ Be comfortable working with each other;
- ✓ Know why they are undertaking the training; and
- ✓ Have set workshop norms and rules as a group.

Materials required

- ✓ Classroom materials

Activities

Welcome (20 mins)

- Introduce yourself to participants (name, institution).
- Ask each participant to introduce themselves in the same way.
- Briefly introduce the trainings, including the purpose and goals of the trainings.

Icebreaker (20 mins)

- Facilitate a brief "icebreaker" activity that will enable the participants to become comfortable working with each other.

Develop expectations (20 mins)

- Ask participants what their expectations are from the training. Listen carefully and write their responses on a flip chart.
- After getting their expectations, share in detail the training objectives & agenda.
- Briefly go over all sessions of the training and tell participants that the focus of this training will be to prepare them to recruit, train and facilitate other carbon farmers.

Set workshop norms (20 mins)

- Before ending the opening session, agree on norms that will be followed by everyone during all of the days of the training.

- Choose some norms to suggest from the table to the right. Write them on a flipchart and invite participants to add on.

Initial assessment of learners (10 mins)

- Ask participants to share their understanding and experience with climate change by show of hands. Fill in the table below.
- If two-thirds of participants score between none and fair, the trainer is expected to spend more time explaining the concept of climate change to participants before they go to the next session. If two-thirds of participants score good or excellent in their understanding, the trainer can move to the next session.

Workshop Norm Examples

- Participants agree to be registered and participate in all sessions of training.
- Phones should be in silent mode.
- Only minimal, necessary movements in the room will be allowed.
- Participants should raise hands before speaking or asking questions.
- The venue and participants should be kept clean during the training.
- Time should be kept during every session.
- Everybody should participate in the discussion.
- There should be access to proper convenience places (sanitation and toilet)
- There should be regular breaks for meals at an agreed-upon time.

Write a number in each square to indicate the number of hands raised.

	<i>Excellent</i>	<i>Good</i>	<i>Fair</i>	<i>Poor</i>	<i>None</i>
<i>What is your level of understanding of climate change causes, impacts, and solutions?</i>					
	<i>Trainings</i>	<i>Field Visits</i>	<i>Radio</i>	<i>Discussion</i>	<i>Other Activities</i>
<i>How have you learned about climate change in the past?</i>					

1.2 What Is Climate Change? (1.5 hours)

Objectives

At the end of this session, participants will be able to:

- ✓ Explain the concept of climate change generally; and
- ✓ Describe the impacts of climate change locally and in eastern Africa.

Materials required

- ✓ Classroom materials

Activities

Climate change introduction (30 mins)

- Ask participants what the term is for climate change in their local language.
- Ask participants to define climate change. Get a number of responses and agree on one by show of hands.

Impact discussion (30 mins)

- Ask participants what impacts of climate change they have observed in this area.
- Discuss other local examples of climate change with participants, such as rain variability, prolonged droughts, floods, landslides, poor yields, rising temperatures, etc.

Question and answer session (30 mins)

- Facilitate a question and answer session about the concept of climate change and the impacts of climate change with participants.

Session notes for trainer

Climate change

Climate change is a long-term shift in weather conditions identified by changes in temperature, precipitation, winds, and other indicators. Climate change can involve both changes in average conditions and changes in variability, including, for example, extreme events.

Local examples

- The Mt. Elgon areas of eastern Uganda have recently experienced a persistent increase in rainfall.
- In 2002 and 2003, there were floods and landslides in Bulucheke, Bufumbo, Bubiita and Buwabwale sub-counties. At least 23 villages were affected, with four bridges and at least 22 acres of crops destroyed, and some homes were buried.
- Landslides with limited severity were reported in 2005, 2006, 2008, and 2009.
- On 1st March, 2010, a major landslide occurred which was triggered by heavy rains that lasted over three months. The landslide buried three villages in Bududa district, killing over 400 and displacing an estimated 5,000 people.
- On 25th June, 2012, a huge landslide struck four villages (Bunakasala, Bunamulembwa, Mabaya and Walwany) of Bumwalukani parish, Bulucheke sub-county, and Bududa district. The landslides and floods buried about 29 homes and about 30 people were killed, with 220 displaced. The landslide washed away everything in an area measuring 200 m wide and 300 m long.
- A drought led to the death of wildlife in Tsavo National Park in Kenya in 2009.
- Due to increased temperatures in Uganda, a reduction of Mt. Rwenzori snow cap has been observed.

Likely impacts in eastern Africa

Water availability

- Climate change is expected to warm sea surface temperatures, which may lead to increased droughts in equatorial and subtropical eastern Africa.
- Climate change is expected to lead to less precipitation during already dry months, which can lead to drought, increased desertification, and reductions in the annual flow of water in rivers and lakes.
- Warmer temperatures can diminish the level of the Mt. Rwenzori snow cap.
- In some cases, there may be an increase in rainfall.



Figure 1: Large gully left by landslides in Bududa District, Uganda (ENR Africa Associates)



Figure 2: Eucalyptus trees uprooted by landslides in Bududa District (ENR Africa Associates)

Food security

- There has already been a decline in long-cycle crops and rainfall between March and May.
- El Niño events, which are expected to increase with climate change, often produce abnormally high amounts of precipitation in parts of equatorial East Africa and can result in flooding and decreased agricultural yields.
- Warming temperatures may negatively affect some fisheries in the region.

Human health

- Temperature affects the development rates of vectors and parasites, while rainfall affects the availability of mosquito breeding sites. Climate change is expected to worsen the occurrence and intensity of future disease outbreaks and may increase the spread of diseases in some areas.

- Rainfall and unusually high maximum temperatures are positively correlated with malaria.
- Rift Valley fever outbreaks are also positively correlated with El Niño events.

Vulnerability

Vulnerability to climate change can be intensified by other non-climatic factors. These arise from, for example, current climate hazards, poverty and unequal access to resources, food insecurity, and incidence of diseases. Therefore climate change vulnerability assessments need to examine the underlying socio-economic, institutional and, to a lesser extent, political and cultural factors that influence vulnerability. This should be done in order to identify the conditions that amplify or dampen vulnerability to adverse outcomes.

1.3 Understanding Climate Change, Adaptation and Mitigation (2.5 hours)

Objectives

At the end of this session, participants will be able to:

- ✓ Describe the causes of climate change.
- ✓ Define the term greenhouse gas (GHG) and identify the major GHGs;
- ✓ Describe how GHGs relate to climate change;
- ✓ Describe the importance of trees in GHG mitigation and climate adaptation;
- ✓ Define the terms mitigation, adaptation, and business as usual;
- ✓ Understand how climate change mitigation and adaptation relate to agriculture; and
- ✓ List five things that can reduce the impacts of climate change.

Materials required

- ✓ Classroom materials

Activities

Brainstorm (10 mins)

- Brainstorm and list the causes of climate change as a group.

Explain greenhouse gases (20 mins)

- Define greenhouse gases and the greenhouse effect;
- Identify the major greenhouse gases: carbon dioxide (CO₂); Methane (CH₄); Nitrous oxide (N₂O); and other GHGs including water vapor;
- Explain how greenhouse gases are emitted (including their sources);
- Describe how GHGs relate to global climate change.

Relate GHGs to agricultural landscapes (30 mins)

- Discuss how GHGs relate to agricultural landscapes, forestry and other land use practices; and
- Discuss the global scale of actions that cause climate change.

Reducing impacts (15 mins)

- Ask participants to list possible responses to climate change. Group them into the categories of adaptation, mitigation, and business as usual.

Understanding adaptation (15 mins)

- Ask participants to define climate change adaptation and give examples.

Understanding mitigation (30 mins)

- Ask participants to define climate change mitigation and give examples.
- Describe linkages between climate change adaptation and mitigation actions.

Question and answer session (30 mins)

- Facilitate a discussion using the following questions as a guide:
 - » What are signs of climate change?
 - » How would you describe climate change to a friend?
 - » How do greenhouse gases relate to climate change?
 - » How does climate change relate to agriculture?
 - » How do trees relate to greenhouse gases?
 - » What are some of the ways you can reduce the impact of climate change (either through mitigation or adaptation)?

Session notes for trainer

What causes climate change?

The factors that cause climate change can be divided into two categories. The first category comprises natural processes. For our purposes we'll focus on the second category, climate change caused by humans through increased emissions of greenhouse gases into the atmosphere.

The greenhouse effect

The greenhouse effect is a natural process that warms the Earth, and, in fact, is quite necessary for our survival. Gases in the atmosphere, like water vapor (clouds), carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) act as a natural blanket by preventing the sun's heat energy from radiating back into space, much like a greenhouse traps the Sun's energy to warm someone's plants even in the middle of winter. The natural greenhouse effect helps warm the Earth's surface by as much as 33°C, and without it our planet would be too cold for humans to survive (IPCC 2007).

Figure 3 shows the basic processes behind the greenhouse effect. As the Sun's energy hits the Earth, some of that energy is absorbed by the Earth's crust and by the oceans, warming the planet. The rest of the energy is radiated back toward space as infrared energy. While some of this infrared energy does radiate back into space, some portion is absorbed and re-emitted by water vapor and other greenhouse gases in the atmosphere. This absorbed energy helps to warm the planet's surface and atmosphere just like a greenhouse.

Although the greenhouse effect is a naturally-occurring process, humans have recently amplified the natural effect by increasing the concentration of greenhouse gases in the atmosphere. According to the most recent report from the Intergovernmental Panel on Climate Change, the Fifth Assessment Report from 2013, scientists are 95% certain that human activity is causing the increase in the Earth's global average temperatures observed since the mid-21st century.

Greenhouse gases

Human influence on the climate has increased substantially due to industrialization in the developed countries. Over the past century, human activities have released large amounts of carbon dioxide and other greenhouse gases into the atmosphere. The majority of greenhouse gases come from burning fossil fuels to produce energy, although deforestation, industrial processes, and some agricultural practices also emit gases into the atmosphere.

The major greenhouse gases are listed in Figure 4, along with their chemical formula. Although some of the gases listed have a larger potential to cause global warming, carbon dioxide (CO₂) is the most important greenhouse gas because of its abundance in the atmosphere. Today, atmospheric CO₂ concentrations measure over 380 parts

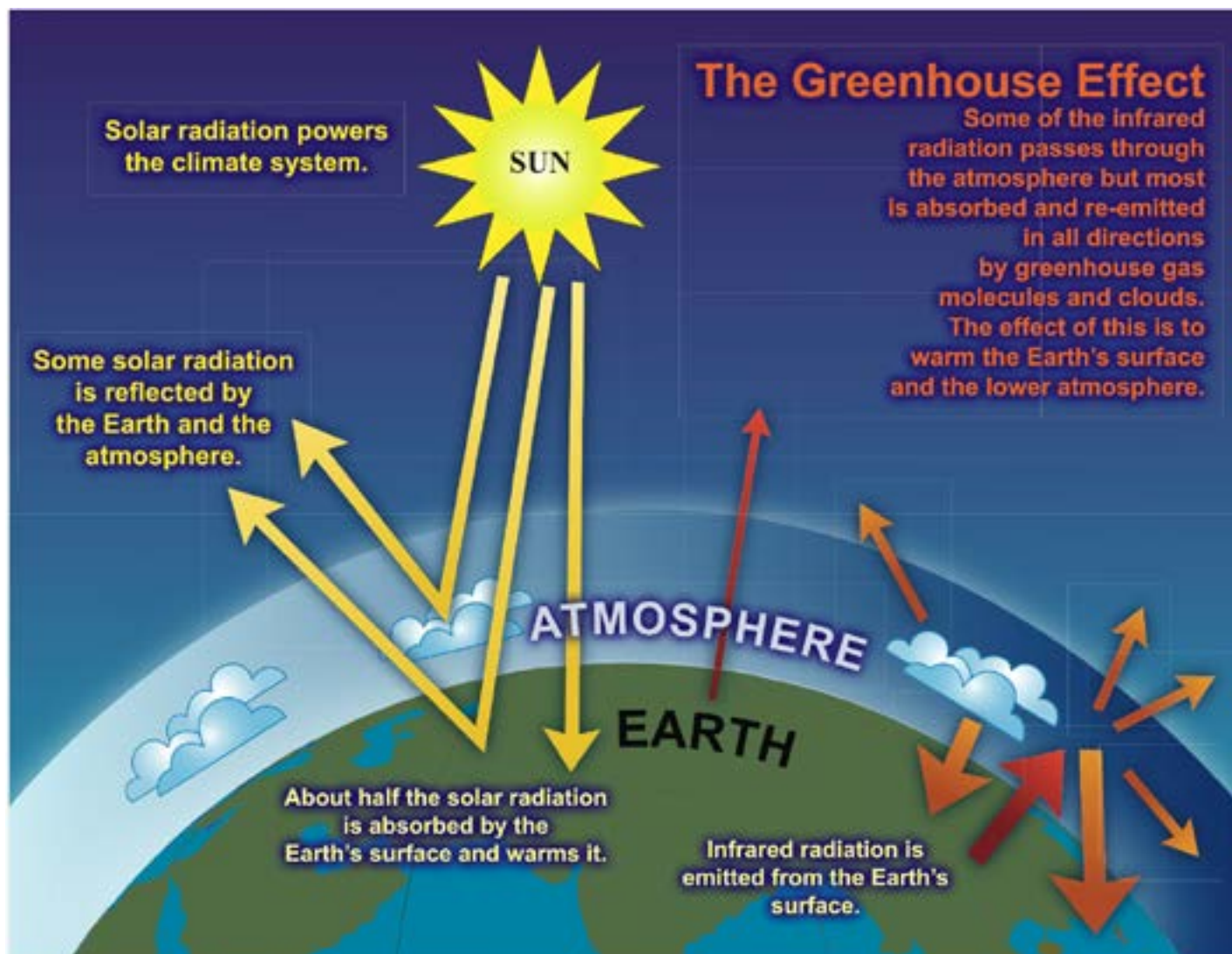


Figure 3: The Greenhouse Effect (Fourth Assessment Report of the IPCC, 2007)

Figure 4: Major greenhouse gases and their sources (UNEP 2011)

Greenhouse gases	Chemical formula	Human-made sources	Global warming potential (GWP)
Carbon dioxide	CO ₂	Fossil fuel combustion, land conversion, cement production	1
Methane	CH ₄	Fossil fuels, rice paddies, waste dumps, livestock	21
Nitrous oxide	N ₂ O	Fertilizer, combustion, industrial processes	310
HCFC-22	CHClF ₂	Liquid coolants	1,300-1,400
CFC-12	CCl ₂ F ₂	Liquid coolants, foams	6,200-7,100
Perfluoromethane	CF ₄	Production of aluminum	6,500
Sulphur hexa-fluoride	SF ₆	Dielectric fluid	23,900

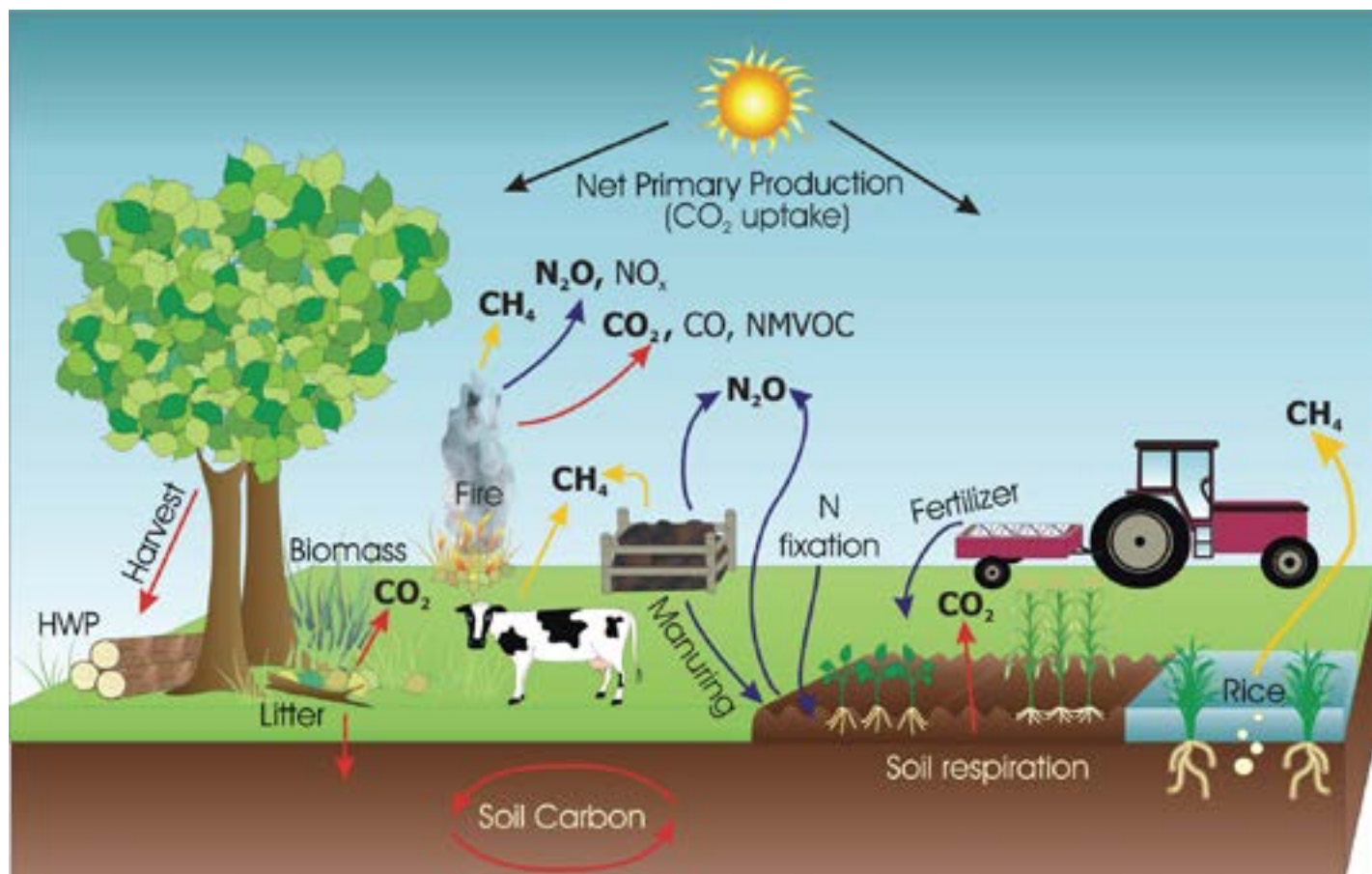


Figure 5: Illustration of sources and sinks in agriculture (IPCC AR4 2007)

Figure 6: Sources and sinks of GHGs in agriculture (Recha et al. 2014)

Sources	Sinks
CO ₂ from decomposition of biomass, soil respiration, combustion of fossil fuels for on-farm equipment (i.e. tractors), and burning of wood and other biomass	CO ₂ uptake in soil and trees
N ₂ O from soil cultivation, manure, and burning of biomass	
CH ₄ from rice paddies, burning of biomass, and livestock and manure	

per million (ppm), mostly due to fossil fuel use in the energy and transportation sectors.

Global-warming potential (GWP) is a relative measure of how much heat a greenhouse gas traps in the atmosphere. It compares the amount of heat trapped by a certain mass of the gas in question to the amount of heat trapped by a similar mass of carbon dioxide.

Agriculture and climate change

In 2010, agriculture, forestry and other land use were responsible for 24% of human-caused global greenhouse gas emissions (IPCC AR5). These emissions were caused mainly by deforestation and agricultural emissions from livestock, soil and nutrient management. Anthropogenic (human-caused) forest degradation, forest fires, and agricultural burning also contributed. However, agriculture can also prevent greenhouse gas emissions, as soil and trees can store carbon, or act as carbon sinks.

Figure 6 lists sources and sinks of greenhouse gasses in the agricultural sector. It highlights the three key GHGs relevant to the agriculture sector: carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O), with Figure 5 serving as an illustration.

Responses to climate change

There are generally three basic responses to climate change.

Mitigation refers to actions aimed at reducing or preventing the emissions of greenhouse gases responsible for climate change. **Adaptation** is dealing with the consequences of warming and other aspects of climate change, such as changes in extreme weather events.

Business as usual refers to responding to the challenge of climate change by doing nothing differently. This option saves expenditures for mitigation in the near term, but risks higher adaptation costs to wildlife, human populations, infrastructure, and economies later on. It also increases the odds of unforeseen consequences from unchecked climate change.

Mitigation

Mitigation usually means using new technologies, making older equipment more efficient, or changing management practices or consumer behavior. It can be as complex as a plan for a new city, or as simple as

improvements to a cook stove design. Protecting natural carbon sinks, like forests, soils and wetlands, or creating new sinks through silviculture or green agriculture are also elements of mitigation.

Agriculture and forestry can make a valuable contribution to lowering greenhouse gas emissions by reducing their own direct emissions and by increasing the amount of carbon stored in soils and landscapes. Options for addressing greenhouse gas levels in agriculture include:

- **Sequestering carbon by planting trees or allowing forests to re-grow:** This is the most straightforward way to sequester carbon in rural landscapes and, along with reduced land clearing, planting trees provides the most immediate, significant, and realizable carbon sequestration opportunity. The carbon projects discussed in the following modules receive carbon credits for practicing this type of mitigation.
- **Storage in soils and degraded rangelands:** Soils are a good store of carbon from greenhouse gases. It is stored through natural processes of decaying organic matter from crops or animal manure. The stored carbon is prevented from converting to carbon dioxide and/or other forms of greenhouse gases.
- **Changed fire management in tropical savannas:** In agricultural landscapes, large volumes of greenhouse gases are released through burning to open up new lands and break pest and disease cycles. Mitigation can be achieved by minimizing or undertaking alternative activities other than burning.
- **Abatement of methane emissions from livestock:** Ruminant animals (such as sheep and cattle) emit methane as a by-product of digesting feed. Additional emissions are contained in the manure released by these animals. Therefore mitigation can be achieved through improved management of manure, better management of feeds and improvement of cattle breeds. These actions would minimize the release of greenhouse gases.
- **Substitution of biofuels for fossil fuels:** When fossil fuels burn, they release high quantities of older supplies of greenhouse gases. When biofuels are used, some of those greenhouse gas emissions can be avoided, because biofuels release lower volumes of newer greenhouse gases. Moreover, greenhouse gases released from biofuels can be integrated into natural processes at a faster rate than those from fossil fuels. Therefore switching from fossil fuels to biofuels could achieve significant mitigation.

Module 1 Evaluation

	<i>Excellent</i>	<i>Good</i>	<i>Fair</i>	<i>Poor</i>	<i>None</i>
<i>Assess participants' knowledge of causes of climate change & impacts of climate change.</i>					
<i>Assess participants' understanding of what can be done to reduce the impacts of climate change.</i>					
<i>Assess participants' understanding of the concepts of climate change mitigation, adaptation and business as usual.</i>					
<i>Assess overall learning gained by group.</i>					

Further Reading

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Module 2 Understanding the Carbon Project Cycle

Overview

The carbon project cycle starts with the development phase before the actual implementation takes place. This second module focuses on outlining the processes of the project development phase. Module 2.1 introduces the generic carbon project development cycle, allowing learners to understand who else is involved in the project, and what their own role will be.

Then, in Module 2.2, the participants will be exposed to ECOTRUST's carbon project implementation cycle using the Plan Vivo standard. Alongside the project development and implementation cycles, this module also introduces aspects of benefit sharing and how to attain the status of an official "carbon project." The module aims to illustrate, at an early stage of the training, what the carbon finance streams mean for farmers. This session also explains how carbon projects must be accepted and registered.

After working through the module, learners will be able to easily perceive the stage of the project and what will be required of them as project participants.

2.1 Carbon Project Cycle (2.5 hours)

Objectives

At the end of this session, participants will be able to:

- ✓ Describe the processes and timeline for developing a carbon project.

Materials required

- ✓ Classroom materials

Activities

Provide an introduction (10 mins)

Define carbon project players (20 mins)

Explain that a project coordinator, project developer, and group of farmers are needed. Sometimes, the project coordinator and project developer can be the same organisation.

Explain development cycle (2 hours)

Using the notes provided, introduce participants to the carbon project development cycle, step-by-step.

Session notes for trainer

Creating a carbon project is not as simple as planting seedlings, tending the growing trees, and then collecting income from carbon credit sales. Before starting a carbon project, it is important to keep several points in mind. Designing and developing a carbon project takes a long time. The time frame for developing a carbon project until the project is validated is approximately 12 months, and an additional 1.5 months should be allotted for the registration process. A carbon project requires considerable technical expertise and financial resources for the initial set-up. There are many steps to the project cycle and many components to developing a project that

will produce carbon credits which are real, measurable, and verifiable. In fact, the initial few steps are just checks to determine whether the project idea is even feasible and should be pursued at all. Carbon sequestered from activities can only be rewarded with credit if produced according to the systems, standards, and requirements of a credible carbon scheme.

Carbon project players

To plan and implement a carbon project, a project coordinator, project developer, and group of farmers are needed.

To organise, aggregate and represent farmers, an institution is required, such as a community based organization, farmer cooperative, NGO, etc., that is trusted by the project participants. It should have a robust and transparent institutional set-up. In addition, it is advantageous if the institution has some expertise on carbon project development, carbon measurements, accounting, and business plan development. The institution will take on the role of project coordinator.

A project developer is required to assist with the formulation of the project and prepare it for the market. The developer should be a registered organisation (i.e., NGO, CBO) and have professional technical expertise. It should be aware of the standards and requirements of carbon markets, and be able to create networks and share information. Sometimes, the project coordinator and project developer can be the same organisation.

Of course, the carbon project needs farmers who want to participate. In order to take part, a farmer will need to:

- have land that is their own (clear land use and tenure rights)
- be able to plant both crops and trees.
- have a management objective, i.e. timber for sale, medicine and fruits for domestic use and sale, etc. Farmers shouldn't enter the project solely because of the carbon money.
- open a bank account in a village bank or a Savings and Credit Cooperative (SACCO) account.
- attend trainings.
- be a registered member of the community based organization (CBO) that runs the project.

Together, farmers, project coordinator and project developer must have the technical and institutional capacity to manage the project. They must have

clear responsibilities, and be able to work together to determine if the project is viable.

Steps in carbon project development cycle

The following general steps show how a carbon project is developed and implemented. Each carbon project player is responsible for different steps.

Develop project idea

The farmers, project coordinator and project developer should work together to come up with a “who,” “what,” “where,” “when,” “how,” and “why” for the project. The project needs a clear scope, such as afforestation, reforestation, improved farming techniques (soil carbon sequestration), renewable energy project, or avoided deforestation.

The project must have a defined geographic area, such as a single farm or a group of farms. It needs a distinct time period of operation, such as new tree planting on a farm and the care of those trees for the next 25 years, and a well-defined set of actions that set apart new and additional activities from those that were normal, everyday operations. Villagers should analyze their goals and make sure a carbon project is the best way to achieve them.

Mobilize initial financial support

A significant amount of money needs to be invested to develop a carbon project. Financial resources may be needed just to convert an idea into a proposal. Ensure sufficient funding for the initial set-up of the project.

Conduct feasibility studies

Studies such as a biomass survey or a socioeconomic analysis should be undertaken. Technical specifications, like how far trees should be planted from each other, can be determined. Also, it is important to assess additionality, leakage and permanence, and to estimate the full inventory of the emissions and uptake of GHG for the project.

Develop a Project Idea Note

A Project Idea Note (PIN) is a summary description of a proposed project. It is commonly used as an initial summing up of the project and is useful for engaging governments, investors, and technical support. A PIN

may be required by the Designated National Authority for issuing the formal Letter of Approval required for CDM projects.

A PIN can also be used to secure an early Letter of Endorsement, which may be useful to indicate conditional government support for a project when engaging with potential investors. A Letter of Endorsement may also provide additional credibility for voluntary market projects, which do not otherwise require any formal government approval. Writing the PIN should be considered a valuable opportunity for project proponents and others to review basic assumptions about the project. It should reflect all the elements including project objectives, activities, and participants as well.

Pick a standard

Carbon markets have developed in order to facilitate trade in carbon credits, and to help mitigate climate change in a cost effective way. There are currently two main types of markets for trading carbon from projects in developing countries. Regulated carbon markets are regulated by international rules defined in the Kyoto Protocol, and include Clean Development Mechanism (CDM) carbon projects. Voluntary markets include all carbon offset trades that are not required by regulation. For example, the project may choose to use the voluntary standard, or maybe the CDM standard. See page 20 for more information.

Select a methodology

Baseline measurements and methodology need to be selected. Projects must use approved methodologies to calculate emission reductions. The project's chance of being registered quickly increases by using approved methodologies. Developing new methodologies can be resource-and time-intensive and may not be justified for smaller projects.

For example, the Simplified Agroforestry Methodology provides calculations to determine the changes in carbon stocks that would have occurred in the absence of the project, the amount of carbon captured by tree planting, and the resultant carbon credits. The project coordinator must use data collected by the farmer to carry out calculations in order to quantify emissions reductions provided by the project and thus, carbon credits for sale.

Write a business plan

Develop a business plan which takes into account all costs and benefits of the project. Market demand must be assessed, costs and revenues must be calculated, and a commercialization strategy must be developed.

Write a project design document

The project description (or design) document (PDD) may be the most important project document necessary for successful development of a carbon project. The PDD describes how the project intends to follow the methodology, how it will meet all the requirements of the selected standard and what the activities and results will be. It functions as the overarching management plan to make the project operational. In general, the PDD will follow the template developed by the carbon program or, if a template does not exist, will follow the order and framework of the carbon standards.

The PDD will provide in more depth the following project details such as:

- Description/background
- Methodology description
- Monitoring Plan
- Emission reductions calculations
- Environmental Impact Assessment
- Stakeholder comments
- Schedule of activities
- Ownership of carbon credits and land tenure

The project description is compiled by the project coordinator with data inputs from the farmer and, if necessary, outside consultants. This description is reviewed by a validation/verification body as part of their assessment of the project, and is made publicly available for potential investors and others.

In summary, a Project Design Document (PDD) is the key source of information and analysis that summarizes project characteristics, quantifies carbon benefits, and lays out a monitoring plan, thereby providing the basis for independent project validation and verification of its emission reductions or removals.

Validate PDD

The project developer determines a third party certifier (accredited by the appropriate carbon standard) who will

review the carbon project document. It is important for the project to be validated to ensure transparent design.

Submit PDD for review and approval

The PDD must also be reviewed and registered or approved by the standard. Registration proves that the project concept has received approval. Carbon payments cannot be made if registration has not been achieved.

Obtain necessary government approval

Approval may be required at local, district, national, or another level.

Implement and monitor project

At this stage, farmers can begin implementing mitigation activities, such as planting. Project developers will monitor performance.

Look for a buyer

The project developer should select potential credit purchasers and develop carbon sale agreements.

Farmers review and sign agreement to sell carbon credits to project developer.

Pay farmers

In some models, farmers are not paid until credits are verified. Other models, like ECOTRUST's model, pay farmers before carbon credits are produced.

Issue and register credits

Verified emission reductions (VERs), or carbon credits, are issued. They are kept in a registry on behalf of the owner until they are bought.

The steps given above are general. The order of steps, and details, will vary from project to project. For example, the chart below shows the tasks a project coordinator (grey) and project developer Plan Vivo (orange) perform in Plan Vivo's carbon project development cycle. The next module will explain what steps farmers follow in ECOTRUST coordinated carbon projects.

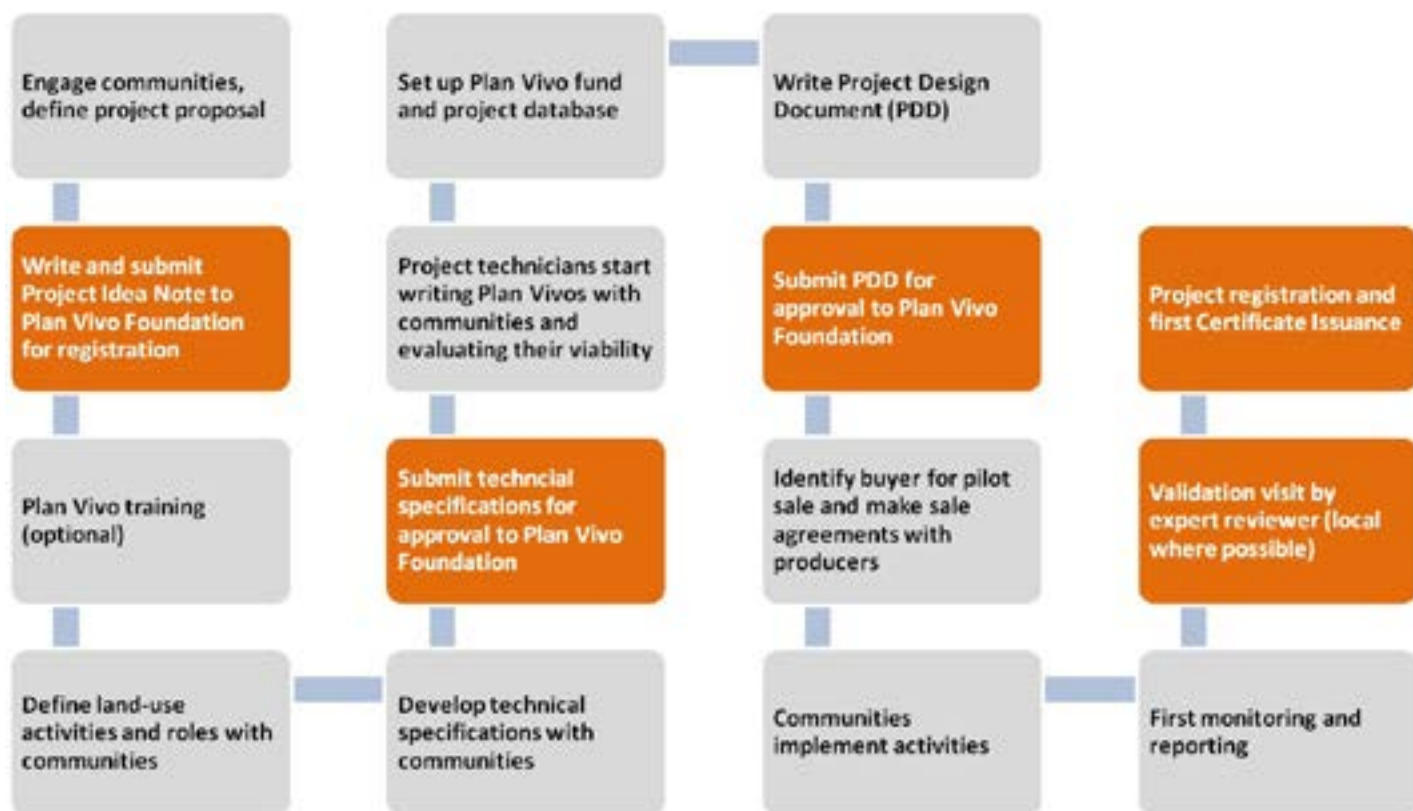


Figure 8: The Project Development Cycle for Plan Vivo Standard

2.2 Plan Vivo Carbon Project Cycle (2 hours)

Objectives

At the end of this session, participants will be able to:

- ✓ Describe concisely ECOTRUST’s Plan Vivo Cycle;

Materials required

- ✓ Classroom materials

Activities

Explain implementation cycle (2 hours)

Review the stages of the carbon project implementation cycle: awareness building, application, review and feedback, training, planting, carbon sale agreements, monitoring, and carbon payment. Use the appropriate application and sale agreement forms.

Session notes for trainer

Awareness building

Induction takes place through awareness and sensitization meetings that are organized to involve the

surrounding community in the process. In this meeting, concepts of global warming and the greenhouse effect, potential impacts like desertification, uses of trees, carbon, carbon sequestration, carbon trading and the program cycle (Plan Vivo Cycle) are explained. This phase may require more than one meeting, depending on people’s interest and issues.

Application

At this stage, farmers express their interest by filling out an application form. The example below shows the minimum amount of information that must be entered into the form. In addition, the farmer must submit a management plan that shows:

- A sketch of the farmers’ land indicating the area (s) to be planted;
- Its location and size;
- The species to be planted and reasons for planting the trees;
- A planting pattern;
- The spacing (density) of the trees;
- The number of trees per species; and
- The rotation period (the time that trees remain on a plot under similar land cover).

Farmer Application Form

Name.....

Age.....

Residence.....

Tree species to be planted.....

Location and size of garden.....

Declaration of farmer willingness to join the scheme.....

Land tenure rights of applicant as witnessed by family and local residential authority.....

Figure 9: Generic farmer application form

Review and feedback

In this step, the project coordinator visits plots to establish whether the information stated in the application is correct. During the field visit, the land to be planted is measured using GPS, and the details of its location are documented. Local leaders and other stakeholders are also consulted about the information given in the application form. The details that are being verified include:

- Actual land size in relation to proposed number of trees to be planted and planting system
- Proposed and existing tree species on specific plots
- Existence of native species on proposed land
- Land size in relation to family food production requirements and number of proposed trees
- Farmer needs
- Land with evidence of past tree cutting not accepted

After the review of the application, a technical person shares their comments with the farmer. The farmer is then informed of the feasibility of joining the scheme and requested to make changes to the initial application, if required.

Training

Farmers with approved applications will be invited for training on the basics of the Plan Vivo System for carbon management. Farmers are guided on how to develop plans for woodlots where various tree species are distributed on different sections of the plot. Possible forestry systems are discussed and the most suitable are recommended for each farmer. They will also be guided through the development of business plans for their plots in order to identify possible sources of income and funding, and future plans for investment. Farmers learn about tree planting as an enterprise.

Planting

When farmers have been given the go ahead, they can begin planting.

Carbon sale agreements

Based on the information presented in the approved applications, the project coordinator develops a carbon sale agreement, such as the one below, for farmer review and discussion. During discussions, plans are further assessed and the agreement may be modified. Farmers

Carbon Sale Agreement Form

Applicant name.....	Date.....
Applicant residence.....	
Period.....	
Number of tons produced.....	
Price per ton of carbon.....	
Planting system.....	
Payment schedule.....	
Terms and conditions of agreement.....	
Institution in charge of carbon scheme.....	
Applicant signature.....	Institution signature.....
Witness signature.....	Witness signature.....

Figure 10: Generic carbon sale agreement form

are also taken through the expectations and terms of reference as stated in the agreement. Requirements include:

- Four passport photographs (with the farmer's name written on the back);
- Account numbers in the nearest village banks where the farmers will be issued with passbooks for easy tracking and identification; and
- Farmer signatures.

After discussion, review, and modification, the form is signed and required materials submitted.

Monitoring

Monitoring of performance is carried out by project technicians, who also provide producers with continued advice and support. The project technicians help the

farmers ensure healthy tree growth and survival. Parameters like tree height and diameter at breast height (DBH) are measured to allow carbon calculations at a later date. The amount of carbon sequestered depends on the weight of the wood.

Carbon payment

Payments are made in installments and disbursed over many years to cover establishment costs and incentives for climate change mitigation interventions. At the end of each monitoring and payment schedule, projects send annual reports to the Plan Vivo Foundation, ensuring that projects continue to operate effectively and transparently. Payments are based on performance indicators developed by Plan Vivo at different stages of tree life and growth.



Figure 11: EcoTrust's Carbon Project Cycle for Plan Vivo Standard

2.3 Benefit Sharing Models (2 hours)

Objectives

At the end of this session, participants will be able to:

- ✓ Distinguish between voluntary and regulatory carbon markets.
- ✓ Understand financial benefits and other co-benefits of carbon finance and how to maximize benefits from carbon projects; and
- ✓ Understand how the carbon markets can provide funds to invest in land use management activities to maximize the benefits.

Materials required

- ✓ Classroom materials

Activities

Explain markets (30 mins)

Explain the two types of carbon markets, and their common features.

Explain carbon finance (45 mins)

Explain the basic concepts of carbon finance, how it operates, and that beneficiaries of the project receive a monetary incentive for mitigation activities.

Explain benefit optimization strategies (45 mins)

Explain to participants how to optimize their benefits,

including by:

- Accessing commodity and ecosystem services value chains
- Using associations or savings and credit groups (village banks);
- Choosing appropriate mitigation actions from alternatives available; and
- Developing tree growing as an enterprise with options for timber, fruit production, cash crop production and other agroforestry benefits.

Session notes for trainer

Carbon Finance

Carbon finance refers to the compensation that individuals and groups participating in a carbon project receive as rewards for their carbon mitigation activities. There are two types of markets for carbon credits: regulated markets and voluntary markets. Plan Vivo lies in the voluntary market. Since its inception in 2003, the market price for verified emission reductions (voluntary market carbon credits) has ranged from \$4 to \$12/ton of carbon dioxide equivalent. Farmers are paid their payments based on the carbon market and their payments reflect the price in United States dollars (\$). Under the Trees for Global Benefits programme, carbon producers (farmers and others engaged in mitigation activity) are given advance payments, referred to as "ex ante" payments, in installments over a period of 10 years. However, the mitigation contract itself continues for up to 25 years in some cases.

What are the carbon markets?

Carbon markets have developed in order to facilitate trade in carbon credits, and to help mitigate climate change in a cost effective way. There are currently two main markets for trading carbon from projects in developing countries.

Regulated carbon markets, which are regulated by international rules defined in the Kyoto Protocol, including Clean Development Mechanism (CDM) carbon projects. Voluntary markets, which include all carbon offset trades that are not required by regulation.

The regulated market: CDM projects

The CDM is one of the mechanisms regulated under the Kyoto Protocol, which allows Annex 1 (developed) countries to meet their emissions targets by implementing reduction projects in non-Annex 1 (developing) countries. Credits which are generated from CDM projects are referred to as Certified Emission Reductions (CERs). Renewable energy projects account for more than 50% of the total registered projects and energy efficiency projects constitute 11%. In November 2009, there were six registered forestry projects--1 afforestation project and 5 reforestation projects.

The Kyoto Protocol states that the purpose of the CDM is not only to assist the Annex I countries to achieve their compliance targets, but also to help achieve sustainable development goals in non-Annex 1 countries. However, the achievement of this objective is in question. The overwhelming majority of projects have been developed in middle income countries (China, India, and Brazil) and less than 1% of projects are in least developed countries (LDCs). In addition, project types with low risks and higher profitability are preferred, and sustainable development benefits are usually not a main criterion for buyers and investors.

Voluntary carbon markets

Voluntary carbon markets include all carbon offset trades that are not required by regulation. One primary motivating factor for purchases of voluntary credits is corporate social responsibility (CSR), for companies looking to market themselves as 'green' or environmentally conscious. The voluntary carbon markets have two separate components: (i) the voluntary carbon markets, which are unregulated and include a range of different trading relationships and voluntary project standards; and (ii) the service which is traded as tonnes of carbon dioxide equivalent' (tCO₂e). Each tonne of carbon dioxide emitted (or another GHG) has an incremental impact on atmospheric GHG concentrations and therefore climate change. One tCO₂e is often called a carbon 'credit' and carbon credits are bought and sold in carbon markets in a similar way to other commodities.

Carbon credits can only be traded if they meet certain criteria which help to ensure that the emissions reductions or removals have, or will, actually occur and that they have only occurred because of the carbon offset project.

Common features of carbon markets

Regulated and voluntary carbon markets have a number of common features. The types of actors in both markets and projects are similar, including:

- End users/buyers: those that need credits to offset emissions for regulatory or voluntary purposes
- Producers/sellers: those that generate and sell credits
- Intermediaries: those that intervene between producers and end users, providing specialist technical skills and familiarity with country contexts (including carbon funds and facilities, traders, brokers, aggregators, and exchanges).

The types of transactions occurring are also similar. For example, transactions can happen directly between suppliers and end users or through intermediaries. Transactions may also differ depending on whether emissions reductions have already occurred or will occur in the future.

Co-benefits

A well-designed carbon project for rural farmers also aims to ensure that farmers have sufficient incentives to participate. The principal reason for undertaking a carbon project is to mitigate greenhouse gases (GHGs). Therefore farmers produce emissions reductions of GHGs and they receive a payment or incentive and this entire process of producing and selling emissions reductions is referred to as carbon finance. However, evidence shows that the carbon finance for farmers under the Trees for Global Benefits is reasonably small (Shames et al. 2012; Masiga et al. 2012). Therefore the projects make considerable effort to enhance the co-benefits from the carbon project.

Co-benefits refer to all the additional gains, aside from carbon payments, that farmers obtain for participating in a carbon project. A tree planting carbon project can create direct co-benefits such as timber, wood, fruits, forage for livestock, improvements in the microclimate in the farmer's field, increased soil fertility, among others. Additionally, a farmer can manage bees for honey, and farmers are usually required to start up or join village banks, which improves financial planning. Furthermore, the groups formed are able to access agricultural markets with bulk production and to receive additional trainings that contribute to the social capital of their communities.

How to optimize carbon finance benefits

At the outset it is clear that the payments from the carbon project are quite small; farmers earn about \$600/ha over a 10 year period. Because the per capita income for the over 80% rural population in Uganda is over \$600/ person, it is clear that most households would expect their earnings to be higher than \$600 over 10 years. However, that is only half of the story with carbon project. The entry point for carbon projects extends beyond carbon finance. It includes developing land use plans in a participatory manner as well as choosing trees to plant that will bring future benefits that fit a farmer's land use plan.

Farmers are encouraged to establish their own nurseries and sell forest products to other farmers and members of the community to earn money. A single, fully mature tree of traditional timber at 18 to 25 years will earn a farmer between \$200 and \$400 stumpage value. The farmer will also be able to collect wood for other uses such as to build a tree nursery or livestock shed. Tree planting is also accompanied by thinning and pruning processes, both these process produce poles and wood, which reduce a farmers costs for maintaining their rural livelihood.

The trees grown need to be compatible with the crops or livestock the farmer manages, and the farmer needs to use the opportunity of access to a village bank to save and borrow money to expand their farm. These components used to optimize livelihoods have been extremely beneficial for the early adopters and have encouraged communities to appreciate the benefits of participating in carbon projects, beyond the carbon finance. Choosing an appropriate combination of enterprises during the land use planning process helps farmers to optimize livelihoods on their land, while participating in the village bank activities can enable a farmer to invest and make payments when they are ready. Many times, the interest rates chosen for carbon farmer village banks are lower than commercial bank rates.

Module 1 Evaluation

	<i>Excellent</i>	<i>Good</i>	<i>Fair</i>	<i>Poor</i>	<i>None</i>
<i>Assess participants' understanding of project development stages.</i>					
<i>Assess participants' understanding of how to implement a carbon project.</i>					
<i>Assess participants' understanding of carbon finance, and additional benefits.</i>					
<i>Assess overall learning gained by group.</i>					

Discussion Questions

- What conditions are required to become a carbon farmer? Do you meet these conditions? Which conditions are problematic for you or require additional help to meet?
- If you wanted to start a carbon project, how would you do it?
- What are the steps in the Plan Vivo Project Cycle? In which step are you currently?
- How can you maximize carbon finance benefits for proper investment in sustainable land management activities?

Further Reading

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Module 3 Implementing Carbon Projects

Overview

This module picks up from the carbon project implementation cycle to further explain and demonstrate a specific climate change mitigation action. The example selected for this manual is an afforestation/reforestation (AR) mitigation action. The module details the specific producer actions, and the administrative process for application, registration and the carbon sale agreement. The module also describes the producer assessment and payment plan as well as the resource requirements for producers.

The main targets of this module are farmers, farmer groups, extension staff of local governments, CBOs and NGOs. This module includes time for field demonstration activities, especially during the first session. The other three sessions of the module involve a lot of discussion. Training should take place at a modest pace to enable learners to have a solid understanding of the implementation process. Learners are advised to come dressed for field demonstration activities, and the trainers will carry a field kit for forestry management activities.

The outcome expected from this module is a clear understanding of implementing a carbon project, including the inputs as well as the expected returns or outputs for the stakeholders.

3.1 Tree Planting for Carbon (5 hours)

Objectives

At the end of this session, participants will be able to:

- ✓ Describe the roles of trees on land;
- ✓ Identify the appropriate tree species;
- ✓ Understand the different systems for planting trees;
- ✓ Describe the advantages and disadvantages of various options for setting up a tree nursery;
- ✓ Understand the best practices for planting and material selection; and
- ✓ Understand the best way to undertake field forestry management activities.

Materials required

- ✓ Classroom materials
- ✓ Field materials (measuring tape, sturdy boots, gloves and pruning aids)

Activities

Review roles of trees (45 mins)

Explain to participants the various roles trees can play, and tree products available for use.

Land management for tree planting (45 mins)

Introduce participants to the steps of implementing the afforestation/reforestation carbon project, including:

- Acquiring land: the farmer needs to own land with secure tenure to participate in the carbon project;
- Developing a management plan for the land; and
- Determining the species and the number of trees to plant.

Nurseries (1.5 hours)

- Discuss the important considerations when establishing a tree nursery, including:

- » The purpose and size of the nursery;
- » Whether the nursery will be for an individual or a group;
- » Site selection; and
- » Nursery bed preparation and seed management practices.
- Describe the process of obtaining seedlings/seeds for planting, and explain seedling management.

Tree spacing and field management (1.5 hours)

- Introduce participants to spacing requirements for different tree systems.
- Demonstrate the following practices to participants
 - » Spot weeding/slashing
 - » Pruning
 - » Thinning
 - » Fire/pest management

Questions and discussion (30 mins)

Session notes for trainer

Roles of trees in land use

Agroforestry practices contribute a wide range of products and services. Trees may provide food, shelter, energy, medicine, cash income, raw materials for crafts, fodder and forage and resources to meet social obligations. Trees used in agroforestry systems can also provide a variety of services, such as being a form of savings and investment and contributing to the improvement of soil fertility for crop production. These products and services can be summarized as follows:

Food

- Increased amounts of food
- A year-round supply of food
- Better-quality food

Energy

- Increased fuelwood supply
- Better-quality fuelwood
- Cheaper and more convenient fuelwood sources

Shelter and shade

- Shade for crops and animals
- Protection from wind
- Protection from animals
- Marking of boundaries

Medicine

- Preventive (to maintain health)
- Curative (to treat diseases or injuries)
- Veterinary medicine

Raw materials for construction

- An increased supply of construction materials (timber, poles)

Cash income, savings and investment

- Employment (cash earnings)
- Sale of products (cash earnings)
- Substitution of own products for purchased items (less cash spent)
- Exchange of products for other goods (less cash spent)

Fodder and forage

- Feed for domestic animals

Conservation of soil water and plant resources

- Increased amount of water for plant growth, domestic use and livestock
- Improved seasonal availability of water
- Improved quality or timing of water delivery to dams and large-scale waterworks
- Protection of soil from erosion and loss of nutrients
- Restoration of degraded soils
- Improvement of soil moisture and fertility
- Maintenance or increase in species and habitat diversity
- Using products of farm tree management (pruning and thinning) as substitutes for harvesting standing trees in forests and on farms
- Improved conditions for the natural regeneration of the most desirable species

Figure 12: Types of planting systems

<i>Planting systems</i>	<i>Spacing</i>	<i>Number of trees/ha</i>
<i>Dispersed /agroforestry</i>	<i>10x10m</i>	<i>100</i>
<i>Woodlot</i>	<i>6x6m; 5.5x5.5m</i>	<i>210</i>
<i>Boundary</i>	<i>5x5m</i>	<i>100</i>

Figure 13: Examples of species preferred by Plan Vivo project in eastern Uganda

<i>Species</i>	<i>Planting design</i>	<i>Key advantages</i>	<i>Remarks</i>
<i>Fagaropsis/ Xanthophyllum</i>	<i>Woodlot or boundary</i>	<i>Survives in less fertile soils, high value timber, medicinal</i>	
<i>Grevillia robusta</i>	<i>Grows on all sites, but good for boundary spacing 6m x 6m.</i>	<i>Ideal for agroforestry</i>	<i>Not yet common in Ugandan timber market.</i>
<i>Musizi (Maesopsis eminii)</i>	<i>Good in sheltered valleys & under shade, e.g. coffee or crops. Good for boundary spacing 6m x 6m. Survives on almost all types of soils</i>	<i>Ideal for agroforestry, fast growing</i>	<i>Slow growing, self pruning, seedlings to be planted when they are 1 foot tall</i>
<i>Mvule (Chlorophora spp.)</i>	<i>Prefers deep soils, requires scattered planting</i>	<i>High value timber</i>	<i>When planted close, trees can spread disease to each other.</i>
<i>Podocarpus latifolia (podo)</i>	<i>Likes both highland & lowlands that are cool and humid. Planted like pine at spacing of 6m x 6m.</i>	<i>High value timber, the only indigenous soft wood that grows like pine</i>	<i>Requires pruning</i>
<i>Funtumia elastica</i>	<i>Likes being planted in crowded sites, not in the open. Spacing 6m x 6m.</i>	<i>Fast growing, benefits from close spacing to reduce branching</i>	<i>Rarely gets straight if planted in the open</i>
<i>Cordia Africana</i>	<i>Likes being planted in crowded sites, not in the open. Spacing 10mx10m.</i>	<i>High value timber</i>	<i>Rarely gets straight if planted in the open</i>
<i>Prunus Africana</i>	<i>Prefers sheltered valleys</i>	<i>High survival, popular as medicinal</i>	<i>Slow growing, seeds hard to access. Wildlings often collected for propagation.</i>
<i>Mahogany</i>	<i>Does well in deep red fertile soils. Spacing 5mx5m</i>	<i>High survival, popular as medicinal</i>	<i>Slow growing.</i>

Planting systems

Different planting systems exist, including woodlot systems, dispersed/agroforestry systems, and boundary planting systems. Figure 11 indicates some of the specific recommendations for each of the planting systems.

Carbon farmers are advised to embrace agroforestry since this system offers maximum utilization of land. Through an agroforestry system, one can realize increased crop production and increased income from both the crops and the trees. With the appropriate choice of agroforestry trees, the system will boost soil fertility, as trees will add nutrients to the soil as well as acting as wind breakers to the crops.

Types of tree species preferred

In the case of Trees for Global Benefits, indigenous/native tree species are promoted. They include: musizi (*Maesopsis Eminni*), croton, focus, and other species, which grow in the nearby natural forests. Naturalized tree species are also promoted, e.g. *Grevillea*, mangoes, jack fruit and avocado. See Figure 12 for more information on nine preferred species.

Source of planting material

- Wildlings: these are tree seedlings that can be obtained from neighbouring natural forests, national parks, central forest reserves and local forest reserves.
- Neighbours: if farmers' neighbours have forests or forestry systems on their land they usually have seedlings growing wildly that can be obtained by mutual agreement.
- Buying: farmers can buy seedlings from a local nursery.
- Seedling supply from institutions: these are local CBOs, NGOs, donations/Corporate Social Responsibility from private firms that can support farmers with seedlings.
- Seedling loan: ECOTRUST links local nursery suppliers and carbon project farmers. Here farmers get seedlings on a loan and money will be deducted and paid to the nursery suppliers at the time of payments.

Seedling (wildlings) management

The cheapest source of seedlings is wildlings. However to ensure the survival of the wildling, the farmer needs to:

- Put uprooted wildlings in a bucket of water or wet soil.
- Keep wildlings in water/wet soil for at least two days before planting them.
- Put wildlings in the nursery bed and water them until when they are at least 1 foot high for planting in the field.

Tree management

Spot weeding/slashing

This practice aims at improving tree growth by removing weeds around the planted seedlings. Weed removal reduces competition for nutrients and reduces pests and disease attacks.

Pruning

Removal of branches from the lower part of the tree crown is known as pruning or side pruning. While pruning a tree, branches are always cut near the stem. The objectives of pruning in agroforestry are threefold: (i) reducing the amount of shade for crops near the tree; (ii) improving the quality of the trunk, mainly for timber and poles; and (iii) harvesting branch wood for fuel or other use.

However, too much pruning reduces the growth of trees. Pruning should be done for up to a third of the crown, shoot or growing tree starting from the base or ground level of the tree. The best time for pruning is towards the end of the dry season to reduce fungal infections and also to enable wounds to heal faster when the rain starts. This ensures that pruning will not interfere with growing crops or other agriculture tasks.

Thinning

Thinning is reducing the tree stand density to allow the remaining trees to increase in volume. As trees grow, they need more space; therefore, thinning can help reduce the competition between trees. A dense stand initially promotes straight growth and small branches, but later the trees must be thinned, otherwise they will be too slender and never reach the desired size. Thinning is particularly important for trees grown in woodlots, but applies also to other situations where trees are growing close to each other. First, thinning removes the dwarfed,

diseased and stunted trees in the plantation. Thinning can also be done by removing every other tree, or two out of every three trees. Thinning is also a way of obtaining some early harvest.

Pest and disease control

Integrated pest management principles should be applied because it reduces the amount of toxins and greenhouse gases released in comparison to industrial pest control. It is best to use organic substances such as ash, urine, red pepper, tobacco, and Cyprus leaves, among others.

Drought management

To ensure that trees don't suffer from severe drought, farmers may need to do the following:

- Time the planting of trees for the onset of the main reason season;
- Mulch or cover trees;
- Plant seedlings that are at least one foot tall; and
- Irrigate trees.

3.2 Carbon Sale Agreement (2.5 hours)

Objectives

At the end of this session, participants will be able to:

- ✓ Understand what should be considered before entering into a carbon purchase agreement.

Materials required

- ✓ Classroom materials

Activities

Review sale agreement elements (2 hours)

Explain the five key elements of a carbon sale agreement: terms and type of payment, timing of payments, requirements to be met, provisions for managing risk, and signatories to the contract.

Question and answer session (30 mins)

Session notes for trainer

Farmer review takes place at two stages, review prior to registration and assessment prior to signing a carbon sale agreement. Before registration, the farmer must have a farm land use plan and indicate that the mitigation activities will not significantly impact on

livelihoods and food security while at the same time indicating willingness of family and adequacy of land for project. The carbon sale agreement is signed after the farmer has planted trees. Therefore the review or assessment will be focused on establishing that the farmer indeed planted trees. The information provided in the registration, such as the commitment of his family to the project, having adequate land, having planted the tree species and specifications indicated in the land use plan are also cross-checked.

Any successful farmer who meets the conditions of review signs a carbon sales agreement which triggers payment. Payment is based on performance, mostly depending on the fulfillment of the target and the species planted. Other causes of variation in payment include the price the buyer is willing to pay and the price of the dollar at the time of payment. The farmers must also submit an account number, passport photographs, and they should be consistent in the details they provide, especially the names on all of documents. After all the necessary calculations have been done, the farmers' pay is channeled into his/her personal account.

Carbon sale agreements are developed and then reviewed and discussed with the farmers before signing. During the discussions, the plans are further assessed and may be modified to suit the Plan Vivo system of carbon management. Farmers are also taken through the expectations and terms of reference as stated in the agreement.

Key elements

► The terms and type of payment

- » How much
- » To whom (one person, community group, vendor of a community service like a school builder, etc.)
- » In what form (cash, in-kind technical assistance, in-kind materials, etc.)
- » Location of plot
- » Farming/planting system

► The timing of payments

- » When the ecosystem service activities will be carried out by the seller
- » When the buyer will ensure that monitoring of the action occurs
- » Payment schedule
- » Delivery of carbon credits/tonnes of carbon dioxide
- » Period
- » Number of tonnes produced
- » Cost per tonne of carbon dioxide
- » Contract duration

► The requirements that need to be met for payment, such as:

- » Periodic reporting
- » Monitoring and verification obligations

► Provisions for managing risks, particularly those beyond a seller's control (such as unexpected natural events), through specific clauses in the agreement detailing

- » How certain risks are shared between sellers and buyers
 - » Provision of insurance (provided it is available, cost-effective and feasible)
 - » Allocation of delivery liabilities
- ### ► The signatories to the contract, as listed below.
- It may also be useful to have provisions for specific roles of support institutions, as well as details on the exact payment that will be made for services rendered by the intermediary.
- » Date
 - » Applicant name and local residence
 - » Name and signature of buyer (or group of buyers)
 - » Name and signature of representative of institution in charge of carbon scheme

Implementing the Purchase Agreement

After an agreement has been made, then the deal must be implemented. During this stage, the project must not only be managed effectively, but also consistently monitored and evaluated for service delivery and adequate distribution of benefits in accordance with the parameters laid out in the agreement. Third-party verification (and, in some cases, certification, depending on the buyers' preferences) may also be required to ensure that the project is meeting its objectives.

The attention then shifts to implementing the farmers' sales agreement, monitoring progress, reporting results, and making changes if the desired results are not being realized.

3.3 Payment for Carbon (2 hours)

Objectives

At the end of this session, participants will be able to:

- ✓ Understand how carbon payments are made;
- ✓ Understand the factors affecting payments and the payment intervals; and
- ✓ Become familiar with the payment schedule used by ECOTRUST.

Materials required

- ✓ Classroom materials

Activities

Review payment schedule (1 hour)

Explain performance indicators and payment at specific intervals.

Explain transfer of payments to farmers accounts

(30 mins)

Question and answer session (30 mins)

Session notes for trainer

Calculation of carbon payments

To offset a quantifiable amount of carbon dioxide, a specific number of trees need be planted. This is dependent on the planting system and the spacing. For example, a woodlot system at spacing of 6x6 m would offset 146.8 tonnes of carbon dioxide. The unit of sale is 1 tonne of carbon dioxide.

All the above aspects are incorporated in the technical specifications that were developed from the biomass and socioeconomic surveys. The biomass and socioeconomic surveys are conducted during the project

development stage to assess the potential for mitigation that exists within a landscape. At the same time the potential impact of the project on the livelihoods, household structure and gender roles in the community are also assessed. These aspects are included in the technical specifications as appropriate tree spacing, appropriate tree management, the design of registration and farm/land use plans that integrate existing land use practices and livelihoods, and the development of purchase agreements to reflect the strengthening of family and gender roles.

Receiving payments

Payments are made in installments and disbursed within an agreed period. The payments are incentives directed to subsidize the farmers' establishment costs (like clearing land, buying and caring for the tree seedlings). At the end of each monitoring and payment schedule, ECOTRUST sends annual reports to the Plan Vivo Foundation, ensuring that projects continue to operate effectively and transparently. Payments are allocated based on performance indicators developed by the

Figure 14: Payment monitoring checklist

<i>Year</i>	<i>Milestone (performance indicator)</i>	<i>Means of verification</i>	<i>Additional purpose</i>	<i>Amount of payment received</i>
0	50% of target trees planted	Physical counting of all trees planted by a farmer.	Verify if recommended spacing is followed.	30%
1	100% of target trees planted	Same as above.	Verify if recommended spacing is followed.	20%
3	85% of trees surviving	Physical counting of all trees, and comparison of number to original number planted.	Give technical guidance.	20%
5	Diameter at breast height $\geq 10\text{cm}$	Stratified random sampling using 15-25m radius plots, a best fit transect in the garden, or targeting 10% of the target. Measure height and diameter at breast height using diameter tapes, clinometers, or cross staff (halving method).	Estimate the growth rate, amount of biomass cover, and amount of carbon that will be produced as tree grows	10%
7	Diameter at breast height $\geq 12\text{cm}$	Same as above.	Same as above.	10%
10	Diameter at breast height $\geq 20\text{cm}$	Same as above.	Same as above.	10%

implementing organization at different stages of tree life/growth.

Carbon payments that accrue to individual smallholders will likely be very small relative to their total income due to the current low carbon prices and high costs of project administration. Payments made to farmers for carbon credits vary substantially. For example, the ECOTRUST project reported that about US\$900 would be paid to farmers over the course of 10 years to keep their land as a woodlot, based on a carbon price of between US\$4.00 and US\$5.50 per tonne of carbon.

Farmers are encouraged to open up individual accounts in local SACCOs, or village banks, which are closer to people and cheaper in term of transport and management costs. Farmers can also use their carbon money as collateral to get small loans from the village banks.

Commonly asked questions and their answers

1. What is involved in this scheme?

It is a voluntary carbon scheme following the plan vivo carbon standards.

2. What is the life span of the program?

The life span of the program is as indicated in the carbon sales contract which is 25 years.

3. When are farmers allocated buyers?

This is after the review exercise and the farmers are given the go ahead to plant.

4. During what period of planting does one receive payment?

Farmers are paid ex-ante credits within the first 10 years before they produce all the carbon as indicated in the carbon sales contract.

5. Is the payment received all at once?

No, payment is made after monitoring and ensuring that the farmer has met the target for the period as indicated in the carbon sales contract. Farmers will be monitored once before any carbon payment is done.

6. When do farmers sign sale agreements?

Farmers sign sale agreements after monitoring their farms.

7. How do the farmers receive payments?

Farmers' payments are made directly into their accounts which are opened in rural micro finance institution in their locality or a bank of their choice (in the absence of a micro-finance institution).

8. Are trees planted before the signing of the sale agreement is considered?

Yes, at least 50%.

9. Do I need to remove the trees already on my land?

No. Potential or participating farmers must not cut or clear standing trees in order to plant carbon trees.

10. What spacing should I use if I am planting a woodlot?

A minimum spacing of at least 6m by 6m should be used when planting (under the woodlot system), although this varies with species.

11. What type of trees should a farmer plant?

Farmers should plant only approved tree species which are either indigenous or naturalized exotics that match the climatic site conditions.

12. How will I know that I have planted the trees properly?

Site coordinators carry out monitoring to provide accurate information about the proportions of trees planted on the farm and those surviving.

13. When is a farmer allowed to start harvesting their trees?

The program allows for thinning after 5-7 years (species dependent) when the trees have established, and these may be used as poles or fuel wood. But the remaining trees are kept for the remaining period of the contract.

14. How will I know which trees to cut during thinning process?

The farmers that have trees for fuel and/or building poles scattered within the carbon woodlots will be guided to only harvest trees in accordance with the thinning practice as indicated in the Plan Vivo guidelines.

15. What if I decide to cut my trees now and plant them for the carbon project? Will I still be allowed to be part of the project?

Land with any evidence of cutting trees in the past five years will not be recruited into the program. Or potential farms with evidence of cutting trees (as seen from stumps) relative to the base year (1990) or a period as decided by the program will not be included in the program.

16. May those in a very hilly area join the project?

Yes, if they come up with a fitting land management plan.

17. Can a farmer use 10ft x 10ft plot with agro forestry planting system?

No, this would be too small for that planting system.

It should be 10x10 metres but even 8.5x8.5 m would be fine.

18. What happens to payments if the trees die?

The farmer is given an opportunity to replant and advised with better silvicultural practices to maintain the trees.

19. How do I join the project?

You join after attending the training and accepting to participate in the project. You fill in the application letter.

20. Whom will I tell, since ECOTRUST is very far?

Farmers choose their own representative who coordinates with ECOTRUST. He/she collects farmers' applications.

21. Is a farmer allowed to use different pieces of land?

Yes, it's allowed, though monitoring becomes expensive and takes a lot of time.

22. What if ECOTRUST goes away or the government changes?

The farmer still owns the trees and land since it is their property.

23. What if I want to sell land?

A farmer may sell the land to someone who wants to continue with the project, or sell the land and pay back the money he/she received.

24. How can local people be employed by this project?

Presently the project encourages farmers' participation and the community to diversify their incomes but does not employ the community.

3.3 Resources Required to Implement Carbon Projects (3 hours)

Objectives

At the end of this session, participants will be able to:

- ✓ Understand the costs incurred in implementing a carbon project; and
- ✓ Identify solutions to minimize such costs.

Materials required

- ✓ Classroom materials

Activities

Brainstorm farmer costs (45 mins)

Brainstorm the activities farmers will need to do to participate in this project and their required inputs. Discuss estimated inputs and their costs, including:

- Fixed inputs such as land;
- Seedlings, field management;
- Participation in training; and

- Opening of bank accounts.

Brainstorm other farmer inputs (45 mins)

Brainstorm actions and inputs of other stakeholders in the project. Discuss contributions for:

- Trainings
- Feedback meetings/workshops
- Marketing
- Extension support
- Feasibility studies
- Documentation
- Monitoring

Input cost reduction (1 hour)

Discuss ways of reducing the cost of farmers input.

- What inputs can be procured at minimal cost?
- Which inputs inevitably require financial resources?
- What are some ways to reduce the costs?

Discuss ways for reducing the costs of other stakeholders input.

- What inputs can be procured at minimal cost?
- Which inputs inevitably require financial resources?
- What are some ways to reduce the costs?

Questions and answer session (30 mins)

Session notes for trainer

When it comes to developing a project, there are many costs involved, and this is why it is vitally important to identify a project developer who can assist in obtaining the funding for the project. It takes more than two to five years (depending on how fast the project is developed and the payment agreement is made) before the money will be received through the sale of carbon credits. This is because in all projects involving forestry and land, the carbon credits would be available only once the carbon is sequestered and can be measured.

Therefore, it is important to identify a project developer and donors at a very early stage of the project to arrange for early (up-front) payment or compensation arrangements for the involved farmers. It is very difficult to determine a standard figure for the costs of forestry and land use projects, as they depend on the size of the project, and costs of labour and land, as well as the availability of skills. The costs can be separated into two areas:

- **Farmer costs**
 - » the cost of project implementation, such as land, ground preparation and planting,
 - » and the cost of on-going management and tending.
- **Other stakeholders:**
 - » the costs of ensuring and increasing the awareness and abilities of local participants;
 - » the costs associated directly with the development of the GHG project documentation, auditing and registration, and the on-going monitoring, reporting and verification;
 - » the cost of initial biomass and socio-economic surveys; and
 - » the cost of recurrent forest inventory to assess progress of the carbon project on the landscape.

Additional transaction costs include all of the time and money expended developing and implementing a

carbon project. Of these two components, time is most often overlooked (unless someone is billing for it). These costs include the time required to:

- assess which ecosystem services could be the focus of the deal;
- compare them to other deals;
- survey prospective buyers;
- negotiate an agreement;
- implement the agreement; and
- monitor and, if needed, verify that the agreement is being met.

At one extreme, and in cases where communities and land managers have little prior organizational expertise, start-up and transaction costs can absorb a significant portion of the seller's hoped for profit. This is why it is critical to estimate and review transaction costs throughout the process — a costly activity in its own right, and one made difficult by the fact that all costs will vary not only from project to project, but also throughout the lifecycle of an individual project. If the costs are too great, the carbon project developers should explore ways of covering them, or even adjust or halt the process to address expenditures.

Ways to minimize farmers' costs

- The cost of seedlings can be reduced by looking for wildlings or establishing one's own nursery.
- The field management costs can be reduced by using family labour and good silvicultural practices.
- The costs of opening and maintaining a bank account can be reduced by opening one in a nearby village bank.

In addition, it is sometimes possible to add carbon project implementation to other reliable, pre-existing conservation or rural development projects that have already established an infrastructure for handling the detail-oriented and costly tasks of monitoring and management.

Module 3 Evaluation

	Excellent	Good	Fair	Poor	None
<i>Assess participants' understanding of the benefits of tree planting and recommended tree species.</i>					
<i>Assess participants' understanding of the recommended planting systems and spacing.</i>					
<i>Assess participants' understanding of the importance of a carbon sale agreement and details involved.</i>					
<i>Assess participants' understanding of the payment plan and how producers can enhance their benefits from the proposed plan.</i>					
<i>Assess participants' understanding of the inputs needed from stakeholders, and how to increase cost-effectiveness.</i>					
<i>Assess participants' understanding of the terms and conditions of carbon purchase agreements.</i>					

Further Reading

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Module 4 Project Participant Roles

Overview

The success of a carbon project is built around stakeholders understanding and delivering on their roles and responsibilities. The success of an institutional capacity building activity is also based on participants' ability to identify their positions within the implementation cycle and show a commitment to contribute to the carbon project. Therefore, this fourth module delineates the project participants' roles and provides a forum to discuss and understand their responsibilities. Carbon project groups and associations, as well as project sustainability are also discussed.

Finally, project participants' roles and responsibilities in the monitoring of the carbon project are presented. Whether a project is CDM or a voluntary carbon project, compliance and support from other stakeholders is needed for the mutual benefit of all involved in the project. If stakeholders understand and mutually support each other, the success of the carbon project can be achieved.

At the end of this module, every participant should be able to identify a specific set of tasks and the roles and responsibilities they intend to perform for the success of the agricultural carbon project.

4.1 Introduction (2 hours)

Objectives

At the end of this session, participants will be able to:

- ✓ Describe the different actors in a carbon project and their roles.

Materials required

- ✓ Classroom materials

Activities

Discuss project participant roles (1 hour)

Identify other potential stakeholders (30 mins)

Ask about non-governmental organizations, local leaders, and general community

Questions and answers (30 mins)

Session notes for trainer

Review Figure 15 (next page). It is important to understand that carbon finance or revenues may come from several entities listed in the chart. Each type of entity can play a valuable role at different stages. Many factors will determine the timing of carbon revenues, prices, costs of marketing and the likelihood of finding certain types of buyers.

Figure 15: Project actors and their roles

Actors	Responsibility
<i>Plan Vivo Foundation</i>	<i>Ensures that Plan Vivo standards are followed and complied with.</i>
<i>Project coordinators</i>	<i>Mobilize producers and link them up with buyers. Comply with Plan Vivo system.</i>
<i>Expert advisors and reviewers</i>	<i>Validate new projects, based on their professional experience and expertise in forestry and carbon sequestration projects, carbon accounting, native ecosystems and social dynamics of the host country and organizations involved in the project.</i>
<i>Approved third-party verifiers</i>	<i>Assess projects against the Plan Vivo standards, based on terms of reference agreed on between project coordinators, verifiers and the Plan Vivo Foundation. Deliver a verification report to the project and the Foundation, which are published on the Plan Vivo website.</i>
<i>Purchasers and resellers of Plan Vivo Certificates</i>	<i>Buy Plan Vivo certificates directly from projects, through the project-coordinators or Plan Vivo Foundation or use registered Plan Vivo resellers.</i>
<i>Producers (sellers)</i>	<i>These are the local people who engage in tree planting as carbon farmers</i>
<i>Technical consultants and research institutions</i>	<i>Provide external technical assistance, especially in the early stages, to design and implement land-use systems and develop technical specifications. Help to develop technical specifications and support project technicians with biomass surveys, baseline studies, carbon modeling and other technical advice.</i>
<i>Project developers</i>	<i>Work on project design, registration and implementation</i>
<i>Funders/Donors</i>	<i>Provide funding to cover initial costs of project design and implementation, such as developing technical specifications, building internal capacity of staff and community.</i>
<i>Brokers</i>	<i>Find buyers and match them with sellers (projects), often according to previously agreed upon conditions. They typically receive a percentage of the transaction value as a fee for their services.</i>
<i>General community</i>	<i>Community members who are not producers but have good will and benefit from carbon farming and related community developments.</i>

4.2 Sustainability of Carbon Groups and Associations (2.5 hours)

Objectives

At the end of this session, participants will be able to:

- ✓ Identify and describe success/sustainability factors for their carbon project;
- ✓ Understand the structure of carbon groups and roles of each function; and
- ✓ Identify financial and non-financial benefits of participation in carbon groups.

Materials required

- ✓ Classroom materials

Activities

Why carbon farmers need groups (1 hour)

- Discuss activities that are undertaken by carbon farmers that require groups and associations, such as nursery practices, assessments of all group activities, participatory monitoring, receiving carbon payments, and pooling common funds (e.g. community carbon fund).
- Discuss what other group enterprises both on-farm and off-farm can be undertaken alongside carbon project.

Groups carbon farmers can form (30 mins)

Discuss types of groups or associations that could be undertaken, such as :

- Individual farmers supported by a farmer coordinator
- Farmers in associations with 30 plus members
- Small farmer groups of 8-15 members
- Gender based groups

Organizing and building leadership (30 mins)

Discuss mobilization & leadership development, including:

- Awareness creation,
- Community meetings,
- Consensus on a basic idea,
- Creation of interim leadership,
- Development of rules, practices, and/or constitution for organization
- Establish substantive leadership, and
- Registration of group.

Question and answer session (30 mins)

Session notes for trainer

Group organization

Organization and functions of community groups

The farmers' link to the project managers can be through engagement in small groups and larger clusters of groups, which enable broad participation, efficient contracting, timely communication, efficient provision of extension services, and carbon benefit sharing.

The small groups and clusters are the mediators between the farmers and the project managers. For some projects, signing contracts with small groups and not with individual farmers is preferred. The small groups commit to the project management to implement certain practices.

Individual farmers are affiliated with the small groups, not to the project management. The managers of small carbon groups liaise between the farmers and project, and therefore, the structure and governance of these groups are critical to ensuring that project benefits are distributed equitably among participants.

Small group and cluster formation

In some cases, these farmer groups and clusters existed before the development of the carbon project. The groups were established to serve other social, livelihood, or religious functions. Since the carbon project activities have the potential to improve existing community

structures, it is ideal to integrate new carbon activities into existing group structures.

In some cases, small carbon groups can be created at the request of the project management where participating farmers are the direct members, who democratically elected their leaders. The small groups can be of 10 to 50 members or more.

Carbon group structure

The small groups should have formalized leadership structures. Some of the positions include Chairperson, Treasurer, and Executive Committee members.

Benefits of carbon groups to a community

- When members belong to a group, they are empowered to exchange ideas and market products together. They can influence the market of their local products and get better prices for products they produce (e.g. coffee).
- Members in carbon groups may be able to access loans using their carbon finance as collateral. These loans are used to invest in farmers' development activities.
- Being in a group enables farmers to tap into other projects from the government and other support organizations.
- Group cohesion creates friendship and care amongst members, which helps in case a member has a problem.

Tips for successful, sustainable carbon projects

Prioritize non-carbon project benefits

During consultation and training about the carbon project, the emphasis should be placed on the wide range of services and products that come with tree planting, for example, improved agricultural productivity, timber sales and community empowerment. The carbon payments are used as incentives to enable farmers to invest in the above activities.

In addition, the relatively small role of the carbon payment in projects needs to be carefully communicated to smallholders to ensure they clearly understand the value of the carbon payment relative to other benefits.

Cultivate strong relationships between the carbon project managers and community groups

The relationship between the carbon project managers and community groups is the foundation for project activities, and the strength of this relationship, as well as that of the groups with one another, affects the success

of the projects' outcomes. The carbon project managers in these cases are either from international or national NGOs, many with previous experience in implementing agriculture and rural development activities in the places where the carbon projects are developed. The project managers with pre-existing relationships with community groups are able to build from a foundation of trust and rapport.

Develop partnerships for scaling up

Moving from hundreds to tens of thousands of farmers (or more), as some smallholder carbon projects are attempting to do, poses significant challenges for project management. As projects grow in size, they could try to partner with other agricultural, rural development and conservation stakeholders within the landscape to achieve synergistic outcomes.

Prioritize upfront financing for projects and for farmers

Most project costs occur in the startup and early project phases when costs accrue for project design, farmer outreach and the establishment of monitoring and payment distribution systems. These costs vary depending on the project managers' experience, the information available and the scale that the project eventually wants to reach. For projects that are pilot testing new development models, these stages will add to the upfront costs. The costs for farmers are highest during early stages, due to demands on their time and labour, as well as cash when farmers are responsible for buying their own tree seedlings.

Minimize financial risks for farmers

The concern of financial risk to smallholder farmers arises only when farmers are asked to make a trade-off between their short-term livelihood concerns and expected cash returns from carbon agricultural practices. Tree planting provides benefits to farmers even in the absence of carbon payments. Nonetheless, farmers who expect payments may encounter delays and carbon price volatility when the price is not set for the duration of the project. This risk is mitigated to an extent through clear communication with farmers, in which the concepts of global climate change and carbon markets are clearly discussed. A system that ensures guaranteed payment levels throughout the duration project can be helpful when possible. Some projects use the promise of benefits from carbon payments as an entry point to support farmers' financial management capacity.

Create a mechanism to handle grievances

Support conflict resolution mechanisms within individual farmers and farmer groups. Formalizing carbon rights

can lead to community conflict, particularly in places where resource rights regimes are unclear. Carbon payments also have the potential to initiate conflicts within communities. Individuals or groups that are aggrieved should be aware of the procedures to take.

Address gender dynamics of the project

Gender roles are a concern in many aspects of the projects, particularly on issues related to land and tree tenure, labour, knowledge, benefit sharing, participation and leadership. Recognizing the challenge of women's participation, some projects can institute measures to improve women's access to project benefits. Women are in a better position to claim benefits where contracts are signed with small groups and where participation does not require land ownership. In some cases, training can target women by employing female facilitators

and scheduling them to ensure that women are able to participate.

Transition management responsibility to local actors

The long-term success of projects will rely on the ability to transfer management authority to local actors over time so that project activities are institutionalized locally. Roles like agricultural extension and carbon monitoring can be done by local actors. These local actors may include community groups, community-based organizations, government agencies, local companies or some combination of these. Project managers should recognize this need and prepare communities early enough for the transition. The chances of a smallholder carbon project being sustainable in the long-term will rest to a large extent on the success of community groups.

4.3 Participatory Carbon Monitoring

(1 hour)

Objectives

At the end of this session, participants will be able to:

- ✓ Define participatory carbon monitoring (PCM);
- ✓ Describe the goals of participatory carbon monitoring; and
- ✓ Name the principles of participatory carbon monitoring.

Materials required

- ✓ Classroom materials
- ✓ Field materials (measuring tape, sturdy boots, gloves and pruning aids)

Activities

Introduce PCM (15 mins)

Review goals and principles.

Brainstorm advantages of PCM (15 mins)

Ask participants to think of advantages to PCM. Examples include:

- It's cheaper.
- It builds farmers' skills in tree management.
- It allows for sharing of the best practices.
- It allows for mutual reinforcement for improved monitoring.
- It provides timely monitoring and payments.
- It increases the co-benefits of the project.

Question and answer session (30 mins)

Session notes for trainer

What is Participatory Carbon Monitoring (PCM)?

Participatory Carbon Monitoring is an approach to collect large amounts of data on tree/ forest resources through

the involvement of local communities. Active and trained carbon farmers, extension staff and community members can participate in carbon monitoring, with oversight by project management as needed. Actions can include identification of types of trees planted, support in counting number of trees and measuring the size of trees, and giving advice to ensure farmers comply with technical specifications necessary to receive payment.

PCM Goals

- **To make monitoring cost-effective:** mobilizing communities can be a more cost-effective strategy compared to the use of professional surveyors in conducting ground-based surveys.
- **To increase likelihood of payments:** Community engagement in carbon monitoring allows for sharing of best practices. It works as an incentive to promote further improvements in tree/forest management, increases the likelihood that carbon payments will be received.
- **To increase participation:** PCM is based on the principles of participatory forest management, and recognizes and capitalizes on communities, households, and other local stakeholders engaged in participatory forms of tree and forest management. PCM is a means of engaging communities and promotes awareness-raising by enhancing people’s understanding of the environmental values of forests in the context of climate change, and how they may better improve

their forest management for carbon and other purposes. At the same time, the collaborative work experience will promote a culture of cooperation between forest owners/communities, local government officers and national institutions responsible for other tasks related to PCM. It builds farmers’ skills in different tree management aspects, increasing the co-benefits of the project.

Principles of PCM

- **Simple methods and tools:** PCM methodologies must be simple enough for communities to implement with some training and assistance of technical forestry institutions. The development of easy-to-understand training tools is necessary.
- **Time effectiveness:** As PCM will be an additional activity for communities on top of regular forest management practices and other non-forest-based livelihoods communities may be engaged in, time-effectiveness will be an important factor which may affect the community’s willingness to partake.
- **Reliability of data:** In order to secure the reliability of data, a PCM team should be guided by technical personnel to ensure conformity to guidelines, as per the standard. Verification of the PCM results will be done through sampling by the technical staff. The data that is collected through PCM is put into a main database and analyzed into reports that are submitted to the standard.

Module 4 Evaluation

	Excellent	Good	Fair	Poor	None
Assess participants’ understanding of how their roles fit into the carbon project.					
Assess participants’ understanding of who the critical stakeholders are & critical relationships from project development to implementation.					
Assess participants’ understanding of their roles in participatory carbon monitoring.					

Further Reading

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