Rainforest Alliance

GUIDANCE ON COFFEE CARBON PROJECT DEVELOPMENT USING THE SIMPLIFIED AGROFORESTRY METHODOLOGY

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The Rainforest Alliance works to conserve biodiversity and ensure sustainable livelihoods by transforming land-use practices, business practices and consumer behavior. Based in New York City, with offices throughout the United States and worldwide, the Rainforest Alliance works with people whose livelihoods depend on the land, helping them transform the way they grow food, harvest wood and host travelers. From large multinational corporations to small, community-based cooperatives, the organization involves businesses and consumers worldwide in its efforts to bring responsibly produced goods and services to a global marketplace where the demand for sustainability is growing steadily.

The Rainforest Alliance sets standards for sustainability that conserve wildlife and wildlands and promote the well-being of workers and their communities. Farms and forestry enterprises that meet comprehensive criteria receive the Rainforest Alliance Certified™ seal. The Rainforest Alliance also works with tourism businesses, to help them succeed while leaving a small footprint on the environment and providing a boost to local economies.

We would like to acknowledge the following individuals and organizations for their contributions to this project:

John Michael Kramer, ***Environment and Development Consultant*** – Based in Washington, D.C., Kramer has over 30 years of development service in more than 40 countries specializing in agriculture, forestry and climate change. He has served as Senior Program Manager, Chief of Party and Senior Environmental Specialist of PADCO (now AECOM International Development); Director of the Environment and Natural Resources Group for the International Resources Group (IRG); Director of Agriculture and Natural Resources for CARE, Project Officer, Environment and Natural Resources Office for USAID Honduras, and Chief Watershed Hydrology Unit at the Honduran Forest Development Corporation.

Edwin Alpízar Vaglio, ***Forester*** – Based in Costa Rica, Alpízar is experienced in forestry and evaluation of ecosystem services and greenhouse gas sources and sinks in Central America. He has conducted basic studies project design, land use planning and evaluation in Kuna Yala, Panama, and the buffer zone of La Amistad International Park. Alpízar participated in the Global Environment Facility's Costa Rica-based Ecomarkets Project, has collaborated with the Costa Rica Office on Joint Implementation, and created land use maps for Costa Rica's national greenhouse gas source and sink inventory. He has also worked in the Talamanca-Caribbean biological corridor, the Fila Chonta-Quepos area, Castro Blanco National Park and Arenal Conservation Area and served as an instructor at the Central American Livestock School.

ECOM Agroindustrial Corp. Ltd., a commodity merchandizing company with operations primarily in ECOM agricultural commodities such as coffee, cocoa and cotton in Latin America, Asia and Africa, as well as Europe and the United Sates. ECOM is an integrated supply chain manager with strong focus on developing countries originating raw and semi-processed agricultural commodities. ECOM is a global leader in the green coffee trade ranking 3rd among the world's coffee dealers. For this project, ECOM acted as the agent for contact with farmers in the Bosawas Biosphere Reserve of Nicaragua, where the company is working with farmers to introduce reforestation on their farms.

pro natura sur

ProNatura Sur, a leading conservation group in southern Mexico, strives to protect cultural and biological diversity in a state that has record numbers of both. The group manages protected areas, conducts research, and helps indigenous peoples improve their farming and sustainably manage forest resources, such as bromeliads, which are used in religious ceremonies. As part of the Sustainable Agriculture Network, ProNatura Sur is working with coffee farmers around the El Triunfo Biosphere Reserve of Mexico.

CONTENTS

INTRODUCTION

The purpose of this guide is to provide those who own or manage coffee farms and the companies or associations who trade coffee with practical, how-to information on developing an agroforestry, afforestation or reforestation project, so that together they can undertake activities that will sequester additional carbon on farm and by doing so, be eligible to earn **carbon credits**. Rainforest Alliance Certification, earned by compliance with the Sustainable Agriculture Standard, is a suggested foundation to the practices explained in this guidance.

The process can be complicated, with many technical steps and complex interpretations of what is acceptable, what is measured, how and when. For small and medium enterprises, the requirements of carbon project standards and methodologies can be confusing, and may even stand in the way of progressive actions to combat climate change. So while there may be an attraction for farmers to earn extra income by planting more trees on farm, coupled with a willingness to do so, knowing just how to go about generating **carbon credits** can be a limiting factor. This guide seeks to reduce the technical barriers to accessing the voluntary carbon market that face the typical grower who is not an expert on carbon projects.

Our aim is to walk the user through the complete process of carbon project development: from evaluating their potential for creating a carbon project, to providing explanation on how one puts together such a project initially; to implementation and management of the project; along with the requirements of independent **validation/verification** (i.e., certification of carbon).

In summary, this guidance addresses the project planning and design; estimation, measurement, and monitoring of CO_2; establishing, managing, and maintaining an afforestation/reforestation area on a coffee farm; and eventually bringing to market and maintaining the project over time for the intended results of the sale of carbon **offsets**.

The guidance assists growers and their partners (such as coffee traders), who will collectively be referred to in this document as "project proponents," in using a particular **methodology** to quantify the carbon sequestration through a project. Our approach has not been to invent an entirely new methodology, but to work with an existing one, and to make it accessible to end-users. The methodology is formally titled: *"AR-AMS0004 – Simplified baseline and monitoring methodology for small-scale agroforestry – afforestation and reforestation project activities under the Clean Development Mechanism"*. It has been approved by the **Clean Development Mechanism** (CDM) of the United Nations Framework Convention on Climate Change (UNFCCC). This methodology can be implemented on coffee farms with little to no adaptation, as described here. Because this methodology aims to allow simple afforestation and reforestation within agroforestry systems, such as coffee farms, we refer to it in this guidance as: the **Simplified Agroforestry Methodology** or (SAM).

This guidance was developed and tested by the Rainforest Alliance, whose effort was made possible by the support of the International Finance Corporation's Innovation Fund and in collaboration with ProNatura Sur of Mexico.

HOW TO USE THIS GUIDE

The guide is split into six modules. Each can be used on its own depending on the reader's familiarity with forest carbon projects, but together they form our comprehensive guidance.

- The first module gives a general overview of forest and agroforest carbon projects to help the reader understand what a "project" is, what a project is not, generally what is needed to set a project apart from business as usual practice, and why such projects are important and have value. It also addresses the roles that must be fulfilled in carbon project implementation.

- The second module looks at the preparation and design of a project, an in particular the requirements for a Project Design Document (PDD), which is the all-important plan that identifies and explains each of the project's key activities, elements, and important data;
- The third module helps users to understand what are considered risks to carbon projects' success and how to assess these, as well as to lower or manage such risks;
- The fourth module explains the processes of independent third party evaluation, known as validation and verification, which are recommended for delivering a carbon credit to market;
- The fifth module presents an overview of the financial and contractual arrangements associated with carbon projects; and,
- The sixth module presents a collection of resources additional to this guide that could be of use to people involved in the project. Here users will also find a glossary for quick reference.

SCOPE OR APPLICATION OF THIS GUIDANCE

This guidance is focused on the development of afforestation/reforestation projects for carbon credits that could be sold into the voluntary carbon market, where companies, organizations and individuals can purchase them. Since any carbon project follows a set of standards, and those standards in turn have requirements for use of a methodology to account for the carbon sequestration, this guidance was designed with certain standards and methodologies in mind. It does not cover all possible standards or methodologies that could be applicable. The following was kept in mind in developing these guidelines:

First, the methodology should be internationally accepted and credible.

Second, the methodology should be approved already by either the Clean Development Mechanism (CDM) or the Voluntary Carbon Standard (VCS).

Third, if not already approved, then the methodology demonstrates a strong potential for approval to the VCS without significant time or cost.

As mentioned, the methodology selected for use with afforestation/reforestation projects on coffee farms is, AR-AMS0004, approved by the CDM, which is global in scope. However our field tests were in Mexico and Nicaragua in March/April of 2009. As a result, the guidance may be particularly suited for implementation in the Americas where coffee farm and market conditions are similar. With few changes – for example, use of a local tree species list – the methodology could be implemented in coffee-growing regions worldwide.

The Rainforest Alliance agricultural certification system, with its basis in the standards and annual audits of the Sustainable Agriculture Network, is a suggested foundation to the monitoring and verification explained in this guidance. Therefore, it will be most applicable for farms where Rainforest Alliance certification is in place or being sought.

MODULE 1: AGROFOREST CARBON PROJECT OVERVIEW

GUIDANCE ON COFFEE CARBON PROJECT DEVELOPMENT USING THE SIMPLIFIED AGROFORESTRY METHODOLOGY

This module gives the user a general overview of forest and agroforest carbon projects to help the reader understand what a "project" is, what a project is not, generally what is needed to set a project apart from business as usual practice, and why such projects are important and have value. It also addresses the roles that must be fulfilled in carbon project implementation.

1.1 WHAT IS A CARBON PROJECT?

The objective of a carbon project is to create carbon sequestration or emissions reductions that are additional to what would otherwise have happened without the 'project'. The proponents of the project will determine a defined boundary (either organizational or operational) to their project. The carbon sequestered from activities within the defined area over time as a result of the project activities (in this case, tree planting) can be considered a credit if produced according to the systems, standards, and requirements of a credible carbon scheme. 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.

Carbon projects seek to mitigate climate change and address the disruptions occurring to the climate worldwide. The global climate system is experiencing dramatic changes due to the huge volume of greenhouse gases that have been released by human activity into the atmosphere since industrialization. The most prevalent of these gasses is carbon dioxide (CO_2). In an effort to mitigate, or decrease, the amount of **greenhouse gasses** already in the atmosphere or to reduce the amount that are newly emitted, numerous so-called "carbon" projects have been initiated around the world. These include many different activities that individuals or organizations undertake to reduce or remove CO_2 from the atmosphere (Pacala and Socolow, 2004):

a. Reducing total energy consumption;

b. Improving efficiency in terms of consumption per unit output;

c. Substituting low carbon for high carbon fuels;

d. Carbon sequestration via aquatic, geological, and technological methods;

e. Carbon sequestration via increased plant, soil, and ocean water storage; and,

f. Improved land management through practices that reduce emissions from agriculture and forest activities.

Planting trees to sequester carbon from the atmosphere and concentrate it in biomass as a project type fits within these last two project categories.

Creating a carbon project is not as simple as planting seedlings, tending the growing trees, and then collecting income from carbon credit sales. A project has a distinct *area*, such as a single farm or a group of farms. A project has 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. A project has a well-defined set of actions that *set apart new and additional activities* from those that were normal, everyday operations.

This is the concept of the **additionality** of project activities, definition and testing of which has strict requirements within project guidelines. Methodologies and the standards by which projects are measured also give strict guidelines for quantifying **baselines** and changes in carbon stock, establishing the **permanence** of that stock, and mitigating any risks created by or threatening the project. Every carbon project must document these elements and, to ensure credibility, be evaluated by a third-party that can offer a public report.

1.2 WHY START A CARBON PROJECT?

The Intergovernmental Panel on Climate Change (IPCC) has found warming of the climate system to be beyond doubt, with evidence being found on every continent on earth[1]. Global average temperatures today are ~0.74°C warmer than 100 years ago. This change in temperature is occurring at different rates across the world, faster over continents and fastest at high northern latitudes. Climate change is affecting more than just temperatures. As the temperature rises, sea levels rise due to thermal expansion and the melting of land-based ice. Melting ice is changing the patterns of river flow experienced by millions who depend on it to irrigate their crops. Rainfall and monsoon patterns are also changing. It is also expected that moderate to extreme changes in storm timing, location, and severity will create risks in terms of future predictability for humans[2]. Coffee-growing regions could be affected by extreme heat and cold, unseasonable rains, severe droughts and floods, changing water resources and loss of plant and animal species.

The IPCC suggests a cap on global atmospheric concentrations of CO_2 at 450 parts per million by volume (ppmv). However, recent studies[3] suggest that global atmospheric concentrations of CO_2 be limited to 350 ppmv to prevent the most dramatic changes in climate. According to a 2008 report,[4] the current concentration of CO_2 in the atmosphere is 385 ppmv, a figure which is increasing at approximately 2 ppmv pear year. Scientists predict that those dramatic changes would occur if the mean global temperature rises 2°C above pre-industrial times. To meet the IPCC target carbon dioxide concentration, carbon emissions would have to be stabilized at 2005 emission levels of 7 billion tons of carbon per year for the next 50 years. However, emissions are predicted to *double* over that time period[5].

Even if we are to implement great reductions in greenhouse gas emissions, **carbon sequestration projects** are absolutely necessary to achieving stabilization at 350ppmv. However, carbon projects are not simply public services. They can generate crucial additional income for project proponents and others in the project supply chain.

Carbon permits are permissions to emit greenhouse gas emissions, as measured in **carbon dioxide equivalent** (CO_2e). They are issued and traded in mandatory markets to fulfill **Kyoto Protocol** commitments (as monitored under the United Nations Framework Convention on Climate Change) and regional or national requirements.

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[1] IPCC, 2007. Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, Pachauri, R.K and Reisinger, A. (eds.)]. IPCC, Geneva, Switzerland, 104 pp.

[2] Emanuel, K., 2005. Increasing destructiveness of tropical cyclones over the past 30 years. Nature 436: 686-688.

[3] The preeminent of which is Hansen et al., 2008. Target Atmospheric CO_2: Where Should Humanity Aim? The Open Atmospheric Sciences Journal 2: 217-231.

[4] Hansen et al., 2008. Target Atmospheric CO_2: Where Should Humanity Aim? The Open Atmospheric Sciences Journal 2: 217-231.

[5] Pacala and Socolow, 2004. Stabilization wedges: Solving the climate problem for the next 50 years with current technologies. Science 13: 968-972.

Carbon credits, however, are issued and traded in both mandatory markets and voluntary markets worldwide. According to 2008 figures from the Ecosystem Marketplace, the volume of carbon dioxide equivalents transacted on the voluntary carbon market in 2008 nearly doubled that of the previous year, reaching 123.4 million (M) tCO_2e[6] (an increase from 65 Mt CO_2e in 2007 and 24 Mt CO_2e in 2006), while the mandatory market involved 2.9 billion tCO_2e trade in 2007. While forestry projects represent a significant portion of credits traded in the voluntary market, only four forestry projects have been authorized under the United Nations Clean Development Mechanism due to high administrative barriers to entry for many potential forestry projects, and limitations on forestry project types allowed in mandatory schemes.

There is widespread support from developing and developed countries as well as the forest management community for including reducing emissions from deforestation and degradation (**REDD**) in the next international climate agreement, which will succeed the **Kyoto Protocol** and go into effect in 2013. Nevertheless, contemporary forest carbon projects are most expediently and beneficially created for the voluntary markets. The voluntary market supports the development of innovative project types and rewards the so-called "co-benefits" of reforestation, **afforestation** and avoided deforestation projects: conservation of biodiversity and support for sustainable livelihoods.

1.2.1 WHAT FINANCIAL BENEFITS MAY FARMERS RECEIVE?

The opportunity to receive financial compensation for the carbon storage function of trees is a relatively new market development. However, it is an ecosystem service important in mitigating climate change, with a growing international trade. The average price of a voluntary **carbon credit** in direct transactions between project proponents and buyers was US$7.34/$tCO_2e$ in 2008, up 22 percent from $6.10/$tCO_2e$ in 2007 and up 79% from $4.10/$tCO_2e$ in 2006. While these prices are not as high as the prices fetched by credits sold in compliance markets, the trend toward increasing value is clear. However, prices of credits change over time and, in most cases, vary depending on the quality of the project from which they originate. Credits from forest carbon projects are generally considered to be quite valuable, as they are associated with valuable social and biodiversity co-benefits that add to the sustainability and stability of the project. Projects that have a third-party validation and/or verification statement command the highest prices. Validated and verified projects are a "safer bet" for consumers, and considered to be most worthy of investment.

Reforestation projects have the potential for benefit beyond carbon finance of harvest of non-timber forest products and potentially even timber itself. Timber may only be harvested from those projects that are designed to have multiple harvest cycles, where the producers have made commitments to replanting after harvesting. This case is not addressed in this guidance but should be considered if it holds value for the project proponent.

For example, we looked at a test case of farms within Waslala, Nicaragua. Based on the data collected during pilot surveys in the spring of 2009 in Nicaragua, there is indication that farmers with a reasonable incentive and technical extension support could be supported to plant additional trees. This could result in an approximate increase of 62 metric tons carbon per hectare (tC/ha) over current average stocking densities.[7] If this outcome is spread out over a twenty-year project lifetime, the corresponding carbon credit sold by farmers would be approximately 3.1 tC/ha per year (11.74 tCO_2/ha per year), though since carbon payments will accrue for *realized* carbon storage, rather than average carbon storage, the payments will be lower initially and higher at maturity).

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[6] Hamilton, K., M. Sjardin, A. Shapiro and T. Marcello, 2009. Fortifying the Foundation: State of the Voluntary Carbon Markets 2009. Ecosystems Marketplace and New Carbon Finance, Washington DC and New York, United States, 107 pp.

[7] See the Appendix 3, Strata Definition and Estimate of Carbon Sequestration Potential on Shade Coffee Farms in Waslala, and Appendix 4, Baseline Data from Waslala, Nicaragua Coffee Farms, for more detail on this estimate.

In this pilot scenario, carbon credit returns would be approximately \$82 per hectare per year based on current voluntary carbon market prices of \$7 per metric ton CO_2e, or \$1644 per hectare for the duration of the project. Assuming an increase in carbon credit prices effectively cancels a discount rate of 6-8% per year, the project would pay back its costs over the life of the project(assuming costs of \$1/tree, 50% technical assistance, 50% sapling and transportation or \$400/ha at the beginning of the project).

There are considerations specific to coffee farms that must be considered in addition to the costs and benefits outlined here.

- Some Rainforest Alliance Certified farms, which already meet the Sustainable Agriculture Network's standards for trees per hectare, may not be able to plant more trees without affecting coffee yields.
- Properties at higher altitudes have less opportunity for shade tree planting due to the effect of shade on coffee yields.
- Thinning and harvesting operations may damage coffee plants and thereby reduce yields and increase expenses.

The cost/benefit analysis for implementation of a carbon project should be considered carefully for every individual project. Nonetheless, the value of the standing trees can be a significant benefit to a coffee farmer's household economy.

1.3 ATTRIBUTES AND CHARACTERISTICS SUITABLE TO QUALITY AFFORESTATION/REFORESTATION CARBON PROJECTS

How can you know whether the conditions are right for you to develop a carbon project? The following section is a checklist of important features projects should have. Project proponents, developers and investors should be able to review such elements to identify coffee farms with potential for developing quality reforestation carbon projects. While the concepts below will help the interested parties to identify project potential, a close review of standards and requirements is required before any project should be initiated to ensure that project is a fit for crediting. It should be remembered that only additional tree planting, beyond that which would have occurred in the absence of the project, would be eligible for carbon credits.

1.3.1 ORGANIZATIONAL STRUCTURE

✓ Rainforest Alliance Certified (or in the process of earning certification)

Coffee farms that are certified to the standards of the Sustainable Agriculture Network may already have the organizational structure necessary to construct an aggregated carbon coffee project. All farms that are certified to these standards are recognized for protecting wildlife, wild lands, workers' rights and local communities. Their experience with annual evaluation by certification auditors has accustomed farmers to a process similar to that which they will need to undergo to offer validated and verified carbon credits. These farms may already have in place some of the documentation systems that are required for forest carbon projects.

In addition, farms that are engaged in the Rainforest Alliance certification and auditing system have established market linkages for the sale of their coffee that potentially can be utilized for the sale of carbon credits.

1.3.2 ENVIRONMENTAL

- ✓ Ability to increase tree planting on farms without negatively affecting coffee yields.
- ✓ New trees planted will result in shade cover suitable for the altitude and type of coffee grown on the farm.
- ✓ Trees will be able to be thinned as appropriate and harvested with negligible damage to coffee plants.
- ✓ Trees can be planted without introducing new exotic species.

Increasing tree cover on a farm has many positive impacts: trees contribute to biodiversity conservation by providing critical wildlife habitat, help coffee farmers improve the quality of their beans, supply firewood, construction materials, fruit and other forest goods, and protects the watersheds.

Trees can be planted in many agroforestry configurations other than as coffee shade. In some cases these plantings may provide more carbon sequestration than as enhanced coffee shade. For example, projects may consider additional configurations on farm such as:

- On cropland as agroforestry interplanting;
- On pasture in sylvopastoral configurations;
- On degraded land as woodlots; and
- Along boundaries such as fence rows, paths and roadsides.

1.3.4 TECHNICAL

- ✓ Tree planting and maintenance: Farmers or those responsible for land management have the knowledge and capacity to plant trees and develop a reasonable management plan for their maintenance and harvest.
- ✓ Monitoring: Farmers or those responsible for carbon project management have the knowledge and capacity to accurately monitor and report on tree growth as part of the project.

Most farmers that participate in Rainforest Alliance Certification already have knowledge of tree planting, appropriate tree species and stand management, and are experienced in integrating shade trees with commercial coffee crops. To earn most benefit from the project, farmers should choose trees that add more value as timber than the ones traditionally used for shade, firewood and posts (e.g., *Inga spp.*).

Some farmers may need basic training in monitoring techniques, such as establishing sample plots and measuring tree growth.

1.3.5 COMMERCIAL

- ✓ Legal establishment: Land tenure and carbon rights are clearly established.
- ✓ Market connection: The project has reasonable certainty of finding a market for its credits.
- ✓ Up-front investment: The farmer and other project proponents (trader, etc.) can finance the initial expenses required to establish the project and support it to the point where carbon finance starts.

Many project implementation costs – planting trees, carrying out baseline assessments, carbon sequestration validation, establishing legal agreements, etc. – are incurred before any carbon is sequestered and the project can earn income from selling carbon credits. A project that is truly additional – that is, it wouldn't happen without the incentive of carbon finance – means that the farmer will not be able to self-finance implementation costs without undue risk. Other project proponents or investors, which could include coffee buyers and traders, may support the project activities in return for a part of the projected carbon credits or profits.

Similarly, a small or medium sized coffee farm is not likely to generate enough carbon on its own to offset the costs of entry into the carbon market. It is likely that a number of coffee farmer carbon activities will need to be aggregated for market entry. In the case of this project, the coordinator – the coffee trader or association – will serve as the carbon credit aggregator and distributor of benefits.

1.3.6 CULTURAL

- ✓ Market orientation: Farmers understand carbon as a commodity that can be sold in a global market and are comfortable with the supply chain that the carbon credit provided by their trees will enter into.

Farmers engaged with Rainforest Alliance certification are generally market-oriented and understand the value of connecting their farms with international value chains. However, selling a *product* of the natural environment, such as coffee, is different than selling the result of an ecosystem *service*, such as a carbon credit. To minimize project risk and increase fairness among project participants, farmers must fully understand the system of selling trees' carbon sequestration capacity and have confidence in the other people/organizations involved.

1.4 ROLES AND RESPONSIBILITIES OF THOSE INVOLVED IN A CARBON PROJECT

From the initial conceptualization of a carbon project to the end of the project period, there are many individuals and organizations that will shape its development. Carbon projects, especially those in forestry or agroforestry, require the expertise of various players to ensure that they are environmentally, socially and financially successful.

This section aims to identify the management responsibilities for engagement between the players in a carbon project, such as growers/producers, coffee traders/buyers, local community and government, or other stakeholders, and the third party auditors. By describing the roles and responsibilities, we intend to illustrate the necessary internal management systems that a carbon project should have.

It should be apparent, however, that these roles can change from project to project. They are defined here with respect to the implementation of the reforestation methodology and for use on coffee farms that have received or are seeking Rainforest Alliance Certification. The responsibilities associated with project development can be carried out by different players depending on their expertise and available resources.

1.4.1 CARBON OWNER: FARMER

In most cases where the Simplified Agroforestry Methodology is applied, the carbon owner will be the landowner of a coffee farm.[8] It may also be an association of coffee farmers, if it is the association that owns the trees for the project. The owner of the carbon may also sell the rights of the carbon to

[8] This role is often referred to as the project proponent.

another. Regardless, the carbon owner should be clearly in any explanations of the internal management for the project and identified in the project's design document.

> *The farmer is responsible for:*
>
> - Acquiring and planting seedlings;
> - Caring for young seedlings;
> - Tending trees and managing their growth;
> - Applying thinning and appropriate harvests;
> - Monitoring tree growth and harvest; and,
> - Marketing timber/wood products.
>
> *The farmer benefits from:*
>
> - Majority payment for carbon sequestered.
> - Sales from timber, firewood and poles.

1.4.2 PROJECT COORDINATOR: TRADER/COFFEE ASSOCIATION

The project coordinator[9] in the case of the projects on which we are focused in this guide is a coffee trader (for example, ECOM Agroindustrial Corporation) or association (for example, FEDECOCAGUA, the Federación de Cooperativas Agrícolas de Café de Guatemala, the national coffee and cacao growers cooperative in Guatemala). These organizations are examples of those suited to coordinate project implementation, because:

a. They have national and often international infrastructure;

b. They work with many farmers and/or many groups of farmers;

c. They have established relationships with farmers;

d. They may have means to support up-front project investments, such as seedling purchases or professional fees for technical assistance or validation;

e. They can make market linkages for distribution and sale of carbon credits; and,

f. They have established methods of disbursing payment to farmers.

[9] This role is often referred to as the **project developer**.

The coordinator is responsible for:

- Establishing a management system for the project;
- Coordination of a group of farms (if a number of farms will be grouped together within a single project);
- Writing the project design document (PDD);
- Preparing for, liaising with and hosting auditors from the validation/verification body;
- Conducting and recording the sale of carbon credits; and,
- Distributing payment to farmers for carbon credits and keeping records of these transactions.

The coordinator benefits from:

- A percentage of the carbon credit sales; and,
- Reputation benefits: the opportunity to sell clients carbon credits along with coffee.

GROUP MANAGEMENT SYSTEM USED BY PROJECT COORDINATOR

Unless the project takes place on only one farm, it will most likely be a group of farmers and farms. Group certification systems are commonly used to increase access and reduce transaction costs.

The objective of group certification is to facilitate access to producers who, for various reasons, may not have the means of entering the certification program on their own. The applicant for certification may also obtain more economic savings through the application of a single socio-environmental management system for many farms to come under. With this system already in place for Rainforest Alliance Certification, the project coordinator should be able to add the appropriate components for monitoring the reforestation project.

The project coordinator can refer to guidance on management of group certifications. For example, the International Social and Environmental Accreditation and Labeling (ISEAL) Alliance's Common Requirements for the Certification of Producer Groups (www.rainforest-alliance.org/agriculture/documents/iseal_req_group_cert.pdf) and the Standards for Group Certification: Rainforest Alliance Certification (http://www.rainforest-alliance.org/agriculture.cfm?id=standards_groups). These standards provide criteria for evaluating the viability and efficacy of the systems to promote compliance among groups of farms.

The group standards are particularly useful in identifying certification requirements and groups that qualify[10].

[10] In order to obtain Rainforest Alliance certification (and validation or verification against a carbon standard), the farms and the group administrator must achieve the following levels of performance:

· 80% general compliance with the applicable standards.

· 50% or higher compliance with any principle of the applicable standards.

· Compliance with all the critical standards indicated.

The project coordinator of the group system may be responsible for aggregating carbon and distributing the benefits of its sale to the farmer.

1.4.3 VALIDATION/VERIFICATION BODY: RAINFOREST ALLIANCE

Validation is a necessary process to demonstrate the credibility of a carbon project. It is the first stage in the **verification** process and is an audit conducted by an organization or firm accredited or approved as a validator/verifier. For convenience sake, this role will here be referred to as 'the verifier'.

In the **validation**, the verifier evaluates the PDD against the selected carbon standard and validates that the plan meets the standard's requirements and informs the standard's program of the successful audit. This usually occurs before a project begins, but sometimes will be done retroactively to a project already underway. The validated PDD serves as the basis upon which future credits are verified. The validated PDD is not a guarantee of future credits but it provides a reasonable assurance of the project coordinator's assertion of the sequestration that is planned.

Verification is conducted by the third party verifier that has been accredited by the chosen carbon standard association. In this case, the Rainforest Alliance could conduct validations and verifications in conjunction with Sustainable Agriculture Network audits, (though not on as frequent an interval).

Farms that are Rainforest Alliance Certified already undergo rigorous annual audits for responsible, sustainable farming practices. Audits of a carbon project that implements the Simplified Agroforestry Methodology as described in this guide can be carried out by Rainforest Alliance auditors at the time of their audits to the Sustainable Agriculture Network's standards. This will economize on the time spent by auditors and farmers in the evaluation period. Because the carbon audit is conducted to a voluntary market standard (see section on Choosing a Certification Standard), a separate audit report will be completed for the carbon project than for the Rainforest Alliance certification.

The validation/verification body is responsible for:

- Evaluation of the project as prescribed by the chosen carbon standard; and,
- Preparation and public release of validation and/or verification statement(s).

The validation/verification body benefits from:

- Providing assurance of the project's quality level; and,
- Payment from the project coordinator.

1.4.4 CREDIT BUYER: COFFEE COMPANY, OTHER ORGANIZATION, INDIVIDUAL

Carbon credits produced through successful implementation of the Simplified Agroforestry Methodology on Rainforest Alliance Certified coffee farms will result in verifiable carbon credits. These credits will be attractive to many buyers in the voluntary carbon market, because of their additional benefits of positive contribution to biodiversity conservation in the tropics and enhancing livelihoods of coffee farmers. While it is anticipated that traditional carbon market buyers (such as offset providers) will be interested in purchasing the credits, the coffee industry has shown a great deal of interest in supporting carbon credits generated on coffee farms to mitigate its impact.

The interested investor or carbon credit buyer may want to purchase carbon credits at any point in the project development. However, they should not purchase credits until the project plan has been validated by a third party, though they may choose to purchase credits before verification.

The credit buyer is responsible for:

- Due diligence on the carbon project: reviewing the project design documents and validation and/or verification statement(s); and,
- Payment for credits according to terms negotiated with the project coordinator.

The credit buyer body benefits from:

- Ownership of carbon credits that may be traded or retired; and,
- Communications about their direct contribution to carbon sequestration and biodiversity and livelihood conservation.

1.4.5 MONITORING

Regular monitoring is the responsibility of the project proponent and project coordinator (as agreed between them) and occurs on a regular basis. The methodology dictates what should be included in the monitoring report: the status of the reforestation activity and, as appropriate, accounting for tree biomass.

Maintaining accurate records of each monitoring visit is crucial, because these visits form the basis of carbon credit sales and payments. Monitoring records are part of the evaluation by the external auditors.

1.5 CHOOSING A CARBON STANDARD

Fundamental to a project that seeks to claim a 'carbon credit' for reductions to the amount of greenhouse gases being emitted into the atmosphere or those sequestered, is the choice of a carbon standard. By following the requirements of a credible standard, the project can provide assurances to their claims to potential buyers. In order to signal to buyers that a rigorous methodology has been followed, the claims made are genuine, and the greenhouse gas benefit would not have occurred in the absence of the project, projects should be evaluated by a third party to a particular standard.

A number of different standards exist. Credits generated and sold outside compliance processes such as the Kyoto Protocol or other national or regional schemes pertain to the voluntary market. Credits generated in the voluntary market are not made to meet any legal or mandatory obligations. Within this market, a number of different standards exist for verifying emission reductions. They each have different aims, processes, criteria, guidelines, eligibility criteria and allow different project types.

The main voluntary systems for carbon validation and verification that allow land-use change and forestry projects are:

- Voluntary Carbon Standard (VCS) – www.v-c-s.org;
- Chicago Climate Exchange (CCX) – www.chicagoclimatex.com;
- Plan Vivo – www.planvivo.org; and,

- CarbonFix – www.carbonfix.info.[11]

The Climate, Community and Biodiversity Alliance (CCBA, www.climate-standards.org) also has standards for land-based carbon projects, although meeting these standards does not result in the issuance of verified carbon credits. Rather, they measure that the project meets strict criteria relating to climate benefits, community involvement and benefits and biodiversity conservation. If a CCBA project intends to generate verified carbon credits, they would need to be verified under one of the other voluntary standards. Validation to the CCB Standard and another voluntary carbon standard is common practice for projects that make quantifiable reductions in GHG emissions as well as providing significant social and environmental co-benefits.

Separate from the voluntary market is the compliance market, notably the Clean Development Mechanism (CDM) of the **Kyoto Protocol**. The CDM has strict standards for afforestation and reforestation (A/R) projects that generate credits for sale to countries looking to meet mandatory GHG emissions targets. These credits, known as certified emissions reductions, are traded on what is known as the compliance market. The biggest compliance market is the European Union Emissions Trading Scheme, which is associated with the Kyoto Protocol, but regional and national compliance markets exist as well.

1.5.1 STANDARDS SUITABLE FOR COFFEE CARBON PROJECTS

For projects that aim to increase tree cover on coffee plantations by planting multiple use and timber species, there are a several voluntary standards that are available. In this section, we consider the applicability or suitability of these aforementioned standards.

We recommend that afforestation/reforestation projects using the Simplified Agroforestry Methodology on Rainforest Alliance Certified coffee farms focus on achieving verification to a voluntary carbon standard.

The CDM is not advisable for a number of reasons. Bottle-necks in the process have led to only few projects being registered to date[12], with high validation and verification costs making small projects difficult. In addition, the prices fetched by the credits are low, because the CDM only issues temporary credits from A/R projects that have to be replaced by purchasers in the future with permanent credits from another project type[13]. We note that the SAM was designed to be used within the CDM, but our guidance is not recommended for use in CDM projects. Most of the guidance would still be applicable, but the projects would be issued with temporary rather than permanent carbon credits, the transaction costs would likely be higher and Rainforest Alliance auditors could not be used to reduce validation and verification costs.

The Voluntary Carbon Standard (VCS) and Plan Vivo are the two most suitable candidates for use in coffee farm afforestation/reforestation projects and will be discussed in more detail in the following section.

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[11] Another standard applicable to reforestation is the Climate Action Reserve (CAR, www.climateactionreserve.org). This guidance will not consider the CAR as its forestry protocols are under revision (as of Spring 2009) and it is unclear what the geographic domain of forestry projects will be (though they are applicable in the United States only, CAR is considering expanding them). However, this standard should be evaluated in the future for use with projects that aim to increase shade on coffee plantations by planting timber species.

[12] See http://cdm.unfccc.int/Statistics/Registration/RegisteredProjByScopePieChart.html for an up-to-date breakdown of CDM-registered projects by scope.

[13] See http://www.forestcarbonportal.com/article.php?item=217 for an explanation of why there are so few A/R CDM projects.

The Chicago Climate Exchange (CCX), has an integrated GHG reduction and trading system including forestry offset projects. CCX issues tradable Carbon Financial Instrument (CFI) contracts to owners or aggregators of eligible projects on the basis of sequestration or reduction of GHG emissions. All CCX offsets are issued on a retrospective basis, with the CFI vintage applying to the program year in which the GHG reduction took place. Projects must undergo third party verification by a CCX-approved verifier. Offset projects can be registered by Members, Offset Providers and Offset Aggregators. Afforestation and sustainably managed forest projects are allowed. The CCX project guidelines are currently being reviewed for updating. This uncertainty, combined with a North American focus and low value of CFIs (they averaged \$4.43/tCO_2e during 2008)[14] make this standard less well suited to carbon coffee projects at this time.

The CarbonFix standards offer best practice guidelines for calculating the carbon sequestered by forest growth projects. The standards provide step-by-step guidance and templates informing project developers how to conduct projects. However, the standard is aimed at pure (A/R) activities, as opposed to agroforestry. As such, one of the eligibility criteria for projects is that at least 500 trees must be planted per hectare. This would not be possible under the plans for shade planting within the cultivated area of coffee farms. It may be a suitable standard for reforestation on-farm, adjacent to planted coffee areas. However, because of its limited suitability, the CarbonFix standards currently are not practical for coffee carbon projects.

A project could also aim to achieve the CCBA standards, but the scope of this guidance is limited to the carbon credit generating standards. The Sustainable Agriculture Network (SAN) standards that the farms already meet require that they are managed in a way that promotes efficient agriculture, biodiversity conservation and sustainable community development. As such, many of the aims of project design standards already will be embodied on Rainforest Alliance Certified farms and having a project design validation might be redundant. Farms wishing to pursue co-benefits standards such as the CCBA could most likely do so with relative ease and may receive a premium on any carbon credits generated, as the CCB Standard is already recognized in the voluntary carbon market.

THE VOLUNTARY CARBON STANDARD AND PLAN VIVO STANDARDS

Both the Voluntary Carbon Standard and Plan Vivo Standard require that a project is well designed, uses conservative baseline methodologies, demonstrates additionality, minimizes and accounts for leakage, and has a monitoring plan. However, the VCS has a system whereby an approved methodology must be used that includes:

- Applicability criteria that defines the area of project eligibility;
- A process that determines whether the project is additional or not;
- Determination criteria for the most likely baseline scenario; and,
- All necessary monitoring aspects related to monitoring and reporting of accurate and reliable GHG emission reductions or removals.

The methodology required by VCS is not project specific and it does not explain *how* the project should be carried out. Rather it outlines what constitutes an eligible project on eligible land, how baselines and emissions reductions should be calculated and what level of monitoring is required.

[14] Hamilton, K., M. Sjardin, A. Shapiro and T. Marcello, 2009. Fortifying the Foundation: State of the Voluntary Carbon Markets 2009. Ecosystems Marketplace and New Carbon Finance, Washington DC and New York, United States, 107 pp.

The VCS automatically accepts CDM-approved methodologies, and one of these is AR-AMS0004 – "Simplified baseline and monitoring methodology for small-scale agroforestry – afforestation and reforestation project activities under the Clean Development Mechanism". Rainforest Alliance analysis has concluded that AR-AMS0004 is suitable to be used as a methodology on which to base a project for tree planting on coffee farms.

To conduct a project, a project design document (PDD) is also required. The PDD is specific to the project and states *how* the project intends to follow the methodology and what the results of doing so will be. It also explains further details such as the project management structure, legal and social considerations, the environmental impact, or risks to the success of the project. To deal with the issue of permanence a separate risk analysis tool (document) must be used to calculate how much risk there is of the credits not being permanent, and subsequently the percentage of credits that need to be withheld from sale and deposited into a buffer pool. The PDD and the risk assessment need to be validated by a third party auditor, and them subsequently verified to issue credits, one the trees have grown. This document provides guidance on how one would write a PDD for a coffee carbon project.

For a VCS project, the SAM would serve as the methodology and this guidance document would help project developers complete a PDD and risk assessment.

Plan Vivo projects are required to document the same things and go through a similar process, but in slightly different documents. First, a 'concept' must be registered with the Plan Vivo Foundation. This involves defining the main aspects of project including target groups, activities and describing area and project aims. Once registered and accepted, project design can begin. This involves writing two documents; a technical specification and an operational manual. Both documents must be reviewed and validated by the Plan Vivo Foundation. The technical specification document is like a combination of a PDD and methodology. It is specific to one project, it contains the methods and how they should be executed. The operational manual contains the technical specification as an annex and also collates all data and information generated by a project as it progresses. The project can be verified by a third party verifier, but timelines for this are not set and it is not essential.

The SAM could be the foundation to build a technical specification and will cover the methods that must be followed. This guidance manual would also be needed to guide a project developer on how to complete the remaining part of the technical specification that deals with *how* the project is to be implemented.

AF-CAFE-TROP1[15], a technical specification for a growing Spanish cedar on coffee plantations, has been approved by the Plan Vivo Foundation and demonstrates a method for calculating carbon sequestration from shade tree planting (and harvesting) on coffee plantations. This technical specification could be used with minimal adaptation for a carbon coffee project under Plan Vivo as an alternate to the SAM.

1.6 THE CARBON PROJECT CYCLE

This overview will guide one though the carbon project cycle, touching upon the roles and tasks of the players involved in each step of the project cycle. The guide moves from step to step, outlining how each step leads into the next and what is to be achieved by the project overall. The project must be conceptualized, designed, validated, implemented and monitored and verified before credits may be sold.

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[15] http://www.planvivo.org/content/fx.planvivo/resources/tropical_coffee_timber.pdf

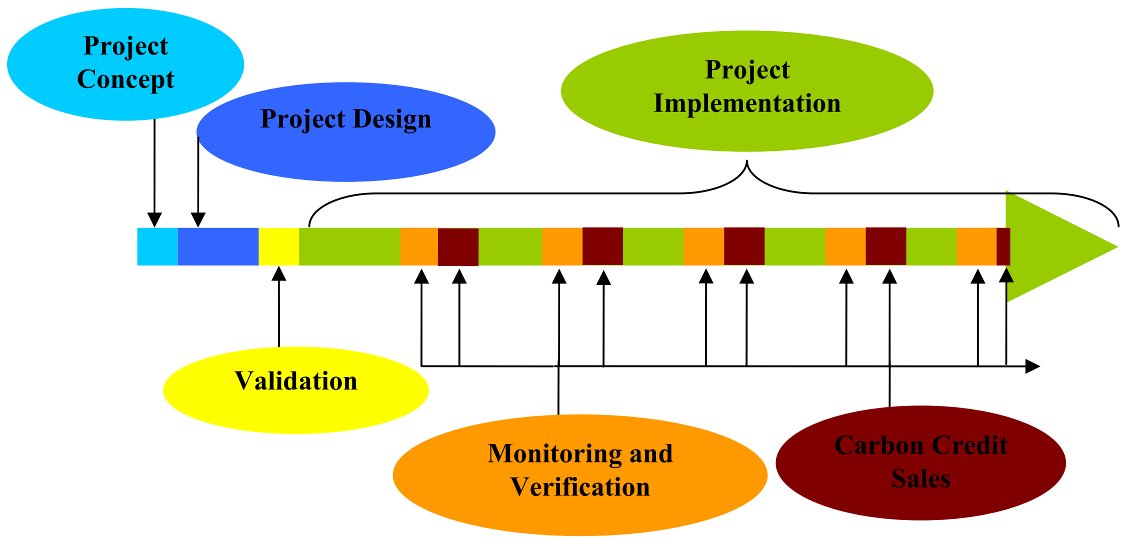

FIGURE 1. THE CARBON PROJECT CYCLE[16]

1.6.1 PROJECT CONCEPT

The reason to create and implement a carbon project may come from the farmer or from a coffee trader or association, which may have already assumed the role of project coordinator. At this very first stage, the project coordinator and the farmer(s) are conceptualizing what a project could be. This step may begin with little more than a brainstorm (*lluvia de ideas*) or rough sketch or outline. There should be dialogue between the project coordinator and the farmer(s) about the scope of activities envisioned for the project, i.e., the "who," "what," "where," "when," "how," and "why" for tree-planting on coffee farms.

The farmer must understand and be able to commit to the long timeframe of the carbon project. The farmer and project coordinator together must have the technical and institutional capacity to manage the project.

The farmer and project coordinator should begin a dialogue to determine what their relationship should be for the purpose of the carbon project (as this may be a different relationship than the one established for coffee sales). At this stage, they can discuss how each of the following will be carried out as well as each party's responsibilities:

- Project boundaries:
    - Farms in the project (single farm or groups of farms)
    - Land title or tenure (documentation of ownership)
- Reforestation plan:

  Location and size of each farmer's area(s) to be planted;

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[16] Adapted from the *Introductory Course on Reducing Emissions from Deforestation and Forest Degradation Participant Resource Manual*. See www.conservationtraining.org.

Species and number of trees to be planted;

Nursery and seedling establishment;

Planting pattern and spacing;

Management (e.g. tending and thinning) plan;

Rotation period.

- Monitoring plan: when and how the plot will be monitored.

It is often common at this stage for the project coordinator to write up a short (1 – 5 page) project concept note, which describes the project activities and makes rough approximations of the expected potential carbon sequestration benefits. Implementation of the project, on one farm or more likely on a group of farms that will aggregate their carbon credits, should have the potential to earn enough revenue through sales of carbon to justify the expected investment in project activities.

1.6.2 PROJECT DESIGN

PROJECT DESCRIPTION OR DESIGN DOCUMENT

The project description (or design) document (PDD) may be the most important project document necessary for successful development of a coffee carbon project. The PDD will describe *how* the project intends to follow the methodology and *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 operational the project. The process of validation (as described in 1.4.3 and 1.6.3) is one of approving this plan to the selected standards of the carbon program. 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 explain 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 (Rainforest Alliance) as part of their assessment of the project, and is made publicly available for potential investors and others.

APPLYING THE CARBON CALCULATION METHODOLOGY

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

ESTABLISHING INTERNAL PROJECT AGREEMENTS

Once the potential of the project is understood by those involved (see Attributes and Characteristics Suitable to Quality Afforestation/Reforestation Carbon Projects, page 8), and it is foreseen that the requirements of the methodology implementation will be met, then formal agreements for the project can be prepared. These include agreements between the project coordinator and each farmer, the project coordinator and the validation body, the farmers or project coordinator and the Sustainable Agriculture Network auditing body, and the project coordinator and credit purchases (though this last agreement may not be signed until later in the project). These agreements are reviewed in detail in Module 5, but a summary of each follows.

The *agreement between the project coordinator and farmer* should be a contract that includes the terms outlined in the project concept note as well as the following, indicating which party is responsible for which items:

- Area to be enrolled in the project (and terms for entering additional lands);
- Duration of the project (start and finish);
- Commitment of farmer to specific practices, standards, techniques;
- Anticipated payment amounts and schedule;
- Methods of payment (e.g., bank account number if payment is to be made by direct transfer); and
- Conditions of payment (e.g., terms or conditions for withholding payments).

The *agreement between project coordinator* and *the project validation body* (according to the policies of the validator/verifier) to perform validation of the project to a carbon standard. The project coordinator should contract the validation body as per that body's standard procedures.[1] The validation body will require certain information prior to agreeing to carry out the validation, including the project's location(s), size, estimated carbon sequestration potential and status of the project design document. It can be useful to engage a validator as soon as the coordinator has an idea of when the project will be ready for validation, as many accredited validation bodies plan work months in advance. In the case of reforestation, carbon projects on farms certified to the standards of the Sustainable Agriculture Network (SAN), the Rainforest Alliance can audit the carbon project in conjunction with the SAN audit for optimal efficiency.

Combining auditors' visits so that evaluation of the SAN and carbon standards are simultaneous is the best way to maximize efficiency for the forest carbon project, and a chief advantage of implementation of this methodology on Rainforest Alliance Certified farms. The *agreement between the project coordinator and the SAN auditing body*, laid out in accordance with that body's contracting procedures, should take into account the joint carbon project-sustainable agriculture audit in its accounting of necessary resources.

The *credit sale agreement* should a contract agreed upon by the project coordinator (who might bundle carbon sequestered on more than one farm to provide a certain volume for sale all at once) and the buyer of project credits. This sale agreement should be explicit about what is being purchased, how much, for what price and how the revenues will be disbursed among project administration and implementation. Precise language should be used to avoid any confusion about the transaction or the value of the credits sold.

1.6.3 VALIDATION

The project is validated by a third party once the Project Description Document (PDD) is completed and the project proponents have decided they are ready to have the project design evaluated by the verifier, such as the Rainforest Alliance. The verifier will typically conduct two types of evaluations or audits of afforestation/reforestation carbon projects: validation and verification.

The process of validation is basically an evaluation of the afforestation/reforestation project PDD according to the chosen carbon standard, i.e., the Voluntary Carbon Standard or Plan Vivo.

Validation involves an inspection of project design documents, anticipated future carbon storage and emission quantities and field operations beforehand to demonstrate capacity to conform to the auditing standard requirements. Validation does *not* confirm the production of a specific quantity of carbon credits. Validation typically happens after the project's design has been established and before or as activities are being implemented.

Verification occurs after the trees have grown for some time and are large enough to measure for their biomass and also they should have accumulated sufficient biomass to justify the auditing (see below).

In validation and verification audits of the carbon project, the Rainforest Alliance will match the timing of the evaluations of a farm or group of farms to the regular annual audits for their Sustainable Agriculture certification.

1.6.4 PROJECT IMPLEMENTATION

Technically, project implementation begins after a project has been validated. In practice, this stage starts whenever the project activities are implemented. For a coffee carbon project the activities include:

- Procuring seedlings;
- Planting trees;
- Maintaining trees, including replacing and thinning as appropriate;
- Harvesting trees as appropriate;
- Monitoring tree growth;
- Accounting of and aggregating carbon sequestered, then translating this to carbon to be sold.

1.6.5 VERIFICATION OF CARBON CREDITS

Verification involves an inspection of validated/registered project design documents, realized past carbon storage and emission data, and field operations after the project has started to confirm carbon credits were generated in accordance with particular auditing standard requirements.

Verification audits by accredited independent third-party entities typically occur in five year intervals (the interval is dictated by the carbon program), and so while they would be timed to coincide with audits by Sustainable Agriculture Network auditors, they would not need to be carried out on an annual basis.

1.6.6 CREDIT SALES AND BENEFITS DISTRIBUTION

In the coffee farm afforestation/reforestation carbon projects, it is likely that the project coordinator likely will be responsible for the aggregation of carbon credits from many farms into a salable amount and for handling transactions with carbon buyers. The project coordinator should ensure that farmers know how payments are connected to their reforestation activities, when to expect payments and how much to expect, and that farmers have access to payment records.

The coordinator should issue contracts for each sale, or one contract that covers a reoccurring sale as appropriate. Each sale contract should identify how the payment will be disbursed; including what percentage of the sale goes to the coordinator and what to farmers (this should be determined at the project's outset).

The type of sale and contract issued may vary based on the credit buyer (see Markets and Buyers, page 54), but should result in consistent and transparent benefit for producers.

MODULE 2: PREPARING A PROJECT DESIGN DOCUMENT

GUIDANCE ON COFFEE CARBON PROJECT DEVELOPMENT USING THE SIMPLIFIED AGROFORESTRY METHODOLOGY

This module provides guidance on how a project design document (PDD) should be created for a coffee farm reforestation project that intends to generate 'additional' carbon and possibly sell credits according to internationally accepted rules for carbon accounting.

The first step in creating a new PDD is the selection of a template suitable for the standards to which the project is being designed. These are usually found on the Web sites of the carbon standards organizations. For example, (http://www.v-c-s.org/policydocs.html). The PDD contains all the information necessary to explain how a project is designed and will operate. A PDD should be used in conjunction with a methodology. The methodology describes for a given project type; applicability criteria, how to demonstrate additionality, how to calculate the baseline and leakage, how to calculate the GHG benefits of the project and how to monitor the project. The methodology is not usually site specific which is why a PDD is needed to explain how the project will use the method in its particular case.

A project must use a methodology that is approved (or could be approved) by the standard to which the project is being designed. The VCS allow for Clean Development Mechanism (CDM), Climate Action Reserve (CAR) methodology, or any newly approved VCS methodology to be used. For Plan Vivo, a new methodology is allowed for each project and is somewhat integrated into the PDD. The guidance below is more suited to a VCS approach; however the guidance could also be applied to Plan Vivo.

One of the most important, and often challenging, technical aspects of a project is to understand how the methodology applies to the project and what must be done to follow the methodology correctly.

This guidance aims to explain the CDM AR-AMS0004, the Simplified Agroforestry Methodology (SAM), as the basis for a coffee carbon project, and provide information on how to execute it. For each of the following sub-sections, as appropriate, there will be guidance for how to use the SAM to address the category of the PDD being covered.

2.1 PROJECT PROPONENTS

The PDD must identify the responsible parties to the project and their roles or tasks in management of the project. As the PDD serves as a management plan for the project, it is best practice to fully describe the management capacity and the management systems.

The PDD should describe the following aspects related to the project proponents:

- organizational structure;
- roles and responsibilities of those involved;
- technical skills/competencies to fulfill those roles;
- experience of the management team;
- training and capacity-building that will be offered to farmers;
- types of technology the project will rely upon;
- consultation and information-sharing;
- financial resources and budget to implement the project;

In addition, the PDD should describe the ownership of the land where the project is to take place and what means the project will use to demonstrate proof of title to the land. The farmers should be able to demonstrate they have ownership (or usufruct) rights. Where such ownership or rights are difficult to demonstrate through legal documentation, then the proponents should describe the means to establish or authorize rights to land. The PDD should also establish that there are not significant disputes that are unresolved as related to the land in the project.

The PDD should demonstrate who will have ownership of the carbon rights and how consent and agreement for their transfer will be established.

Using the SAM
The SAM does not require any specific description of the project proponents or participants. This would be a requirement solely of the carbon standards that a project would use.

2.2 PROJECT PARTICIPANT/BENEFICIARY

The PDD should describe the participants, and where there are many farmers who are participating within a group, the PDD should describe the systems and procedures that will be used to manage the group and the activities that each landowner would undertake. The PDD should be transparent about what constitutes a participant, i.e., agreements that are needed to demonstrate involvement. There should be a register of farmers, their lands, their planting areas and commitments, as well as designation of responsibilities they will undertake to be within the group. The PDD should identify external stakeholders to the project and make the distinction, in terms of roles and responsibilities, with those who are internal or external to the project.

The PDD should document the policies to determine when a group member is not meeting the minimum requirements of the program, what will be done to improve performance, or as a last resort to remove a farm from the group.

Using the SAM
The SAM does not require any specific description of the project participants or beneficiaries. This would be a requirement solely of the carbon standards that a project would use.

2.3 PROJECT LOCATION/BOUNDARIES

The project location, explains where the project is located relative to its surroundings, whilst the project boundary, in its narrowest definition, defines the project area. Project areas can comprise of more than one discrete parcel of land but they must be uniquely identified. It is necessary to clearly define and document the boundaries of the project, and its geographic location. Most commonly this is achieved through remote sensing satellite data and geographic information systems (GIS) software.

Free images, from the Landsat satellite with a resolution of 30m are available from various sources[17]. Higher resolution imagery is available, but this can be expensive[18]. Remote sensing/GIS software and some expertise are required to manipulate the images. Free GIS/remote sensing software is available[19]. A global positioning system (GPS) device should be used to record the project boundaries and overlay them with the satellite image.

Alternatively, officially certified topographic maps, land administration and tenure records, and/or other official documentation that facilitates the clear delineation of the project boundary can be used. The data shall be geo-referenced, and preferably provided in digital format.

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17 http://www.dgi.inpe.br/CDSR/ (South America only), http://glovis.usgs.gov (Global)
18 For example, IKONOS or ASTER
19 http://www.dpi.inpe.br/spring/english/ (SPRING GIS /Remote Sensing software)

At the time of project validation it may not be necessary for the project proponent to have control of the entire project area stated in the PDD (VCS Guidance for AFOLU Projects). It will be necessary for project proponents to have control of the entire area at the verification stage. If this is the case, the specific requirements of the standard being applied should be checked.

Using the SAM

For carbon coffee projects using the SAM, the land area that comprises the project area will be the coffee farms themselves. The project area may extend beyond the coffee fields to unused areas, pasture, buffer zones, or anywhere where the land cover is expected to change as a result of the project. Each area should be given a distinct name/number. If less than 80% of the project area is under the control of the project participants at the time of the validation, then the 'VCS Guidance for AFOLU Projects' document should be consulted and the specific guidelines for this situation be followed.

The project boundary can also refer, more widely, to the project crediting period, the sources, sinks and types of GHGs being considered and the carbon pools considered (VCS Guidance for AFOLU Projects). These concepts are discussed further in detail below.

2.4 PROJECT START DATE, PROJECT DURATION AND CREDITING PERIOD

The project start date is defined slightly differently by different standards, but essentially is when actions to reduce GHG emissions (or create sinks) started. The earliest start date is often specified for a project to be eligible because it is difficult to prove that a project started many years ago is additional.

The duration of the project must be defined project, and it must have a management plan for the entire project period. This is to increase the confidence that permanence in reductions will be achieved.

The crediting period is the period over which a project claims verified emissions reductions and over which credits may be issued.

Using the SAM

For carbon coffee projects using the SAM the "date on which a financial commitment was made to the project and the project reached financial closure" is the start date of the project and the crediting period is "the date the first monitoring period commenced".

For carbon coffee projects using the SAM the project duration must be between 20 and 100 years, according to VCS rules. Under the VCS the project duration is equal to the crediting period. During the crediting period, credits are issued after successful verifications of the actual increases in carbon stocks measured via the monitoring program. It is recommended that the project be verified every 5 years. Frequent verification is rewarded by the release of credits stored withheld by the VCS in the buffer account (See section on Permanence and Risk below).

2.5 DESCRIBING THE INITIAL PROJECT CONDITIONS

Projects, under any standard, will be required to describe the conditions prior to the initiation of the project. This is not the same as describing the baseline, which is described in more detail below. The conditions at the initiation of the project can be thought of as a 'snapshot' of the project area prior to the project start date, whereas the baseline scenario is an estimate of what would have happened in the absence of the project. It may be that the projection is that things would stay exactly the same, in which case, the baseline scenario would be the initial conditions remaining constant over the project duration.

Using the SAM

In describing the initial conditions the project area should be divided up into 'strata' of land areas that are similar (strata are explained in more detail in the Monitoring section below). As stated before if the project area has more than one discrete area, then each should be referred to separately. For example, a project that comprises of two farms may label the farms 'A' and 'B'. Within each farm there may be different strata that require describing; A1 = 10ha of coffee plantation with no shade, A2 = 3ha of unused area with a scrub covering etc. The strata should be shown on a map (ideally mapped using GIS and GPS data).

Once the project area has had its strata defined, for each stratum, the following should be provided:

- A text description of the project area (location, vegetation cover etc)
- A description of the land-use practices conducted in the area (harvesting, fertilizing, planting, burning etc)
- An estimate of the density of the current carbon stocks, i.e. how much carbon there is above and below ground per hectare. (The Baseline and Methodology section below should be referred to in order to determine which pools should be selected and how to calculate the carbon stock)

The values of carbon densities per strata defined here are considered the carbon densities at time zero.

2.6 BASELINE AND PROJECT METHODOLOGY

A project '**methodology'** generally contains applicability criteria, additionality determination procedures, the criteria for calculating the most likely **baseline** and monitoring specifications that determine, what will be measured and when to calculate the GHG emissions reductions or removals.

The exact content of methodologies will vary from standard to standard. Plan Vivo, for example require a new methodology for each project. VCS requires that an 'approved' methodology is used[20]. At present the only approved methodologies for use in a VCS project are Clean Development Mechanism (CDM) and California Climate Action Registry methodologies.

The following sections explain how the SAM can be used when writing project design document for the VCS standard. The guidance given here could be used if other standards are being followed, but consultation with the standards rules would be required.

NOTE: IT IS NECESSARY TO HAVE THE SAM OPEN WHILE READING THIS DOCUMENT TO CROSS REFERENCE THE GUIDANCE.

2.6.1 APPLICABILITY

Section I, part 1 of the SAM deals with applicability conditions. These are the criteria a project design must pass to be eligible to use this methodology. The methodology has been designed such that Rainforest Alliance certified farms, increasing shade on their lands, will meet the necessary applicability criteria.

[20] http://www.v-c-s.org/methodologies.html

Below each of the criteria and how these would be met by a coffee carbon project are explained. It is necessary for a project to satisfy all criteria A, B, C and D. However for those criteria with sub-criteria (C and D), only one of the sub-criteria need to be met.

- Criterion A states that the project must be implemented on cropland.

  As a coffee farm the project area is eligible as cropland.

- Criterion B states that the Project activities include a cropping regime that is considered an agroforestry system that is consistent with international or national definitions. The World Agroforestry Centre (www.icraf.cgiar.org) defines agroforestry as "a dynamic, ecologically based, natural resources management system that, through the integration of trees on farms and in the agricultural landscape, diversifies and sustains production for increased social, economic and environmental benefits for land users at all levels."

  The cultivation of coffee under shade is a typical example of agroforestry, meeting the definition.

- Criterion C aims to ensure that if significant biomass exists already on a site, then this will not be removed under the project activities. Coffee carbon projects may fall under two categories.

  Either they will meet criterion part (i) and not have existing biomass greater than 10% of the increases expected under the project or clearly state in the PDD that if they have significant biomass already, as in part (ii), this biomass will not be removed. To ensure this criterion is met a statement saying that biomass will not be removed as part of the project activities must be made in the PDD. If clearing is required for tree planting a more detailed calculation based on expected gains and pre-project stocks will be required. Such calculations would use the carbon accounting methods described below.

- Criterion D is to ensure that if the amount of area in which can be cultivated for crops decreases because of the project there are not negative impacts caused elsewhere. Only one of the four parts of the criteria must be met.

  If there is not any expected displacement of crops then part (i) is satisfied. If there will be displacement, then a project must show that deforestation will not occur under part (ii). Rainforest Alliance certified farms are not permitted to clear forest for new production areas under the SAN standard, and thus would pass this criterion. If a farm is not certified, the areas into which displaced crops will be moved should be documented and mapped, to show this does not require deforestation. If the land into which the displacement occurs has very low biomass (scrub, few trees etc) then displacement is allowed under part (iii). Finally, if the reduction in cultivated area is less than 50 percent of the project area, this is acceptable providing **leakage** is calculated. It is not anticipated that **leakage** should need to be calculated because one of the criteria of parts (i), (ii) or (iii) will be met.

2.6.2 ELIGIBILITY

The SAM, in section I.4a, requires that the project prove that it is being carried out on 'eligible lands', as determined by using a CDM tool. Eligibility refers to the historical land-use at the project site, for example, recently deforested lands are not eligible for reforestation.

The land to be afforested or reforested must not be forest already:

The project must be on eligible land, as defined by the UNFCCC *"Procedures to demonstrate the eligibility of lands for afforestation and reforestation CDM project activities"*[21]. This document requires that the project area does not meet the host countries Designated National Authority's (DNA) definition of a forest. Each country sets its own definition of forest (within limits) for UNFCCC accounting purposes[22]. For example, the Nicaraguan DNA define a forest a minimum 20 percent tree crown cover, across an minimum area of 1 ha, with the trees having a minimum height of 4 m. For comparison the Mexican values are 30%, 1 ha and 4 m. However, the SAM is designed for agroforestry systems, and nations typically define agroforestry systems differently than forests. For example, within the Republic of Guatemala's Ley Forestal (Decreto 101-96) an agroforestry system is defined as: *"Los sistemas agroforestales son formas de uso y manejo de los recursos naturales en las cuales especies leñosas (árboles o arbustos) son utilizadas en asociación deliberada con cultivos agrícolas o en explotaciones ganaderas con animales, en el mismo terreno, de manera simultánea o en una secuencia temporal*[23]*."* This indicates that Guatemalan law defines an agroforestry system as an area that is cultivated with agricultural crops, but also includes trees.

It is anticipated that the national DNA definition from the CDM will preclude most options to increase tree planting on anything other than bare cropland. Thus, projects should access local and national definitions of land uses and types, as with the example from Guatemala. A project may propose within the PDD that the validator/verifier accept a deviation to the approved methodology, provided that the deviation maintains a conservative estimate of the baseline. This would likely involve a review of the countries definition for agricultural or cropland, and justification of the cultivated agroforestry systems to be defined as agricultural lands rather than forest.

The land must not have been forested according to the DNA's definition of forest since 31 December 1989 for 'reforestation' projects:

The land must not have been under forest for 50 years for '**afforestation**' projects. In order to demonstrate land eligibility a number of methods are allowed including satellite imagery or local land registries, so the best method will need to be chosen.

2.6.3 ADDITIONALITY

The SAM, in section I.4b also requires that projects are 'additional'. Additionality means that the project stores more carbon than otherwise would have been stored in the absence of the project, thus providing genuine climate benefits through removal of greenhouse gas emissions from the atmosphere. In order to prove this an assessment must be carried out, as described in section 4b.

The project must use 'Appendix A' of the SAM to demonstrate that it is additional, proving that at least one of the eight 'barriers' listed applies to the project. It is likely that once this assessment is done for one project, it will apply to many in the same region, minimizing work.

Coffee carbon project developers are required by the Simplified Agroforestry Methodology (SAM) to demonstrate that the project's carbon sequestration would be greater than that which would have occurred in the **baseline** scenario, i.e., what most likely would have happened in the absence of the project. This is known as the assessment of additionality. The baseline scenario may be business-as-

[21] Available from: http://cdm.unfccc.int/methodologies/ARmethodologies/Tools/methAR_proc02_v01.pdf

[22] Available from: http://cdm.unfccc.int/DNA/allCountriesARInfos.html

[23] ORGANISMO LEGISLATIVO CONGRESO DE LA REPUBLICA DE GUATEMALA, DECRETO NUMERO 101-96, El Congreso de la República de Guatemala.

usual (i.e., continuation of current activities and sequestration levels) or it may be some other scenario which involves a gradual increase in sequestration.

For coffee carbon projects intending to increase carbon stocks, this may be through adding shade trees or converting land uses with low carbon storage to those with more trees, such as woodlots or shade coffee. For these projects, additionality has several important considerations:

- There should be an actual increase in carbon within the project boundaries over what would have been the case if the project had not occurred.
- Increases in carbon storage in the project area should not result in a decrease in carbon in another area (known as **leakage** and treated separately above).
- Funding for the project activity (not the project per se but what it does) should not have been available except for the incentives provided by the demand for carbon **offsets** (e.g., carbon markets).

Appendix A of the SAM provides a simple means for project developers to demonstrate additionality by showing that the project activity would not have occurred anyway due to at least one of seven barriers that may prevent the implementation of the type of proposed project activity. These are:

- Investment barriers;
- Institutional barriers;
- Technological barriers;
- Barriers relating to local tradition;
- Barriers due to prevailing practice;
- Barriers due to local ecological conditions; and,
- Barriers due to social conditions.

These barriers are understood as impediments to project activities occurring in the absence of the contribution from carbon finance. The barriers would be lessened by increased funding. The barriers are not mutually exclusive and it strengthens the case for additionality if more than one barrier can be shown to exist. The following considers these barriers as these may pertain to a coffee carbon project.

Investment barriers:

These are barriers to funding project activities through existing sources such as debt funding, international capital markets or lack of access to credit. A project activity would not be considered additional if it were part of the project developer's, the coffee farmers', the local or national governments', or some other entity's ongoing program of activities. Project developers can demonstrate that this barrier is present if there are no other sources of funding available for similar types of activities other than grants or other non-commercial finance.[24]

One of the important 'investment' barrier considerations for shade coffee growers is the coffee farmers' own financial resources. If the farmers have been planting trees on a regular basis then the

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[24] Similar activities are defined as those with a similar nature and scale that take place in a comparable regulatory environment and are undertaken in the same geographical area.

project activities would be additional only to the extent that they increased the planting rate and ultimate planting density of the shade trees. Similarly, if the farmers were steadily converting land from other less carbon intensive land uses to shade coffee then the project activity would be additional only if it increased the rate and/or ultimate amount of land planted. Carbon sequestration activities that are considered business-as-usual practices for the farmer should be subtracted from the with project level to determine the additional level of carbon sequestration. *This will be necessary even if there are other barriers to project activities that might qualify the project as additional.*

Institutional barriers:

For coffee carbon projects a common institutional barrier to project activities might be the lack of government incentives or technical extension support needed to effectively implement tree-planting activities. Project developers should assess the state of the current government support for the proposed project activities as this will often be a barrier to widespread project activity adoption.

Other institutional barriers include risk relating to changes in government policies or laws and/or lack of enforcement of laws relating to forest or land use. A project might be justified by these barriers if the project's organizing activities would provide them with the standing or political power needed to overcome obstacles stemming from a weak or capricious rule of law.

Technological barriers:

Lack of access to planting materials, e.g., of appropriate species for enhanced shade tree planting, is a potential barrier to coffee carbon projects. Project developers should determine if farmers are currently obtaining seedlings and, if so, information about the seedling source such as species types available, seed source, viability of seedlings, etc. Even if the farmers have a source of seedlings the project may be offering a substantial improvement over the current supply. Less than adequate current supply of seedlings would be considered a barrier.

Another technological barrier might be the lack of infrastructure for implementing the project supported technology. Lack of market infrastructure (transport, warehouses, processing facilities, sawmills, etc.) to capture added value of the coffee farmers' products is a potential barrier to coffee farmers who would like to sell a higher quality bean or non-traditional wood products. Inadequate infrastructure would be a barrier justification for the project only to the extent that the project was addressing the infrastructure deficiency in some substantive way.

Barriers relating to local tradition:

This barrier refers to traditional knowledge and practices, laws and customs, market conditions and traditional equipment and technology. One barrier to increased coffee carbon intensification might be an incomplete farmer appreciation of the benefits of planting certain species for coffee shade. Traditional shade tree planting uses a limited number of species such as *Inga spp.* and *Erythrina spp.* Planting timber species such as mahogany, cedar, laurel, etc. in greater numbers than traditional practice has been shown to significantly increase carbon stock and provide additional revenue to farmers from the future sale of timber but often may need the project's intervention for widespread adoption.

Barriers due to prevailing practice:

This refers, among other things, to the barrier of 'first of its kind' i.e., that there is no project activity of this type operational in the country. In the case of coffee carbon projects a similar activity would be denser shade tree planting or conversion of other land uses to shade coffee at the scale and in the region of the proposed project whether or not these activities were generating carbon credits for sale. As carbon project approvals are required by major standards organizations to be made public it is relatively straightforward to check if a coffee carbon project is operating in the country. National coffee grower institutions are likely to be aware of similar activities that are not involved in carbon marketing.

Barriers due to local ecological conditions:

This barrier relates to unfavorable ecological conditions such as degraded soil, catastrophic events (e.g., landslides, fire), unfavorable climate and biotic pressure such as grazing that prevents farmers from intensifying or expanding their shade coffee production. For example, carbon coffee developers might identify a barrier to the conversion of degraded lands or unimproved pasture to shade coffee in the difficulty and cost of eliminating aggressive weed species.

Barriers due to social conditions:

This barrier includes population pressure, social conflict, widespread illegal practices, lack of skilled labor and lack of local community organization. An example of social barriers to carbon intensification on coffee fields might include the absence of coffee producer organization needed to support widespread tree production and planting.

ESTABLISHING EVIDENCE OF BARRIERS TO THE PROJECT ACTIVITIES

Project developers must provide evidence of the existence of one or more of these barriers in order to demonstrate that the project is additional. Anecdotal evidence is allowed, but it is not sufficient. Documentation from authoritative sources is necessary. The reasons underlying the barrier(s) to project activities must be established.

Convincing evidence must be provided to support the claim that without the project these barriers would prevent the activities from being undertaken. Stronger forms of evidence include:

- Relevant legislation, regulatory information or environmental and natural resource management norms, acts or rules;
- Relevant studies or surveys (e.g. market surveys, technology studies, etc) undertaken by universities, research institutions, associations, companies, bilateral/multilateral institutions, etc;
- Relevant statistical data from national or international sources;
- Documentation of relevant market data (e.g. market prices, tariffs, rules);
- Written documentation from the project developer, such as minutes from Board meetings, correspondence, feasibility studies, financial or budgetary information, etc;
- Documents prepared by the project developer, contractors or project partners in the context of the proposed project activity or similar previous project implementations;
- Written documentation of independent expert judgments from agriculture, forestry and other land-use related government and non-government organizations, individual experts, educational institutions (e.g. universities, technical schools, training centers), professional associations and others.

In order to develop this guidance, several farms in Waslala, Nicaragua, were evaluated for the potential additionality of establishing reforestation projects intended for carbon sequestration. The study showed that there does exist significant potential for reforestation on these Rainforest Alliance Certified coffee farms. For more detail and a walk-through of the additionality assessment, please review Appendices 3 and 4.

2.6.4 CARBON POOLS SELECTION

The SAM, in section I.2, defines above-ground and below-ground tree biomass and soil organic carbon (SOC) as the carbon pools.

Therefore, changes in stocks of the following pools do not need to be measured and can be ignored:

- litter,
- deadwood,
- non-woody plants, and
- mineral soil carbon.

This is considered conservative practice as these pools would likely increase under afforestation but are not being measured. The expense of measuring these other pools and to justify changing the methodology would likely out-weigh any potential increase in carbon sequestration quantified. If the coffee carbon project planned to allow harvesting, a ‘harvested wood product’ pool may be considered for inclusion, and the methodology adapted accordingly.

2.6.5 NON – CARBON DIOXIDE GHG SELECTION

The SAM does not require that any GHGs other than CO_2 are accounted for.

2.6.6 PROJECT EMISSIONS DETERMINATION

Project emissions are those emissions caused by the project (e.g. burning for land clearance, transport related emissions, etc). Because of criteria 1d, the project emissions are considered zero.

No further calculations or justifications are required for the methodology.

2.6.7 BASELINE DETERMINATION

The **baseline** is the expected changes in biomass within the project area in the absence of the project. The SAM in sections II.5 to II.7 states that the baseline change in carbon stocks is to be considered zero.

Therefore no further justification is needed in the PDD.

This is allowed because of the applicability criteria that the project passed. It states this in the form of **Equation 1**. In the case of coffee farms this means the assumption is that shade cover was not anticipated to have increased or decrease over the project period. Accordingly, a baseline of zero change does not mean that the baseline stock is zero, since there may be some trees already within the strata (area) that is being planted.

In the case of existing, pre-project carbon, these trees will be measured using the same techniques as will be used in the project and their biomass quantified at the start of the project. This will give $C_{trees,i,t}$ (carbon stock of trees in stratum *i* at time *t*) at the start of the project (time =0).

This quantification of the existing tree biomass is important as it will be deducted from the total tree biomass recorded at later dates as the project progresses in time. This is to ensure only the additional trees planted are counted for carbon credits.

ESTIMATING WITH PROJECT GHG REMOVAL

STRATIFICATION OF THE PROJECT AREA

The SAM, in section III.8, describes how the land within the project area should be stratified to improve the accuracy and precision of biomass estimates. The concept of stratification is that if you know an area of land is not likely to contain the same amount of biomass, but you know some of the controlling factors that influence this (species in the area, slope, soil, planting time etc) by dividing the land up into areas that are similar, accurate sampling can be done more easily. 'Stratified random sampling' means that once you have divided your land into strata, you must randomly place the plots in which you will measure the choice of biomass. This is usually done in a GIS program.

The following are suggested as a basis for stratification:

a. legal carbon ownership (e.g. community or individual or government)

b. growing conditions in terms of elevation, precipitation, and site quality (pre-existing conditions)

c. A/R planting protocol in terms of tree species and density (planned A/R activity)

d. time period for planting and management (planned A/R activity)

e. intensity of management including thinning and harvesting of trees (planned A/R activity).

Depending on the scale that coffee carbon projects are defined (a single farm or larger regions) this will need considering differently. For example, at a farm level you may wish to stratify between edge plantations and shade trees. However at a larger scale you may wish to stratify between the altitudes / climates of the projects as well as by local factors.

The field work conducted in Nicaragua defined one stratum for shaded coffee, and using 600m^2 plots found large variation within this stratum even within the same farm. For example, one farm had total carbon stocks of 30 and 161 t C ha^{-1} within the same strata, as recorded in two plots. This suggests that efforts should be made to sub-stratify shaded coffee areas into more homogeneous units. If however, the distribution of carbon is very heterogeneous on a small scale, then larger plot sizes would be recommended.

CALCULATING TREE BIOMASS INCREASES

The SAM contains a series of equations that must be used to calculate the removal of CO_2 from the atmosphere and storage in tree biomass. The following section, describes in plain English, each of the equations and how they should be applied.

Equation 2 simply states that the GHGs removed by the sinks in the project (newly planted trees) is equal to the *actual net* GHGs removed by the sinks (newly planted trees). This may appear a circular definition, but the purpose is to show that no additions or subtractions are made to the removals by the sinks to reach the net value.

Equation 3 states that the GHG removals by the newly planted trees in year *t* is equal to: the sum of the GHG removals by trees and soil for each stratum that is defined. So, if for example you had five strata, you would sum the totals from the each of the five. The right hand side of the equation is multiplied by 44/12 to convert the value $\Delta C_{project,\ i,\ t}$ from t C yr^{-1} into t $CO_{2\text{-}e}$ yr^{-1}.

Equation 4 is to calculate the GHG removals by trees and soil for one stratum in year *t* (in t C yr^{-1}). This provides the inputs for **Equation 3** explained above. In the first part of the equation you must subtract the carbon stored the trees within a stratum at time t_1 (a designated start time) from t_2 (the time at which the measurement is being taken). This gives you the change in carbon stock of the trees within a stratum. This value is divided by the length of time between t_1 and t_2 to give you the rate at which the carbon stock changed. This rate of change of tree carbon is added to the rate of change in soil carbon. The equations for calculating the carbon stock and tree and the change in soil carbon stock is explained in the following equations.

ESTIMATION OF CARBON STOCK IN LIVING BIOMASS OF TREES AT THE STRATUM LEVEL

The SAM in section II.12 explains the steps to calculate the living biomass in trees within a stratum. The answers feed into the equations above. First, two methods for calculating the above-ground (AG) biomass are presented, followed by a method to calculate the below-ground (BG) biomass. The first AG method uses biomass expansion factors (BEF). The BEF is a technique that allows the total biomass of a tree to be calculated from data on the commercial timber volume of trees, this commercial volume is calculated from equations based on diameter at breast height measurements or direct tree volume estimates. The second method is based on allometric equations. Allometric equations use the diameter at breast height (dbh) (and sometimes height) to estimate the biomass of trees.

The allometric equation model is more commonly used, because species specific allometric equations are more common than BEF's and less calculation steps are required. Therefore only the allometric equation steps are explained here. The method applies for both estimating the carbon stocks *ex ante* and measuring them *ex post*, with the only difference being the input data (estimate or actual).

For each of the calculation steps below an automated spreadsheet could be set up to calculate all the required values.

Step 1: This step is to gather the data (dbh and height) required to use allometric equations.

For the estimates before the project starts, the data will have to be estimated from species specific volume tables or any other literature values that can be found for the species to be planted. Growth data has been gathered for common species planted in Nicaraguan and Mexican coffee farms in Appendix 1, Data and Parameters for Use in Coffee Carbon Project Development Using the Simplified Agroforestry Methodology.

For measurements after trees have been planted, all the data should be gathered for all trees within the sample plots of known area. A spreadsheet to take this data and automatically do all the required calculations can be made.

A field guide to conducting measurements is presented in Appendix 2, Field Measurement Guide to Estimating Biomass on Coffee Farms.

Allometric equation(s) must be chosen.

See the data and parameters section below for more details of the available options and Appendix 1 for a collation of potentially useful equations. There is also a list of default equations allowable under the SAM in Appendix C of the SAM. It is unlikely that species specific equations will be available for all species, so regional equations will need to be chosen.

Equation 9 states that for each species, within each stratum, within each sample plot, the carbon stock of a tree is equal to the sum of the results for the allometric equation for each tree multiplied by CF_j. CF_j is the carbon fraction of dry matter, essentially the ratio between carbon and biomass in dry organic matter. In most calculations this value is 0.5 (dry biomass is 50% carbon). This calculation is repeated for each tree of each species, in each stratum and in each plot.

Step 4: Once the above-ground carbon stock is calculated it is multiplied by R_j (the root to shoot ratio) for each tree to derive the below-ground carbon stock, as shown in **Equation 10**. The R_j value will be chosen as explained in the data/parameters section below.

Step 5: Equation 11 is to calculate the carbon stock (above- and below-ground) for one stratum.

Step 6: Equation 8 is to calculate the carbon stock of the entire stratum based on the area of the plots within the stratum. This is then the number that feeds into equation 4 above.

CALCULATING INCREASES IN SOIL ORGANIC CARBON

The other major carbon pool is soil organic carbon. With the SAM, the approach to calculating gains in soil carbon is different from the above-ground tree component in that no measurements are necessary. There is an assumption within the **methodology** that increasing tree cover will increase the soil carbon pool for some period of time, until a new equilibrium is reached.

Equation 12 introduces the concept of $t_{equilibrium}$ which is the amount of time it takes, under the new landuse (increased shade cover) for the soil carbon stock to reach a new equilibrium. The stocks are expected to increase, because of increased leaf litter and root input. **Equation 12** states that until this time is reached, the rate of increase in soil carbon is estimated for *ex post* and *ex ante* calculations (no measurements are required). After this time the rate is assumed to be 0, the soil carbon stock is in equilibrium and not increasing. The choice of what value to use for $\Delta C_{agroforestry,i}$ are explained in the data/parameters section below.

Sections 14 and 15 in the SAM document the procedure for calculating soil carbon changes if the project changes mid way through. For example, if the project switches to pure **afforestation** / reforestation (coffee planting stops) or switches to a different agroforestry type.

It is not envisioned that this would occur, and therefore the calculations required to do this are not explained here.

2.6.8 LEAKAGE ASSESSMENTS

In section IV.16-20 of the SAM deals with **leakage**. It explains that there is special exception granted to small scale A/R projects which means if it can be demonstrated that activities or people are not displaced due to the project, leakage can be considered zero.

It is not anticipated that the planting of shade trees will displace any activities or people. Because, for the applicability test in section 1d it is argued that the displacement of crops will not cause deforestation (as this is a requirement of the Sustainable Agriculture Standard), then the validity of a leakage = 0 assumption has been met. No further **leakage** calculations or monitoring are required.

The maintenance of SAN certification however should be required to provide assurance that no forest was being cleared for farm expansion. Therefore confirmation of SAN certification for each farm included in the project area should be documented in the PD and checked during monitoring.

2.6.9 CALCULATING THE TOTAL CARBON SEQUESTRATION

The SAM, in section V21-22 shows how to calculate the net carbon sequestration (GHG removals by sinks) per year. ΔC_{ACTUAL} was calculated in equations 2 and 4. This was the change in carbon stocks of the trees and soil in the project area (starting with the baseline stock in year zero). The components for change in baseline stocks and leakage are both zero as was explained above.

The SAM, in section VI shows how to calculate 'Certified Emissions Reductions' (CERs) which are the currency of the Clean Development Mechanism (CDM). A/R projects under the CDM only result in the creation of temporary credits. In the voluntary market standards such as the VCS or Plan Vivo allow the creation of permanent credits from A/R projects. Therefore these equations should not be used exactly. Instead, in order to calculate the credits which should be issued at any verification equation 24 should be used, but the notation should be changed such that the credit generated is not called a CER but a VCU (Voluntary Carbon Unit). If the carbon standard under which the methodology is being used allows the issuance of credits prior to the trees actually growing, the calculation should be performed using estimated growth data in the previous steps over the period equal to the crediting period.

2.6.10 MONITORING

The SAM, in section II, states that the monitoring of the baseline is not required. It is a requirement of the SAM (VII.27) to design a system to store all monitoring data for at least two years after the end of the crediting period. This should be in digital format with multiple back-ups and hard copies being created at each monitoring interval. Section VII.28-31 of the SAM describes how to stratify the project area into homogenous units.

Examples of farmland strata that might be used to monitor carbon sequestration for coffee carbon project are discussed below. Not all strata will need to have permanent monitoring plots. In discussion with farmers an understanding should be determined if there is much potential for some form of agroforestry tree planting on these lands under project auspices. If in the judgment is that the potential is minimal then permanent sampling plots may not be needed and simply mapping these strata would be sufficient. However, project developers may want to establish a few permanent sample plots on these strata anyway to support their possible inclusion in future carbon sequestration activities.

Shade coffee: There are various ways to stratify shade coffee, altitude (ANACAFE)[25], average coffee production (Winrock, 1998)[26] are two methods. But project carbon sequestration monitoring would best be served by choosing strata that reflect potential for carbon sequestration, e.g., standing tree biomass (t/ha), tree density (stems/ha) or shade density (percent cover). The strata definitions should be relatively simple to determine to enable parcels to be placed in the appropriate strata without time consuming and costly measurements. Standing biomass would be most difficult to accurately estimate while percent cover would be the easiest. During initial establishment of permanent sampling plots tentative strata can be defined for initial placement of plots. As the carbon density of these plots is determined other parameters including altitude, average production, stems per hectare, percent cover, etc can be measured and the project developers can determine whether the proposed strata definitions correlate well with actual carbon density and produce relatively homogenous strata in terms of existing carbon density.

The break points between strata should be determined in discussion with potential farmers as it is their willingness to plant additional shade that will ultimately determine the potential for carbon

[25] ANACAFE Technical Note (no date), Cuantificacion estimada del dioxide de carbono fijado por el agrosistems café en Guatemala. 1 p.

[26] Winrock, 1998 Carbon Sequestration and Sustainable Coffee in Guatemala. 18 pp.

sequestration. Farmers will generally have a rule of thumb for how much shade they are willing to allow grow on their coffee plantations. Though it may be a project aim to convince them to increase their allowance, at the inception of the project it is best to use strata definitions that follow their current thinking. Thus, as has been noted in Central America, if farmers think 80 trees per hectare is about the most they would like to maintain, one stratum might be greater than 80 trees per hectare with minimal sequestration potential. A second stratum might be from 30 to 80 trees per hectare where tree planting has some potential and a third might be less than 30 trees per hectare where potential is significant.

Annual cropland: Annual crops include primarily corn and beans and to a lesser degree vegetables. There are at least two types of annual cropland strata that need to be considered. First would be permanent annual croplands where relatively high inputs of nutrients, weed suppression, improved seed, etc. mean that the land is cropped every year or nearly so. The second strata would be part of a fallow rotation in which the land was cropped for a few seasons and left fallow for a longer period of time.

Permanent cropland (not coffee): A strata would need to be defined for permanent crops other than coffee. Common examples of non-coffee permanent crops include cacao, bananas, peach palm and citrus.

Pasture: These are grasslands often mixed with shrubs and trees on which cattle or other livestock are present during much if not all of the year. At least two types of pasture strata should be considered, improved pasture and unimproved pasture. The carrying capacity of the two types can differ markedly and if both are present they need to be differentiated.

Degraded lands: Degraded lands are common throughout Central America. They include lands that are steeply sloping, eroded, infested with pernicious weeds, affected by landslides, water-logged, salinized, etc. Other than occasional extensive grazing they typically are not used for productive purposes. Degraded lands do offer potential for woodlots and reforestation and if present on project farmer lands should be considered for their potential carbon sequestration.

Forested lands: Strata for forested lands in Central America are numerous and highly refined among academics and forest managers. Project developers need to consider selection of forested land strata in terms of the potential for project supported carbon sequestration. It may be that the project will not be having an impact on forest land carbon and multiple forest land strata are not needed. Improved forest management and reduction of deforestation and forest degradation are not in the scope of the SAM. It may be sufficient for a coffee carbon project to have just one forest strata. Alternatively, project developers and farmers may see potential for converting degraded forest lands into shade coffee which would be permissible as long as there was at least no net decrease in forest cover or tree density. In this case there could be two strata: forest lands and degraded or, perhaps, open forest lands.

Boundaries: Boundaries (*linderos*) offer significant potential for tree planting on coffee farms. They include fence rows, paths, both sides of roadways, separation of parcels, etc. A typical space for agroforestry tree planting, boundary strata are a bit difficult to measure as they are defined as linear units not area. But it is recommended that they be segregated from their neighboring land uses as they are quite different in how farmers will manage tree planting.

During the life of a project, as *ex post* measurements are taken, changing of the strata is allowed to improve accuracy.

This section presents two options for defining the strata for the *ex ante* estimation of carbon sequestration. Although not explicit, the plot size, number and location are all part of the sampling strategy and need defining. Option (i) is to use a “good forest inventory in the host country.” Option (ii) is to devise your own method for estimating biomass stocks to a precision of ±10% of the mean at a 90% confidence interval.

The level of sampling required is dependant upon the scale and type of project and the homogeneity of the strata. More information about how to calculate the size and number of sampling plots is given in a specific CDM A/R tool, "Calculation of the number of sample plots for measurements within A/R CDM project activities."[27] This tool requires input such as the variation in results between plots in the same stratum, data that must be either gathered by a pilot study or by looking at literature data. CarbonFix[28] provides a spreadsheet template which calculates Equation 5 from the tool automatically.

In section VII.30, the SAM states that if something happens to affect the homogeneity of a stratum (e.g. fire, pest, harvesting), the strata may be redefined during the project. Likewise, in section VII.31, if the reason for separating two strata disappears, then two strata may be merged.

2.6.11 DATA AND PARAMETERS TO BE USED

The SAM divides data and parameters into two classes those that are not monitored (VII.25) and those that are (IX.32).

Below, for each of the data and parameters that are not measured, the unit, a description and a copy of the text from AR-AMS004 regarding the allowed sources of the details is presented. The 'Choice explained' section then discusses what data is available and what needs more research. In selecting data and parameters, a conservative approach must be taken. This does not always mean 'take the lowest value', but If a range of equally plausible values exist for a given value, the one that does not lead to the overestimation of net GHG removals by sinks must be taken.

Data / parameter	CF_j
Unit	t C t^{-1} d.m (the amount of elemental carbon per tonne of dry biomass)
Description	Carbon fraction of dry matter for species of type *j*
Allowed sources of data	The source of data shall be chosen with priority from higher to lower preference as follows: (a) Existing local and species-specific or group of species-specific; (b) National and species-specific or group of species-specific (e.g. from national GHG inventory); (c) Species-specific or group of species-specific from neighboring countries with similar conditions. Sometimes b) might be preferable to a); (d) Globally species-specific or group of species-specific (e.g. IPCC GPG_LULUCF 2003). Alternately, the default value of 0.5 t C t^{-1} d.m. may be used.
Choice explained	**It is suggested to use the default value of 0.5 t C t^{-1} d.m as this is widely accepted.**

Data / parameter	D_j
Unit	t d.m m^{-3}
Description	Basic wood density for species *j*
Allowed sources of data	The source of data shall be chosen with priority from higher to lower preference as follows: (a) Existing local and species-specific or group of species-specific; (b) National and species-specific or group of species-specific (e.g. from national GHG inventory);Species-specific or group of species-specific from neighboring countries with similar conditions. Sometimes b) might be preferable to a);

[27] http://cdm.unfccc.int/EB/031/eb31_repan15.pdf

[28] http://www.carbonfix.info/; a password is required to access the template

	(c) Globally species-specific or group of species-specific (e.g. Table 3A.1.9 IPCC GPG-LULUCF 2003).
Choice explained	**Appendix 1 presents the findings from research into the wood densities of trees that are likely to be found or planted on coffee farms.** **However, for many allometric equations it is not necessary to have a wood density value. If a wood density value is needed the appendix should be consulted to look for species specific values and the values converted into the units applicable for the equation. If the species required cannot be found, then project proponents should use the values from the tables suggested in (d).**

Data / parameter	$F_j(DBH, H)$
Unit	T d.m. tree $^{-1}$
Description	Allometric equation for species *j* linking diameter at breast height (DBH), and possibly tree height (H), to above-ground biomass of living trees. In the case of some shrubby plants such as coffee, the diameter of the main stem at 15 or 30cm from the ground as well as height it often used.
Allowed sources of data	Whenever available, use allometric equations that are species-specific or group of species-specific, provided the equations have been derived using a wide range of diameters and heights, based on datasets that comprise at least 20 trees. If species specific allometric equations are not available then use default allometric equations included in Appendix C to this report (The SAM) or default equations from IPCC literature, national inventory reports or published peer-reviewed studies — such as those provided in Tables 4.A.1 to 4.A.3 of the GPG LULUCF (IPCC 2003).
Choice explained	**A literature review of the allometric equations published for species likely to be found on coffee farms is presented in Appendix 1. If the species that has been measured (or is going to be planted) is not in Appendix 1 then those from Appendix C from the SAM should be used. The selection of these requires knowledge of basic climate data.**

Data / parameter	R_j
Unit	d.m. kg^{-1} d.m.
Description	Root-shoot ratio appropriate for biomass stock, for species $_j$
Sources of data	The source of data shall be chosen with priority from higher to lower preference as follows: (a) Local values if available; (b) If local values are not available, values should be selected from Table 3A.1.8 of the GPG-LULUCF (IPCC 2003), or equivalently Table 4.4 of the AFOLU Guidelines (IPCC 2006). Alternately, a default value of value of 0.3 kg d.m. (kg d.m.)-1 may be used as a conservative generic root:shoot ratio for all trees.
Choice explained	**It is recommended that unless local values are known, the default value of 0.3 is used for simplicity.** **Local values for root:shoot ratios are unlikely to exist, but if they are known to, they should be used where possible. The ratios mentioned in the table are above are presented and explained in Appendix 1.**

Data / parameter	$t_{equilibrium}$
Unit	yr
Description	Time until a new equilibrium in carbon stocks in soil organic matter is reached for the second agroforestry system in stratum *i,*years
Sources of data	Documented and verifiable local values of $t_{equilibrium}$ should be used when possible, for example from published literature. In the absence of such values default value of 20 years may be used.

Choice explained	**AR-AMS0004 states "Local values of this parameter should be used together with local values of $\Delta C_{agroforestry,i}$. Or else default values for both $t_{equilibrium}$ and $\Delta C_{agroforestry,i}$ provided in the methodology should be used."** **It is suggested the default value of 20 years is used, as no studies have been found that provide local values. If local studies do exist, these should be used.**

Data / parameter	$\Delta C_{agroforestry,i}$
Unit	Tonnes C yr^{-1}
Description	Average annual change in carbon stock in soil organic matter for stratum *i*, for year *t*
Sources of data	Documented and verifiable local values of $\Delta Cagroforestry,i$ should be used when possible, for example from published literature. In the absence of such values, the default value of 0.5 t C ha^{-1} yr^{-1} assuming a maximum accumulation period of 20 years shall be used.
Choice explained	**It is suggested the default value of 0.5 t C ha^{-1} yr^{-1} is used as no studies have been found that provide local values. If local studies do exist, these should be used.**

Below, for each of the data and parameters that are measured, the unit, a description and a copy of the text from AR-AMS004 regarding the allowed sources, frequency and comments are presented. The 'Coffee project specifics' section then discusses any specific aspects relevant to carbon coffee projects.

Data / parameter	A_i
Unit	ha
Description	Area of stratum *i*
Sources of data	Monitoring of strata and stand boundaries shall be done preferably using a Geographical Information System (GIS), which allows for integrating data from different sources (including GPS coordinates and Remote Sensing data)
Frequency	At least every 5 year from the start of the project activity
Comments	None
Coffee project specifics	Remote sensing data for the area will be required and someone with the skill to use it. In order to save time and money, the remote sensing work for many farms in one region should be done together. All the data should be held in a central repository.

Data / parameter	$Asp_{,i}$
Unit	ha
Description	Total area of all sample plots in stratum *i*
Sources of data	Field measurement
Frequency	At least every 5 year from the start of the project activity
Comments	GPS can be used for field survey. Sample Plot location is registered with a GPS and marked on the project map
Coffee project specifics	Guidance has been provided on best practice for plot laying.

Data / parameter	*DBH*
Unit	cm
Description	Diameter at breast height of tree
Sources of data	Field measurements in sample plots
Frequency	At least every 5 years
Comments	Typically measured 1.3 m above-ground. Measure all the trees above some minimum *DBH* in the permanent sample plots that result from the A/R project activity. The minimum *DBH* varies depending on tree species and climate; for instance, the minimum *DBH* may be as small as 2.5 cm in arid environments where trees grow slowly, whereas it could be up to 10 cm for humid environments where trees grow rapidly

	Note: for *ex ante* estimations, mean *DBH* and *H* values should be estimated for tree species *j* in stratum *i*, at time *t* using a growth model or yield table that gives the expected tree dimensions as a function of tree age. The allometric relationship between above-ground biomass and *DBH* and possibly *H* is a function of the species considered.
Coffee project specifics	The minimum dbh to be measured needs to be decided. Some tree species may require measuring at 30cm from the ground due to multiple branching, if so there must be allometric equation that can handle this input data. Guidance has been provided on best practice for field measurements.

Data / parameter	*H*
Unit	M
Description	Height of tree
Sources of data	Field measurements in sample plots
Frequency	At least every 5 years
Comments	Note: for *ex ante* estimations, mean *DBH* and *H* values should be estimated for tree species *j* in stratum *i*, at time *t* using a growth model or yield table that gives the expected tree dimensions as a function of tree age. The allometric relationship between above-ground biomass and *DBH* and possibly *H* is a function of the species considered.
Coffee project specifics	Best practice for tree height measurement has been provided.

Data / parameter	$Area_{crops}$
Unit	AR-AMS004 says “yr”, but this is believed to be a typo and it should be “ha”
Description	Area cultivated with crops within the project boundary
Sources of data	
Frequency	At start of project activity and at each **verification** up to end of first crediting period
Comments	none
Coffee project specifics	This is used to work out the **leakage** amount. If the change in this with the project is < 10% then **leakage** = 0.

2.6.12 DEMONSTRATION OF COMPLIANCE WITH LOCAL LAWS AND REGULATIONS

It should be well-accepted that a successful carbon afforestation/reforestation project must respect the laws and regulations where the project will be implemented. It is expected that the project is based on a solid legal framework and will satisfy applicable planning and regulatory requirements. Rainforest Alliance certified farms must demonstrate such respect for laws under the SAN standard.

Within the PDD, the project should demonstrate that the project proponents consult with and communicate early on with relevant local, regional and national authorities in order to allow adequate time to earn any necessary approvals that may be needed. If such approvals or permits are required, the PDD should document that the project will gain approval from the appropriate authorities.

The PDD should demonstrate that the project proponents have procedures to be aware of the relevant national and local laws. The project should provide a commitment or statement of intent within the PDD to assure that the project will comply with these regulations.

Using the SAM

The SAM does not require any specific compliance requirements, however, this would be a requirement of the carbon standards that a project would use.

MODULE 3: EVALUATING AND MINIMIZING PROJECT RISK

This module helps users to understand the risks associated with carbon sequestration from reforestation projects (generally and specifically) and how to lower or protect against such risks.

The Voluntary Carbon Standard (VCS) organization provides guidance for project developers and verifiers to assess the risk that a project may not result in sequestering all the carbon expected and provides a means for establishing a pooled buffer account to offset shortfalls (VCS, 2008)[29]. These set-asides reduce the amount of carbon credits that a project may offer for sale. As the risks are in part driven by the long-term nature of carbon sequestration in agriculture, forestry and land use (AFOLU) projects as the project proceeds risk diminishes and carbon credits may be issued for some of the set-a-sides in accordance with reduced risk.

Table 1 shows the types of risk VCS requires project developers to consider and verifiers to assess for all AFOLU projects. VCS also provides risk factors for AFOLU activity types that expand on these factors. Coffee carbon projects fall under the agricultural land management (ALM) type of project but have some characteristics of the afforestation, reforestation and revegetation (ARR) project types.

TABLE 1. RISK FACTORS APPLICABLE TO ALL PROJECT TYPES AS DESCRIBED IN THE VCS *TOOL FOR AFOLU NON-PERMANENCE RISK ANALYSIS AND BUFFER DETERMINATION*.

Project risk
Risk of unclear land tenure and potential for disputes
Risk of financial failure
Risk of technical failure
Risk of management failure
Economic risk
Risk of rising land opportunity costs that cause reversal of sequestration and/or protection
Regulatory and social risk
Risk of political instability
Risk of social instability
Natural disturbance risk
Risk of devastating fire
Risk of pest and disease attacks
Risk of extreme weather events (e.g. floods, drought, winds)
Geological risk (e.g. volcanoes, earthquakes, landslides)

VCS requires that the project developer conduct a risk assessment for verifiers to review and accept or request modifications. The developer (or project proponent) must first evaluate the project against the risk factors applicable to all AFOLU projects types, then evaluate against risk factors for the specific project activity type. Finally the project developer must determine an overall risk classification for the project based on the first two steps.

[29] VCS, 2008 Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination. 16pp.

3.1 RISK AS RELATED TO AFFORESTATION/REFORESTATION ON COFFEE FARMS

We discuss below some risk considerations for the special case of coffee carbon projects as an agricultural land management project. These should not be construed as an alternative to conducting a full VCS risk assessment.

3.1.1 PROJECT RISK

Risk of unclear land tenure and potential for disputes:

Generally land tenure will not be a project risk for coffee farmers. It is unlikely that a coffee farmer would make the sizable investment in establishing coffee plantations without having security of long-term rights to the land. However, project developers should ensure that that proper documentation is available to demonstrate tenure. In Central America two types of land tenure are sufficient to justify a low risk rating for ownership/user rights, *derecho real* and *derecho posesorio*. Both are legally recognized and provide documented user rights. Project developers should be able to produce evidence of tenure upon request.

Risk of financial failure:

Financial risk includes the risk that the farmer will not be able to continue the carbon sequestration activities and that the project developer will not be able to afford to continue project support activities.

Despite two centuries of experience, coffee growing and trading remains a volatile business. Farmers face price fluctuations, fickle markets, inclement weather, a changing climate and competition for land, especially by suburban sprawl and other development. Afforestation/reforestation for a carbon project can help buffer most of these vulnerabilities. Certification to internationally accepted standards such as those used by the Rainforest Alliance helps producers improve farm management, control costs, increase productivity and quality. However, there remains the risk that coffee farmers may convert the land to some other use.

This risk may be significant in some areas, where there is high competition for land from other uses, for example, in the coffee farming areas in El Salvador, which are subject to pressures for development. The risk is much lower in traditional coffee growing areas, from Nicaragua and Honduras to Ethiopia and Kenya, where coffee production is one the most lucrative uses of the land and there are few other commercial opportunities.

Risk of technical failure:

The concern for technical failure is centers on the use of technologies that have not been proven effective in the project zone. Generally, there should be no need to introduce unproven technology in a coffee carbon project. Examples of unproven technology would be the introduction of an exotic species of shade tree or a new cultivar of coffee. We strongly recommend the use of tree species for coffee shade and other agroforestry planting that are already well known in the region.

If the project were working with coffee farmers who were growing coffee in full sun there would be an enhanced risk of introducing shade as sun grown coffee cultivars are different than the shade tolerant cultivars and the coffee plants may not do well under shade.

Risk of management failure:

Coffee carbon projects will most often require the pooling of carbon sequestered on a number of farms, quite possibly a large number of farms. This means that the project developer will probably not be the carbon producer. More likely, the project developer may be a producer cooperative or association, a locally-operating coffee trader, an NGO or another institution. The risk of management failure is judged in terms of the developer's experience in managing similar types of activities in the same zone or another. Assessed risk of management failure will be reduced if the project developer has an ongoing relationship with the coffee farmers and an on-site management team.

3.1.2 ECONOMIC RISK

Risk of rising land opportunity costs causing reversal of sequestration:

This risk is greatest in peri-urban zones where there is pressure to convert coffee farms to housing. This has happened already in San Salvador and Managua among others. The cool climate requirements for coffee mean that the land is also a desirable place to live. Coffee plantations near urban areas and transportation are likely to come under pressure to be sold for housing developments during the long-term time frame required for a coffee carbon project. If a project is planned in a peri-urban zone special consideration for ensuring sustainability of the project and the coffee plantation will need to be developed to avoid unacceptable levels of risk.

3.1.3 REGULATORY AND SOCIAL RISK

Risk of political instability:

There is little that project developers can do to reduce the risk of political instability. Central America continues to suffer uncertain political climate and project developers will have to accept that this form of risk will be part of their working environment. Developers should document the recent political history of the zone to facilitate as accurate an assessment as possible.

Risk of social instability:

Project developers can, however, have a significant impact on social stability. Project developers should adopt progressive social policies to ensure farmer and worker safety, health, education and fair compensation. Most coffee certification programs have social criteria that will ensure to a reasonable degree the social benefits of the coffee carbon project.

3.1.4 NATURAL DISTURBANCE RISK

This includes risks from devastating fire, pest and disease attacks, extreme weather events and geological hazards such as volcanoes and earthquakes. Project developers need to assess the likelihood and severity of these risks against the proposed project intervention and to the extent possible include mitigation and/or adaptation measures to reduce the impact of natural disturbance. For example, avoiding exotic tree species will mitigate against pest damage. Steeply sloping land can be excluded from project intervention to reduce the potential for losses due to landslides and erosion.

Coffee carbon project developers should also note the improvement in natural hazard risk associated with enhanced shade coffee. Compared to pasture or fallow, coffee plantations are much less susceptible to fire and erosion damage from heavy rains.

3.2 GENERAL RISK FACTORS APPLICABLE TO AFFORESTATION AND REFORESTATION PROJECTS UNDER THE VCS

The Voluntary Carbon Standard, in its Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination, provides risk factors and resulting ratings for each category of risk that must be considered for any A/R project. Preliminary indications are that risk factors as shown below should be mostly low with one or two medium levels depending on who is developing the project and their choice of project design. A buffer of 20 percent is likely to be adequate.

Risk factor	**Risk Rating**
Long-term commitment (i.e., many decades or unlimited) with no harvesting	Low
Long-term commitment with no harvesting in politically unstable countries	Medium
Long-term commitment with harvesting	Medium
Medium-term commitment with harvesting	High
Medium-term commitment (i.e., a few decades) with no harvesting	High
Short-term commitment with or without harvesting	Fail

3.2.1 PROJECT LONGEVITY

Project longevity is a specific project type risk factor used for afforestation, reforestation and revegetation (ARR) projects. However, as coffee carbon projects are involved in planting trees with the intention of future harvest for timber, poles or firewood, verifiers may expect them to demonstrate a long term commitment similar to ARR projects. We recommend that coffee carbon projects plan for minimum project duration of 25-years in order to establish at least a medium level of longevity risk. Anything less than 25 years is subject to failing to meet minimum VCS criteria for carbon credits if the commitment to replant after harvest cannot be satisfactorily demonstrated. The 25-year project commitment avoids the absolute requirement of demonstrated commitment to replant.

3.2.2 OWNERSHIP TYPE AND USER RIGHTS

Coffee farms are generally owner-operated and this type of risk should be low. Project developers should be prepared to produce evidence of ownership at the time of verification.

Risk factor	**Risk Rating**
Established NGO or conservation agency owner; or owner-operated private land	Low
Rented or tenant-operated land	Medium
Clear land tenure but disputed land use rights	High

Uncertain tenure but with established user rights	High
Uncertain land tenure and no established user rights	Fail

3.2.3 TECHNICAL CAPABILITY

Shade tree planting on coffee farms has been widely practiced in Central America since the earliest days of coffee cultivation. Even the proposed shift shade tree species composition to a higher percentage of species valued for timber is a well proven technology though not at the levels proposed. As a result there should be low technical risk.

Risk factor	**Risk Rating**
Proven technologies and ready access to relevant expertise	Low
Technologies proven to be effective in other regions under similar soil and climate conditions, but lacking local experimental results and having limited access to relevant expertise	Medium

3.2.4 FINANCIAL CAPACITY

Coffee carbon project that pool large numbers of farmers carbon enrichment activities will need to demonstrate long-term capability of funding the cost of project establishment and implementation until returns from carbon sales are sufficient to cover investment and operating costs. Investment financiers are available if the project developer is not capable or willing to provide the long-term up front capital. Whether this is assessed as a low or medium risk factor will depend on the project developer's or alternative sources of long-term investment.

Risk factor	**Risk Rating**
Financial backing from established financial institutions, NGOs and/or governments	Low
Long-term project funding not secured	Medium

3.2.5 MANAGEMENT CAPACITY OF PROJECT DEVELOPER

The assessment of this risk factor will be case specific for coffee carbon projects depending on the institution. Coffee traders that have been working in a community for some time probably will have low risk ratings as they have supported project-type activities (pooling farmer production, international market engagement, farmer training, etc.) for multiple years. While not traditional 'projects' these ongoing relationships require all the management capacity needed for project development.

Risk factor	**Risk Rating**
Substantial previous project experience (≥ 5 projects) with on-site management team	Low
Limited project experience (<5 projects) with on-site management team	Medium
Limited project experience (<5 projects) without on-site management team	High

3.2.6 FUTURE INCOME

The assessment of this risk factor will be case specific for coffee carbon projects depending on the management plan. A chief concern will be how to maintain farmer interest in planting and maintaining trees prior to sale of ex post carbon credits, i.e, what types of incentives will the farmer need to engage in carbon intensification on their coffee plantations. Project developers will need a detailed management plan describing farmer benefits and how they will be financed and management to score low on this risk factor.

Risk factor	**Risk Rating**
Appropriate management plan, and financial analysis demonstrates that likely income stream(s) will finance future management activities (e.g., carbon finance to be used for project management, tending operations, etc.)	Low
Future costs and revenue stream(s) not documented	High

3.2.7 FUTURE/CURRENT OPPORTUNITY COSTS

In order to achieve a low risk rating coffee carbon project developers will need to be careful to avoid marginal coffee producers who might be forced out of coffee production during a prolonged downturn in the world coffee price. Also the likelihood that coffee farms in peri-urban areas might be sold for urban development should be carefully reviewed before including such farms in a carbon project. In the absence of convincing evidence to the contrary such project would be assessed a high risk rating. Generally, with these two exceptions opportunity cost risk rating for coffee carbon projects should be low as coffee is one of the highest value uses of farmland in Central America.

Risk factor	**Risk Rating**
Alternative land uses are unlikely to become attractive in the future	Low
Project is competing with other land uses likely to become more attractive in the future	High

3.2.8 ENDORSEMENT OF PROJECT OR LAND-USE ACTIVITY BY LOCAL POPULATION AND LOCAL/ NATIONAL POLITICAL ESTABLISHMENT

Generally endorsement for coffee carbon project should be easily obtained and a low risk rating obtained. Coffee carbon projects do not involve widespread change in land use, the projects will be largely based in the private commercial sector and reasonably free of national political whim, and, if conducted in concert with a coffee certification program as suggested, there will be improved societal and environmental benefits to foster local community support.

Risk factor	**Risk Rating**
Endorsement given and not likely to change in the future	Low
Endorsement given but may be subject to change in the future	Medium
No endorsement given	High

MODULE 4: VALIDATION AND VERIFICATION

GUIDANCE ON COFFEE CARBON PROJECT DEVELOPMENT USING THE SIMPLIFIED AGROFORESTRY METHODOLOGY

This module explains the processes of independent third party evaluation of the reforestation project that are recommended for delivering a carbon credit to market.

Numerous auditing standards have developed in the voluntary marketplace to identify high quality forest carbon storage projects which have proven additionality, mitigated leakage, and reduced impermanence risk. These auditing standards can be divided into validation standards and verification standards.

Validation involves an inspection of project design documents (PDD), anticipated future carbon storage and emission quantities, and field operations *ex ante* to demonstrate capacity to conform with particular auditing standard requirements. Validation does *not* confirm the production of a specific quantity of carbon credits.

Verification, in contrast, involves an inspection of validated/registered project design documents, realized past carbon storage and emission data, and field operations *ex post* to confirm carbon credits were generated in accordance with particular auditing standard requirements. Verification audits by accredited independent third-party entities typically occur in five year intervals.

4.1 ASSESSMENT TYPES

Validation and verification are two separate processes, but various assessment types can be carried out by the validator or verifier in order to complete their responsibilities or to illustrate to project proponents the status of their project. These may include the following.

- Pre-assessment – applies to an audit prior to a main assessment with the objective of identifying barriers or gaps to the standards and requirements (of the GHG program) and is typically done through desk evaluation.
- Main Assessment – applies to an initial audit which provides a complete evaluation of an operation to determine whether they are in compliance with the standard and requirements (of the GHG program) and whether a validation or verification statement should be issued.
- Surveillance audit – applies to an audit conducted to evaluate the project proponents continued compliance with the standard and requirements (of the GHG program).

The criteria that the project must be evaluated on are different for each GHG program, but since this guidance focuses on the Voluntary Carbon Standard and Plan Vivo it is those systems' criteria that will be considered here.

4.2 AUDIT PROCEDURES

Familiarity with audit procedures will help project proponents and developers to be best prepared for validation and verification audits. The following sections describe the various steps that take place related to the validation or verification auditing of a project.

4.2.1 AUDIT PLANNING

Prior to validation of a carbon project, auditors will want to make sure that there is a Project Design Document (PDD).

Prior to verification, auditors will ensure that the project has a Registered Project Document (RPD) or otherwise has the approval of the GHG program. The auditors will be planning to evaluate consistency between the validated PDD and implementation as described through correspondence or documents. In addition, auditors will be checking if there have been any significant changes in the project, including baseline scenario and underlying assumptions of the scenario. If verification is to be undertaken, previous verification reports must be examined for their reliability, which may be tested by sampling data calculations and examining conversion factors against IPCC recommendations, as well as to their completeness.

4.2.2 PREPARATION FOR ON-SITE ACTIVITIES

Clients are expected to comply with validation/verification standards, to make available areas, documents/records, and personnel for the field audit, and to make provisions to accommodate observers or auditors in training. Any changes to validation or verification standards that have taken place and which may affect objectives of client should be described by the validator/verifier to the client. During this preparation phase, auditors will maintain open communication with the client to confirm the elements of the validation/verification plan, confirm how the validation/verification activities will be undertaken, and to provide opportunities for the client to ask questions.

VALIDATION AND VERIFICATION PLAN

The verifier will provide to the project proponents a validation or verification plan prior to conducting the audits and this plan will address the following:

- objectives (standard conformance/compliance);
- significant changes since last period;
- scope (organizational boundaries of project);
- baseline scenario (legal, financial, operational, and geographic);
- physical infrastructure and activities of the carbon project;
- inventory of the greenhouse gases covered;
- estimated amount of CO_2e in the inventory;
- time period under review; and,
- timing of data collection and reporting process.

4.2.3 REPORTING

The results of the carbon validation or verification evaluation are recorded in single carbon validation or verification report. Reports will generally consist of four parts: background and introduction, audit methodology, audit findings and conclusions. The report should include a validation/verification statement. The statement will determine whether the carbon standard organization offers validation or verification to the project, whether the organization offers validation with qualification, and how many verified carbon credits the organization will have issued.

At the time of verification of carbon credits, the VCS requires a second, independent auditor to conduct a desk review of buffer/set-aside credit determination because of the financial consequences of this decision.

The project proponent will receive the completed report to review for a brief period, and then it is finalized by the validator/verifier.

VCS and Plan Vivo both require public reporting. Therefore, confidential and proprietary information critical to the report should be highlighted in the document prior to submission to the carbon standard organization with references to this information in the cover letter so that such material can be removed in the public version.

The project proponents should be provided with information on procedures for handling an appeal or filing a complaint against the validation/verification body and contact information for the standard organization for permission to use its brand for promotional purposes.

4.3 FREQUENCY OF EVALUATIONS

The frequency with which a project is audited depends on the requirements of the system.

Voluntary Carbon Standard

The VCS requires that validation of projects shall occur at the time of, or before the first verification. The frequency of verification will depend upon the project and the rate of sequestration and potential to issue carbon credits. However, for small-scale agroforestry projects, such as those that will use the SAM, the quantity of potential credits will be small, so verification audits will likely be each five years.

Plan Vivo

To register as a Plan Vivo project, a project must be validated and found to meet the Plan Vivo Standards. Once registered, projects can enter into sales contracts for Plan Vivo Certificates. This is a primary and important difference between VCS (which only permits ex post credits) and Plan Vivo (which offers ex ante credit sales).

Plan Vivo projects are required to work towards verification within the first five years or registration by a process of continuous improvement and by scaling up through increased sales of Plan Vivo Certificates.

MODULE 5: AGROFOREST CARBON PROJECT AGREEMENTS AND FINANCES

GUIDANCE ON COFFEE CARBON PROJECT DEVELOPMENT USING THE SIMPLIFIED AGROFORESTRY METHODOLOGY

This module presents an overview of the financial and contractual arrangements associated with carbon projects.

The project design section of this guidance (Module 2) is based on and assumes that the project developers are using the Simplified Agroforestry Methodology for rigorous project design and carbon sequestration monitoring on coffee farms. Such a project design would be useful for evaluation under the Voluntary Carbon Standard or as the technical specifications/project design required under the Plan Vivo System. It is the latter system to which we turn for examples and experience in implementing project agreements and finances for coffee farm reforestation carbon projects (though reference will be made to Voluntary Carbon Standard systems as appropriate).

Because the Plan Vivo System is intended for use specifically by project developers that are concerned with promoting sustainable livelihoods, the mechanisms that have been developed for agreements and contracts, payments and developing relationships with buyers are particularly appropriate for integration with the Rainforest Alliance Certification system and coffee farm reforestation carbon projects.

5.1 PROJECT MANAGEMENT AND IMPLEMENTATION

SUGGESTED AGREEMENT: BETWEEN PROJECT COORDINATOR AND FARMER

An agreement between project coordinator and farmer should cover the duration of the project. The periods of Plan Vivo and Voluntary Carbon Standard projects (between 20 and 100 years) dictate that these be long-term agreements.

Though it is likely to present few problems on Rainforest Alliance Certified coffee farms, where farmers already recognize the value of shade trees, farmers must understand agreements will not be entered into with producers that have cut down trees in order to join the project.

The agreement between the farmer and the project coordinator should outline each party's responsibility for:

- Establishing land tenure: Farmer must be able to prove tenancy of his/her land to participate in the project. The project coordinator should check to ensure that land tenancy guarantees rights to carbon sequestration services in the jurisdiction of the project.

- Implementing the reforestation plan: The reforestation plan should be walked through on site with both coordinator and farmer present to ensure that it is realistic and manageable by the farmer. The plan should include the following elements.

  - Location and size of plot(s) to be planted;

  - Species and number of trees to be planted (ideally, trees planted under this project should be native species that have some value in local markets or produce food. However, this is a recommendation made only to increase the environmental and financial sustainability of the project; the SAM does not exclude the planting of non-native species);

- Planting pattern (ways tree planting might affect coffee production should be noted) ;

- Spacing;

- Management (e.g. maintenance, pruning and thinning) plan;

- Rotation period (both carbon sequestration and tree value at harvest should be considered when determining rotation period); and,

- Replanting of harvested and dead trees.

- Monitoring: when, how and by whom the plot will be monitored.

- Payment:

  Method of payment (e.g., bank account number if payment is to be made by direct transfer); and,

  Anticipated payment amounts and schedule.

The agreement should articulate the specific rights and responsibilities and the conditions under which either party could withdraw from the agreement. Most such contracts would be legally binding in the local jurisdiction and comprehensible to all parties.

Example: Plan Vivo System agreements between project coordinator and producers

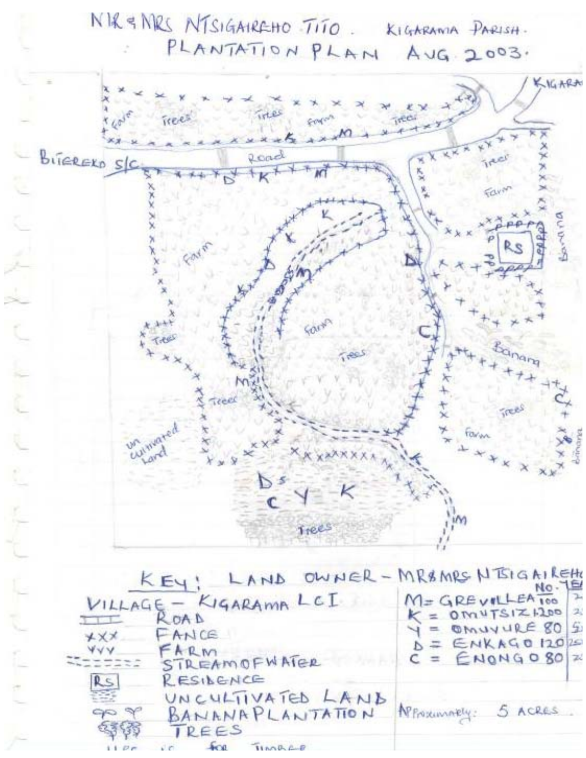
Plan Vivo requires two forms of commitment between the project coordinator and producers.

First, producers draw a map of their property that is used as a reference for carbon project management. Each *plan vivo* is required to identify:

1. The name of the producer;
2. The address of the producer;
3. The total land-area;
4. Proposed land-use systems;
5. Management objectives;
6. Species proposed;
7. Planting density and rotation length;
8. Estimates of resources needed to implement activities.

Second, producers sign a carbon sale agreement with the coordinator. Each relates to a specific *plan vivo* and includes:

1. The name of the producer or producer group (and in the latter case, the name of the group leader);
2. The *plan vivo* the sale agreement relates to (which must be registered with the project);
3. Proof of land-tenure;
4. The amount of carbon being purchased;
5. The price being paid for the carbon (local currency /tC or /tCO2);
6. The identity of the buyer(s);



A SAMPLE *PLAN VIVO* FROM THE ECOTRUST TREES FOR GLOBAL BENEFIT PROJECT, UGANDA (SOURCE: THE PLAN VIVO MANUAL: GUIDANCE FOR DEVELOPING PROJECTS).

7. The producer or producer groups bank account details or other necessary payment details; and,
8. An obligation to re-plant trees that have died (e.g. as a result of disease, drought etc.) or have been harvested for timber or other purposes as part of a rotation cycle specified in technical specifications.

Table A: Sale details

Producer (Organisation/Group/Individual – delete as appropriate)	
Location	
Plan Vivo Number	
Total Carbon Benefit	
Buffer (x%)	
Total Saleable Carbon Benefit	
Purchaser	
Price (e.g. $/t)	
Total Payment ($)	
Purchaser Account Details	

Table B: (Example) Monitoring Schedule

Time of Monitoring (years after initial planting)	Monitoring Target	Percentage of total payment to be made (%)	Payment (US$)
0	50% plot established	30	
1	100%plot established	20	
3	Survival not less than 85%	20	
5	Average DBH not less than 10cm	10	
10	Average DBH not less than 20cm	20	

PLAN VIVO SALE AGREEMENT
[NAME OF PROJECT]

Preamble

This agreement was made on [date] between [project coordinator] of [address] and [producer/representative of producer group or community] of [address]. Its purpose it to provide terms and conditions agreed upon by the above parties for the sale of ecosystem services under the Plan Vivo System implemented in [Project name].

Whereas the said [project coordinator] has agreed to buy ecosystem services from the producer under the Plan Vivo Project at the price and conditions laid out below;

Whereas the Producer [is the owner/has long-term use rights] over the piece of land described in Table A of this agreement, and has registered Plan Vivo number [xxxx], attached in Annex in respect of the same piece of land, which has been evaluated and approved by [project coordinator] as meeting Plan Vivo Standards.

Agreement

1. This agreement shall remain in force for the period set out in Table B.

The **[project coordinator]** agrees:

2. To carry out monitoring of the producer's land over the period and against the targets laid out in Table B, and according to its procedures as specifies in the project manual.
3. The agreed purchase price, set out in Table A, shall be paid to the purchaser by the project coordinator in instalments set out in Table B where results of monitoring show that the corresponding targets have been met.

The **producer** agrees:

4. To implement activities (summarised in Table C) and carry out management actions as set out in their Plan Vivo, and to implement any corrective actions prescribed during the monitoring process.
5. To deposit [percentage] of his or her calculated carbon benefit in a carbon risk buffer maintained by [project coordinator].
6. To refrain from selling carbon to any other person or entity in respect of the same piece of land covered by the Plan Vivo attached.

Table C: Activities

Activity	Area (Ha)	Technical Specification Applicable	Species	Rotation Period (years)	Proposed date of Planting (_/_/_)

Project Coordinator:	**Producer:**
Signature: …………………………………	Signature: …………………………………
Name: …………………………………	Name: …………………………………
Post: …………………………………	Date: …………………………………
Date: …………………………………	

LEFT ABOVE AND BELOW; ABOVE: THE PLAN VIVO TEMPLATE FOR SALES AGREEMENT BETWEEN PROJECT COORDINTAOR AND PRODUCER (SOURCE: THE PLAN VIVO MANUAL: GUIDANCE FOR DEVELOPING PROJECTS).

5.2 RAINFOREST ALLIANCE CERTIFICATION AND THE CARBON PROJECT

SUGGESTED AGREEMENTS: (1) CONTRACT BETWEEN PROJECT COORDINATOR AND VALIDATION/VERIFICATION BODY; (2) AGREEMENT FOR SUSTAINABLE AGRICULTURE NETWORK AUDIT

Under the auspices of the Sustainable Agriculture Network (SAN)[30], the Rainforest Alliance works with farmers to ensure compliance with the SAN standards. Farms that meet these rigorous standards are awarded the Rainforest Alliance Certified seal. Certification to the SAN standards alone connotes no claim about any reforestation carbon project on a farm. However, by auditing the carbon project to the VCS or Plan Vivo standard at the same time as the farm is audited to the SAN standards, the Rainforest Alliance can offer efficiency and lower the burden on the farmer and the project coordinator.

The project coordinator should engage the Rainforest Alliance as a validator and/or verifier of the project by sending basic information to auditors via the Rainforest Alliance's carbon project application. Rainforest Alliance will in turn provide the coordinator with a proposal for the cost of the audit – as one budget with the SAN audit, if the coordinator is paying for both audit fees, or with a budget for the carbon project evaluation alone if another body is financing the SAN audit.

The auditors will complete two reports: one for the SAN and one for the appropriate carbon standards association.

5.3 SELLING AND BUYING

SUGGESTED AGREEMENT: CARBON CREDIT SALE AGREEMENT

The point at which carbon credits can be sold is of crucial importance to the project, because it is the point at which proponents can start recouping some of the investment that they make in establishing project activities. In establishing the project, proponents and the project developer should be clear about which sources of funding will be utilized at which stages of the project, when payments for carbon credits can realistically be expected, and how such payments will be allocated.

While credits for carbon sequestration may be sold at any point that project proponents and developers agree to sell such credits, if the credits are to be associated with the project's compliance with a standard system, they must meet that system's particular standards for credit issuance. Plan Vivo and the Voluntary Carbon Standard differ fundamentally in the calculation of how many credits (of the total carbon sequestered by the project) should be available, when they should be eligible for sale and when they should be registered.

The amount of credits to be sold is the total eligible credits *minus* the risk buffer, which is a reserved percentage of the total carbon expected to be sequestered by the reforestation activities. The risk buffer is held back from sale to cover unforeseen loss of carbon stock (due to disease, theft, fire, etc.) It is held in reserve until such time that is clear that the project can deliver in full its promised benefits.

The point at which credits are available for sale also significantly affects how many credits can be sold at a given time. If credits can be sold as "futures" (or *ex ante* credits) before the carbon has been sequestered, the project benefits because it can use these futures to earn financing for project start-up.

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[30] For more detailed information, see http://www.rainforest-alliance.org/agriculture.cfm?id=san

However, the investor bears a high degree of risk that the project will not be realized, and credits delivered, if (s)he invests before the project is validated or verified or before the credits have been created.

Credits must be registered before they can be officially sold as credits under a certain system. Registration is the process by which credits are tracked from issuance to retirement, ensuring uniqueness and traceability.

The contracts for sale of carbon credits should be legally binding and arranged between the buyer and the project coordinator. This allows the project coordinator to aggregate the carbon sequestered on more than one farm to create a saleable product. The sale agreement should include:

- How many tons are being purchased;
- From which farmer(s);
- At what price per ton;
- The total price; and,
- The breakdown of distribution of the fee: i.e., what amount goes to the project coordinator, and what amount goes to each farmer.

The unit of the sale (tons carbon or tons carbon dioxide sequestered) should be clear. The coordinator's records of sales should be precise and available to auditors of the project. Each ton may only be sold by the project one time.

Coordinators and buyers alike must be careful to use precise language about what is being transacted (carbon credits), both in agreements and in any related communications. If possible, buyers should be educated about the project in order to help in promoting forest carbon and carbon credit projects that support livelihoods in rural communities.

Under the Plan Vivo System

Timing of credit issuance: Credits from Plan Vivo projects are issued first in a pilot sale, and thereafter on an annual basis. Pilot sales occur at the time of the project's activation, *before the project has been validated* (these are, most often, *ex ante* credits). The objective of a pilot sale is to allow the project to begin training for producers, develop *plan vivos*, establish sales agreements between buyers, the project coordinator and producers, and establish systems for monitoring carbon sequestration – to get on with establishing the project. The pilot sale credits are intended to be real emissions reductions, and should be verified at a future date.

Registration: Project validation occurs when the Plan Vivo Foundation deems the project to be well-enough established. If, in the validation audit, the project is found to meet the Plan Vivo Standards, and the PDD and technical specifications have been approved, the project will be registered as a Plan Vivo project and Plan Vivo Certificates issued for carbon sequestered in the first project cycle, which would have been completed. These Certificates can be sold to buyers. Validation occurs *after* the pilot sale, and registration is followed within five years by verification.[31]

Non-saleable carbon sequestered: Plan Vivo projects are required to reserve a minimum 10% buffer of each producer's carbon sequestered.

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[31] More information on the Plan Vivo registration process can be found in The Plan Vivo Registration Process: A step-by-step guide, available at http://www.planvivo.com/content/fx.planvivo/resources/Plan%20Vivo%20Registration%20Process-step%20by%20step%20guide.pdf.

Under the Voluntary Carbon Standard

Timing of credit issuance: Carbon credit (Voluntary Carbon Unit, in the VCS parlance) issuance can be requested of the Voluntary Carbon Standard Association *once a project has been validated and its GHG emission reductions or removals verified* (VCUs are strictly *ex post* credits).

Registration: After validation, project documents must be submitted by the project coordinator to the Voluntary Carbon Standard's registry system[32] and reviewed and officially registered in order for VCUs to be issued. However, VCUs can be issued while the registration process is ongoing. [33]

Non-saleable carbon sequestered: The VCS requires that an in-depth risk assessment be conducted to identify how much carbon should be held in reserve as a risk buffer. This is described in the Voluntary Carbon Standards Association *Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination*.[34]

5.4 MARKETS AND BUYERS

Though this project uses a methodology that has been approved for use in the Clean Development Mechanism, project proponents will find it more efficient to choose either the Voluntary Carbon Standard or Plan Vivo for project evaluation and to market the credits in the voluntary market. In recent years, the proportion of forestry-based projects has grown in voluntary carbon markets, especially in North America. In 2007, these types of projects made up one third of the voluntary carbon marketplace.[35]

The voluntary carbon markets are much smaller overall in size than the Kyoto Protocol-motivated regulated market, but they are growing exponentially and currently allow more forestry-based project types than compliance markets. More streamlined project-based crediting mechanisms (such as the Voluntary Carbon Standards Association and Plan Vivo), are utilized in the voluntary of markets. Companies, individuals, and other organizations' investments are driven not by mandatory emissions targets but by concerns about corporate social responsibility, environmental responsibility (interest in reducing carbon footprint or even becoming "carbon neutral") and, increasingly, the desire to be well-positioned for impending compliance regimes.

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[32] For detailed information on the VCS registry system, see http://www.v-c-s.org/projects.html.

[33] See VCS Guidance Document: VCS Project Registration and VCU Issuance Process (http://www.v-c-s.org/docs/VCS%20Project%20Registration%20Process%20version%201.pdf) for more detailed information.

[34] http://www.v-c-s.org/docs/Tool%20for%20AFOLU%20Non-Permanence%20Risk%20Analysis%20and%20Buffer%20Determination.pdf

[35] The Ecosystem Marketplace and New Carbon Finance publish an annual report with this information titled State of the Voluntary Carbon Market. See http://www.ecosystemmarketplace.com/ for the most recent version.

WHO BUYS CARBON CREDITS IN THE VOLUNTARY MARKET?

According to recent research by Ecosystems Marketplace and New Carbon Finance, the largest group of buyers in the 2008 voluntary market were businesses that purchase these credits for resale, expecting to profit from increasing prices for credits. It is expected that many of these credits will be re-sold to buyers who wish to retire them in order to reduce their carbon footprint and prepare for a compliance regime where such action will be mandatory. Businesses purchasing credits explicitly for retirement, in order to reduce their net greenhouse gas impact, makes up another third of carbon credit purchases (this motivation was cited for one half of purchases in a study of the 2007 market, with the decrease perhaps being attributable to the addition of the "not applicable/I don't know" category to the 2008 market survey). It is this latter category that will likely be most interested in purchasing offsets from coffee farm reforestation projects.

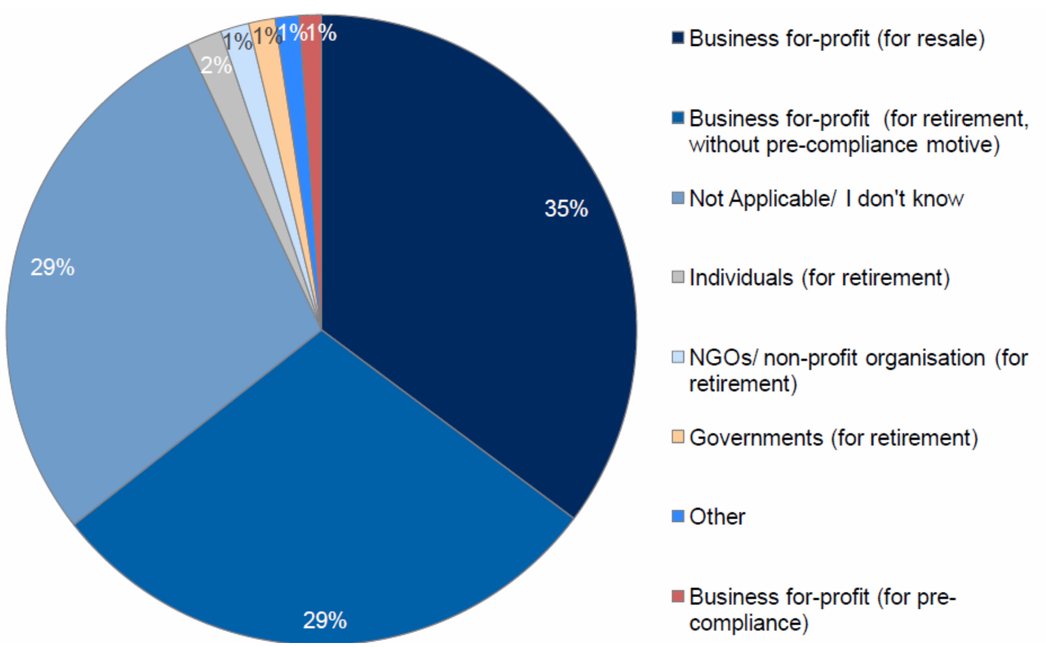

Figure 2. Transaction volume by type of buyer in the voluntary, over-the counter (i.e. non-exchange) market, 2008. Source: Fortifying the Foundation: State of the Voluntary Carbon Markets 2009 (Ecosystems Marketplace and New Carbon Finance), results based on 107 survey respondents.

Good potential for selling credits from coffee farm reforestation projects lies in marketing the credits directly to companies that purchase coffee from the same farms. The Rainforest Alliance has determined that coffee retailers have significant interest in purchasing offsets from coffee farms, where they can tie the story of offsetting their impact in with the story of the beans. Project coordinators that are coffee traders or associations are well-placed to market and sell these credits based on their existing relationships with buyers.

If they are not sold directly to coffee companies, these credits are unlikely to be sold to carbon market firms that are simply re-sellers, because they will not be available in great enough volume or be inexpensive enough for these firms. There is greater potential to sell the credits to carbon offset retailers, such as Carbonfund.org, who are attracted to carbon projects with important social and biodiversity benefits and have a track record of support for validated forest carbon projects.

5.5 DISBURSING THE BENEFITS

After a sale of carbon credits, the project coordinator is responsible for distributing the payment to the farmers as per the sale agreement. This should be carried out in a timely manner (as agreed upon in the agreement between farmer and project coordinator) and with clear records, which may be audited.

MODULE 6: SUPPLEMENTARY RESOURCES

GUIDANCE ON COFFEE CARBON PROJECT DEVELOPMENT USING THE SIMPLIFIED AGROFORESTRY METHODOLOGY

Hopefully, users of this guide will feel prepared to develop a reforestation project on a Rainforest Alliance Certified coffee farm using the Simplified Agroforestry Methodology. This module contains supplementary resources and directs users to independent appendices.

6.1 GLOSSARY

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 – a collective name for 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[36].

Allowance – equal to the maximum permitted level of GHG emissions. A company may only emit as much carbon as it has allowances for.

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 greenhouse gases that have been sequestered or mitigated.

Carbon dioxide equivalent (CO_{2e}) – 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 (CO_2).

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

Clean Development Mechanism (CDM) – a flexible mechanisms 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 tradeable credits corresponding to the volume of emission reductions achieved by that project.

Credit – equal to a specified amount of sequestered CO_2 or prevented CO_2 emissions.

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[36] ICRAF, 1993. International Centre for Research in Agroforestry: Annual Report 1993. Nairobi, Kenya. pp 208.

Ex ante – predicted, beforehand

Ex post – actual, afterwards

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

Joint Implementation – a flexible mechanism contained in the Kyoto Protocol that allows an entity from an Annex I (developed) country to implement an emission-reducing project or a project that enhances removals by sinks in another Annex I Party and by doing so generate Emission Reduction Units that will count towards meeting its own Kyoto target.

Kyoto Protocol – a protocol to the United Nations Framework Convention on Climate Change that provides a framework for remedial and precautionary action to tackle adverse effects of climate change, including mandatory emissions targets for signatory developed countries. It entered into force in 2005 and will be in effect through 2012.

Leakage – the change in GHG emissions by sources which occurs outside the boundary of a project activity which is measurable and attributable to the project activity. Increases in carbon stocks are considered positive leakage, and increases in emissions are considered negative leakage.

LULUCF – Land Use, Land Use Change and Forestry, a category of project activities.

Methodology – an application of an approach to an individual project activity for the determination of the **baseline** scenario and the means by which to calculate the net anthropogenic GHG removals by sinks achieved by the project.

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.

Permanence – the maintenance of carbon storage over project lifetime.

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.

Project proponent – entities or individuals that identify, develop and implement carbon project activity. In the case of the projects discussed in this guidance, farmers are the project proponents. .

REDD – Reducing Emissions from Deforestation and Degradation, a category of project activities.

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.

6.2 APPENDICES

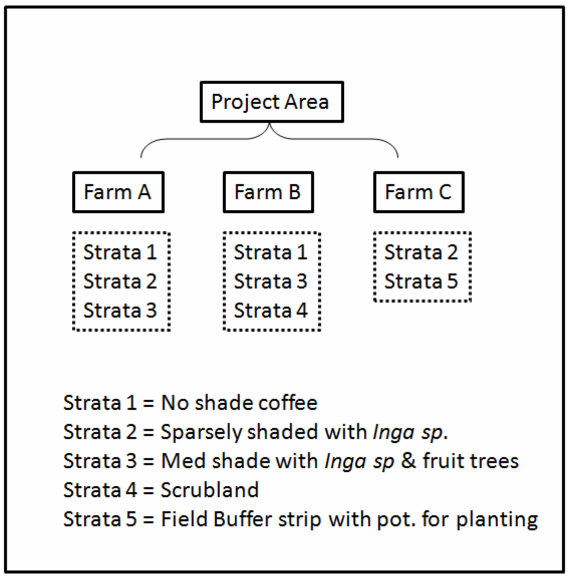
APPENDIX 1, DATA AND PARAMETERS FOR USE IN COFFEE CARBON PROJECT DEVELOPMENT USING THE SIMPLIFIED AGROFORESTRY METHODOLOGY

This workbook contains tabs with data and parameter research findings for use with the RA's carbon coffee project, including wood density, useful allometric equations, root to shoot ratios and references. (Excel)

APPENDIX 2, FIELD MEASUREMENT GUIDE TO ESTIMATING BIOMASS ON COFFEE FARMS

This document provides guidance on estimating the current biomass of potential project areas. It does not cover other aspects that are necessary to work out the overall feasibility of a project such as access to trees, finances, social, legal issues etc. It does not cover additionality determination, leakage or permanence.

Carbon coffee projects will have a project area that is made up of a number of farms. These farms will each have a number of strata of relatively homogeneous areas of vegetation; strata will be common across farms. At the time of the field visit, the project areas may not be defined, and a more farm based approach taken. In this case, thought should still be given to how the farms could potentially form one project area. The figure below shows how this division of land, amongst a project area could work (this is just an example).



GUIDANCE AT THE POTENTIAL PROJECT AREA SCALE

As mentioned above, if potential project areas are not defined, then it will not be possible to complete this approach. However, the data needed should still be considered, and gathered for a farm where possible.

For each potential project area determine[37]:

- Name of the project area (e.g., department, municipality, canton, locality, farm name, etc.)
- Map(s) of the area (paper format and/or digital format, if available)

[37] List from IPCC Best Practice for LULUCF (2003), Chapter 4.3.2.1

- Geographic coordinates
- Altitude range
- Climate type
- Holdridge life zone
- Total land area
- Number and names of strata that comprise the area
- Details of land ownership
- Land use and management history of the selected site(s) especially year when forests were cleared and when coffee plantations where established.

A project area will contain different farms, at this stage we may not know which farms would be likely to be grouped to form a project area. So an assumption that all farms in close proximity, or who sell to a common buyer, would be part of the project area could be made.

GUIDANCE AT THE FARM LEVEL – DEFINING AND MEASURING STRATA

For each farm, the following should be prepared:

- An annotated map (digital and geo-referenced is best, but paper and hand-annotated is acceptable) should be made for each farm, with scale, north arrow and major features on. If the study sites are known and good Google Earth images exist, then they could be printed prior to the trip and annotated in the field.
- Stratification of land area into homogeneous units, bearing in mind likely additional planting potential. Each stratum should be labelled and described, so if a similar stratum is found on another farm in the project area, the same stratum name can be used. Summary data for each straum would include:
    - a map of the stratum (drawn on satellite image, existing map, or as a new map);
    - area of the stratum based on map and field measurements;
    - altitude;
    - tree species present and relative abundances;
    - average density of tree species;
    - average coffee bush height and diameter of main shoot at 15 cm and density (number of plants per unit area);
    - average tree diameter at breast height (DBH);
    - average height and description of canopy (single layer, multiple etc);
    - average canopy coverage;
    - description of soil;

- description of litter layer;
- current land use;
- past land use;
- potential for new tree planting (qualitative and quantitative data as is possible);
- Estimate of costs for reforestation; and,
- Management capacity for reforestation (experience, nursery, fertiliser required etc).

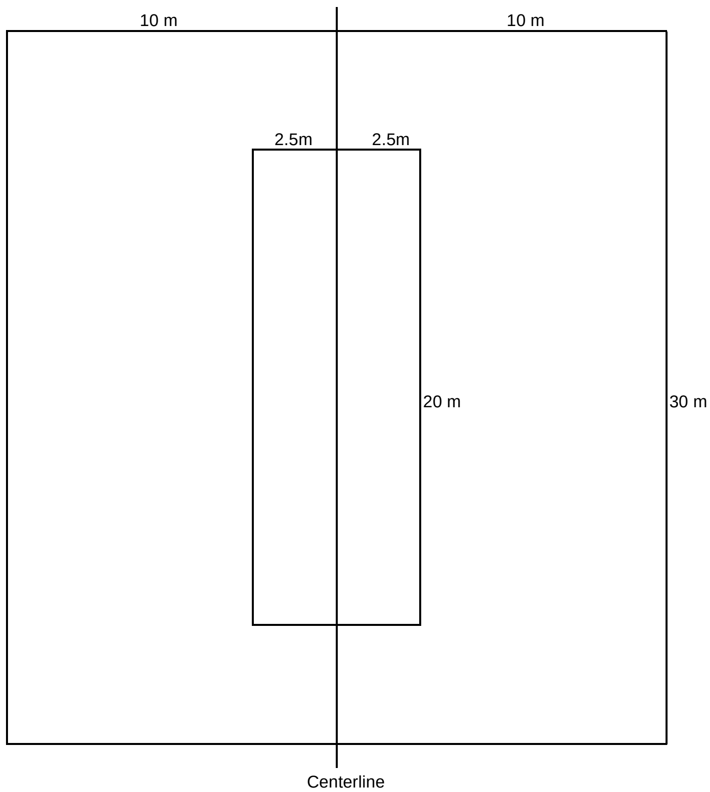
- It will be very useful to take pictures (label immediately, with a system) of each stratum that show what it is like. Have someone or something in the picture for scale.
- In order to estimate the biomass, one plot per stratum should be established at a random location in the stratum. The plot will only be temporary at this stage.
- Within the plot, DBH and height measurements should be taken of all trees with dbh > 5cm.
- The plot design is based on the Whittaker nested design, but with a reduced plot size[38] and without the smallest plots. As shown in the figure on the next page, each plot should be 20 m wide and 30 m long (600 m^2 = 0.06 ha) oriented perpendicular to environmental gradient such as slope. The larger plot should be located by randomly selecting a center point for one of the 20 m sides and taking a compass bearing along the environmental gradient. A marker is placed at the starting point and at 10, 20 and 30 m along the compass bearing. All trees greater than 30 cm DBH within 10 m of the centerline are measured for dbh and height, species determined and recorded. For permanent sample plots a permanent marker (e.g., a partially buried PVC tube with one end painted) is placed at the selected center point and its location as well as the compass bearing used is noted along with the permanent plot data.
- Within the larger plot establish a subplot 5 m wide and 20 m long (100 m^2 = 0.01 ha) centered on the long axis of the larger plot. The subplot begins 5 m along the large plot centerline and extends 20 m to 5 m short of the opposite short side. All trees greater than 5 cm DBH, less than 30 cm DBH and within 2.5 m of the centerline are measured for DBH and height, species determined and recorded.
- In addition:
    - record all standing dead trees >=5 cm DBH in large plot; and,
    - record all heights and diameters of main trunks of coffee plants at 15cm from the ground in small plot.
- Ideally multiple plots would be placed in each strata (10 -15 is recommended) so the variance can be established. This variance measuring only needs to be done once for a stratum. It allows the calculation of the number of sample plots required in a strata to achieve the desired confidence limits. So if time allows, repeat this procedure in a strata. If time does not allow, then a qualitative assessment of the homogeneity of the strata should be noted. For example: "*Strata A was a very homogenous strata with equally spaced coffee plants and fruit tree xxxx at spacings of 3m, if we*

[38] IPCC Best Practice for LULUCF (2003), Chapter 4.3.3.4 recommends a size of 600m^2 for sparsely populated trees.

had done the measurements 50m in either direction, the amount of biomass recorded is not likely to have changed much".

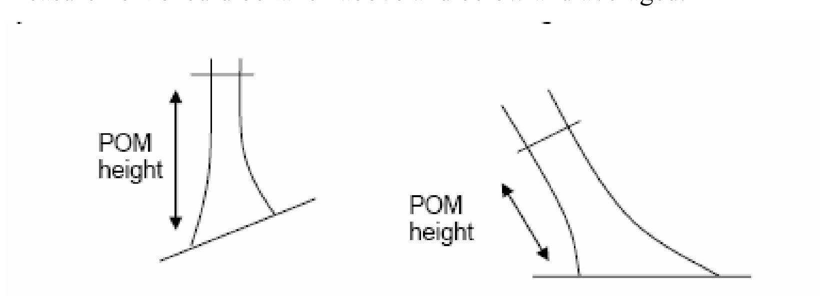
- Determine amount of wood harvested and uses of harvested wood that occurs currently within each stratum.

Sample Plot Design



TECHNIQUES

DBH: Diameter at breast height (1.3m from the floor), measured along the tree trunk, from the upside of any slope using a stick of measured height. If multiple branches are present at dbh, each should be measured separately, but recorded as being part of one tree. If a deformity is present at DBH, the measurement should be taken above and below and averaged.



Tree height: See http://www.wikihow.com/Measure-the-Height-of-a-Tree and http://www.geog.leeds.ac.uk/projects/rainfor/manuals/TreeHeight_english[1].pdf for examples of how to measure heights. Use the most accurate method time and equipment permit.

Plots: The plot centerline location and compass bearing used for the environmental gradient marked on a map.

If in doubt the following link gives guidance to acceptable best practice for plot establishment and measurement of trees (note our plots are intentionally smaller): http://www.eci.ox.ac.uk/research/ecodynamics/panamazonia/rainfor_field_manual_english.pdf

Farm Areas: The co-ordinates of the farms boundaries should be marked with a GPS, so an idea of the size, shape and location is recorded digitally. This is in addition to the sketch map (to scale as much as possible).

SCALING DOWN

If the above is not possible given time constraints then the replication for variance could be skipped, but would likely need to be done at some point in the future.

If the number of strata is very low (2-4) then it should be possible to get at least one plot done per strata. If there are many types of land cover found this may be more difficult. Priority should go to the higher biomass areas and the areas that represent more of the total area. For example, if 80 percent of land is ‘sparsely shaded coffee’, then 80 percent of the sampling effort should be here. In addition, strata where trees can be planted are of priority. Don’t forget, if biomass is very low, this will be a very quick exercise.

If the shape of the plot will not fit in an area, then it can be changed as needed. i.e. made more square or elongated.

If an area, such as a border has been defined as a strata, because it would be intended that a line of trees would be planted on it, then it is OK to do a long thin plot, which is more like a transect.

EQUIPMENT NEEDED

This is the minimum required to do the instructions above. If you want to have multiple people working in parallel, then maybe more units of each piece will be needed. Back-ups of essential equipment are usually advisable as well.

- 30m tape measure (2 would be best);
- Permanent markers;
- Tape or ribbon for;
- DBH measuring tape (or normal tape to measure circumference);
- Calipers for measuring DBH of small trees and coffee bushes (very cheap ones are fine);
- GPS device, charger, software and computer wire (knowledge of how to download data is needed);
- Camera, memory card and charger;
- Pre-made sheet for recording data on (and correlating spreadsheet for quick data entry);
- Measuring stick for coffee plant height; and,

- Extendable measuring stick for tree height measurement, or optical tree height measuring device, or, angle measuring device.

DATA SHEETS NEEDED

- Project area level data sheet;
- Farm level summary information gathering sheet containing strata summary information;
- Biomass estimation gathering sheet (for individual tree measurements and species etc); and,
- Copies of any existing maps or images for annotating strata and plot data.

APPENDIX 3, STRATA DEFINITION AND ESTIMATE OF CARBON SEQUESTRATION POTENTIAL ON SHADE COFFEE FARMS IN WASLALA

The coffee farms surveyed in Waslala were stratified into six distinct, relatively homogenous land use types (table 1). Estimates of tree and coffee plant carbon contained in the above ground and root biomass were developed on 17 sample plots (table 2) on one land use type coffee plantation. Expert observations of the other strata were used to typify the biomass on these.

From the sample plot data we developed an estimate of the potential for carbon sequestration by strata for the sample farms. Our field counterpart, ECOM-Atlantic Trading Company, a coffee trader active in the area, selected the sample farms and indicated that they were representative of the farms that had been participating in the ECOM support tree planting efforts in 2006-2007. ECOM also indicated that these farms would be the target of a future coffee carbon .project.

TABLE 1: FARM STRATA SUMMARY WASLALA BASELINE SURVEY

Farm Name	*Total Area*	*Coffee*	*Annuals*	*Pasture*	*Fallow*	*Forest*	*Degraded*
La Providencia	31.0	3.5	0.9	3.1	11.0	12.8	14.6
Las Delicias	32.3	13.2		14.8	4.3		
La Flor	7.7	3.7	2.1		1.9		
Los Pesares	21.0	9.1		8.1	3.8		
Las Miradas	41.0	5.6	8.8	23.4	0.5	2.7	
Los Laureles	25.9	4.9	4.2	11.6	3.0	0.6	1.6
La Victoria	26.8	22.7	1.6		0.2	0.4	1.9
Total Area (ha)	185.7	62.7	17.6	61.0	24.7	16.5	18.1
Percent of Total		34%	9%	33%	13%	9%	10%

The following describes the farm strata and their potential for carbon sequestration.

COFFEE

Over a third of the land on the sampled farms is planted to shade grown coffee. Shade density ranged from a low of 30 percent to a high of 80 percent. Farmers uniformly reported that they were satisfied with the density of shade they currently have on their coffee parcels.

The trees that were on the plots were reported to have grown there naturally or were left in place when the parcel was planted to coffee. Some farmers reported transplanting volunteer seedlings of desirable species, e.g., Laurel (Cordia alliodora) that they found growing elsewhere. There was no evidence of systematic tree planting on coffee fields other than the experience of ECOM supported tree planting program in 2006 and 2007. Replacement was judged to be roughly equivalent to removal. Although we did not assess tree age we did determine the age of the coffee farms which ranged from 12-28 years.

Nearly every coffee plantation visited evidenced recent tree harvesting. Farmers reported that they were removing windfall and diseased trees with permission of local officials. The harvested wood was destined mostly for firewood and, to a lesser extent, fence posts. There was no evidence or reports of any tree harvesting on the sample farms of trees being felled for sawlogs or construction polewood.

Additionality of tree planting in coffee: Our preliminary assessment is that a coffee carbon project in Waslala would have substantial potential for carbon sequestration that meets the additionality test of the Simplified Agroforestry Method (SAM). This is based on three tests:

- *Investment barriers*: Coffee farmers in Waslala have limited access commercial sources of credit and we were not able to identify any sources of credit for long-term investment such as carbon sequestration through tree planting. With the exception of the tree seedlings provided by ECOM-Atlantice in 2006/2007 farmers have borne the entire cost of tree planting to date and as a result the investment has been minimal, shade trees are almost entirely volunteers, sometimes transplanted sometimes left where they germinated. As a result the current carbon sequestration baseline is judged to be effectively nil. That is farmers are content with the amount of shade they currently have and are planting about enough to offset the removals. There is no evidence that absent a project promoting tree planting and change in land use that this situation will change. Indeed the one salient exception to the carbon neutral scenario, the ECOM tree planting promotion project of 2006 and 2007, is no longer in operation due to the high cost of seedling transport and technical difficulties in producing seedlings in 2008. The municipality of Waslala is producing a few thousand tree seedlings for the 2009 planting season but most of these will be used for ornamental purposes. No other tree seedling production activity was reported.

- *Barriers due to prevailing practice*: Coffee carbon project certainly meet the first of its kind additionality test. There are none currently operating in Nicaragua and none have been identified that are intended to reach the voluntary carbon market. The SAM was approved by CDM only in November of 2008 its use is just beginning. There are no approved CDM projects that use the SAM.

- *Institutional barrier*: The small coffee farmers in Waslala cannot directly access international carbon markets due to the requirements of these markets for project documentation, verification and validation of carbon sequestration. There are currently no national institutions operating in the country that have significant experience working with carbon markets and pooled small farmer carbon. The project funds will be used in part to create this capacity in ECOM who has experience in pooling the production of large number small farmers.

It is important before proceeding in preparation of a Project Design Document (PDD) to have a preliminary understanding of the potential for carbon sequestration in the project area. This gives a rough idea of whether the substantial costs of project design, verification, carbon credit registration and validation can be covered by the carbon funding that might be generated with enough left over to cover the costs of implementation. To calculate the potential for additional carbon sequestration we have prepared the following analysis.

CARBON SEQUESTRATION POTENTIAL IN WASLALAN SHADE COFFEE

As shown in table 2, the maximum density of total tree and coffee carbon found on the shade coffee plot samples made during the study was 161 mtC/ha. The average biomass was 60 mtC/ha while the minimum density encountered was 16 mtC/ha. We judged that the current roughly steady state biomass in shade tree was reached at or before 20 years. The coffee parcels had few really large or very young trees. The parcels had been established for at least 12 years and at most 28 years.

TABLE 2: SAMPLE PLOT BIOMASS DATA WASLALA BASELINE

Sample Plot	Coffee Plant Density no. ha-1	Above Ground Tree Carbon t C ha^{-1}	Below-Ground Tree Carbon t C ha^{-1}	Total Tree Carbon t C ha^{-1}	Coffee Carbon t C ha^{-1}	Total Tree & Coffee Carbon t C ha^{-1}
1a	2941	17.7	5.3	23.1	2.7	25.8
1b	3704	78.1	23.4	101.5	3.4	105.0
2a	2778	11.1	3.3	14.4	1.4	15.8
2b	2778	39.9	12.0	51.9	4.0	55.9
2c	3571	40.6	12.2	52.8	1.8	54.6
2d	2500	35.8	10.7	46.5	1.3	47.8
3a	3086	28.1	8.4	36.6	2.9	39.4
3b	3086	22.0	6.6	28.6	4.0	32.6
3c	4167	16.1	4.8	20.9	1.4	22.3
4a	3125	33.1	9.9	43.1	1.1	44.2
4b	3676	108.3	32.5	140.7	1.4	142.2
5a	2778	22.0	6.6	28.6	1.7	30.3
5b	2778	122.2	36.7	158.8	1.7	160.5
6a	4464	35.1	10.5	45.7	4.1	49.8
7a	4274	57.0	17.1	74.0	4.0	78.0
7b	3268	37.6	11.3	48.9	1.4	50.3
7c	4762	45.8	13.7	59.5	1.8	61.3
Average	**3396**	**44.1**	**13.2**	**57.4**	**2.4**	**59.8**

We believe it is reasonable to expect that farmers with a carbon market incentive and technical extension support could be induced to plant additional trees on parcels with lower stocking rates to bring the average up to about 75 percent of the high end of the plot stocking density or about 100 mtC/ha at the end of a 25-year project, an increase of 40 mtC/ha over current average stocking densities. Assuming an average tree biomass of 0.5 mtC at 20 years this would be approximately 80 additional trees per hectare. Roughly double this amount would need to be planted to account for mortality and tree thinning to achieve desired spacing.

Conservatism of the estimate: We judge this estimate to be inherently conservative. First, we are using estimates for maximum carbon sequestration actually achieved on several farms without external incentives. Second, recognizing farmers' inherent conservatism we are setting the target for average tree shade stocking density at 25 percent below the maximum found on site.

By using current tree stocking data to estimate potential future stocking we are also underestimating carbon stocking density by not including a plus up resulting from a shift in tree species composition. Currently there a high percentage of trees planted as coffee shade are Inga, spp. which has a low growing wide spreading habit. Thus fewer Inga trees are required to achieve a desired level of shade density than would be the case for trees with tall straight habit. We expect that a coffee carbon project in the zone would promote more planting of timber and polewood species, already known in the region such as laurel, Honduran mahogany, (*Swietenia macrophylla*), Spanish cedar (Cedrella odorata) and pochote (Bombacopsis quinata). These species are known as emergent in that they will after a few years emerge from the canopy of Inga and other lower growing species. Compared to Inga they provide less shade relative to the carbon they contain, a desirable trait for a coffee carbon project and, if implemented would result in high carbon density that predicted from the analysis of current species composition.

PASTURE

The area of pasture is roughly equal to coffee land use on the sample farms. Pastures are typically covered with native grasses and herbaceous plants, some pasture had been planted with improved pasture such as Brachiaria grass (Urochloa brizantha). There were occasional remnant native forest trees (e.g., Ceiba sp.) and small copses of natural reproduction in gulleys and other places that are out of reach of grazing cattle. Other than these the carbon stocking on pasture land was herbaceous and ephemeral. We did not sample the carbon density of above-ground tree biomass pasture lands but for the purposes of a coffee carbon project the carbon density could be considered nil.

Farmers reported cattle stocking density at one or two head per *manzana* (about two head per hectare). This is much lower than could be achieved with improved pasture and herd management. Farmers said that while they did not consider themselves to be cattlemen they did appreciate the benefits of maintaining a small herd. Cattle provide an ongoing source of protein from, mainly, milk and, occasionally, meat. As important, cattle can be sold to provide a ready source of cash if a farmer is financially pressed. Farmers recognized that they could increase cattle stocking through improved management, but none expressed their intention to change their current low-input low-return livestock system. As such there is an opportunity for conversion of pasture to coffee plantation.

Additionality of pasture conversion to shade grown coffee: All of the farmers interviewed reported that the land that they had purchased and started coffee farming on was originally used for extensive pasture, annuals cropping and native forest. No one reported any recent (less than 10 years) conversion of other land use to coffee. The reason farmers gave for the slow down in planting new coffee fields was the low world market price and the high initial cost of establishment and the lack of credit. Thus any carbon resulting from conversion of pasture to shade coffee plantation and/or tree planting and would be additional to the business as usual scenario under the investment barrier of the SAM additional test, there is insufficient credit to available to the coffee farmers in Waslala to support substantial creation of new coffee plantations.

CARBON SEQUESTRATION POTENTIAL ON PASTURE

It seems reasonable that a properly designed coffee carbon project could induce farmers to convert pasture to shade coffee. A target of 25 percent of total pasture land seems to be a conservative estimate of the potential land available for converting to coffee plantation. Alternately these lands could be reforested as was often the case during the 2006-2007 ECOM tree planting program. Using the same carbon density estimate of 100 mtC/ha for improved shade grown coffee and an assumption of no baseline carbon on the fields prior to conversion the potential carbon sequestration is effectively double that of improved coffee plantations, 120 mtC/ha versus 62 mtC/ha.

Conservatism of the estimate: We judge this estimate to be inherently conservative. As with the improved shade tree stocking scenario for existing coffee plantations we have used middle ranges for what is actually occurring and not included plus ups for using emergent species. The soil in well established coffee plantations is very rich in organic matter and carbon as compared to a long-established plantation which has a relatively impoverished soil carbon component.

FALLOW

Fallow lands as identified by ECOM mapping are lands that have previously been used for annual crops (mainly corn and beans) but are currently not in production. The municipality of Waslala, which has only been widely settled in the past 30 years or so, still does not have the dense population pressure of many parts of Central America. This reduces cropping intensity and, particularly with high value cash crop alternatives such as coffee, the need to retain the land in annual production is reduced. Thus the fallow in the Waslala zone does not follow a set sequence of cropping for a few seasons followed by a set period of fallow. As a result for the purposes of a coffee carbon project fallow is essentially the same as pasture for management options. We believe additionality, carbon sequestration potential and conservatism apply equally to the two land uses.

ANNUAL CROPLANDS

Annual croplands are primarily areas under active cultivation of corn and beans. This is a traditional cropping practice and with little or no technical improvements. We do not consider these lands, less than 10 percent of the total area of the surveyed farms, are not considered suitable for carbon sequestration. The minimal area and the cultural importance of small plot of corn and bean production are such that it is best to focus carbon project efforts on lands that are likely to render more significant results.

FOREST

Only one of the surveyed farms included significant extent of forest lands. The forest was dense native forest that apparently has never been cleared. We visited this forest parcel and decided not to sample biomass contained in the parcel because it would have been very difficult and time consuming to conduct the sample. In addition, we did not have the expertise on the team to identify many of the species.

Finally we considered that the remaining stands of forest were not suitable for carbon sequestration in a coffee carbon project. All cutting of the forest is prohibited and apparently this law is obeyed. Thus there is no justification for a REDD-based carbon credit. This also means that farmers would not be able to benefit from harvest of planted trees. Finally, the forest is already quite dense and replete with many small trees ready to replace any blow downs.

DEGRADED LAND

One farm contained a sizable parcel of degraded land. This is land that is neither suitable for coffee, annual crops or pasture. It probably would be suitable for reforestation effort. We did not observe this parcel or sample its biomass. Further examination is needed to estimate potential for carbon sequestration on these lands.

APPENDIX 4, BASELINE DATA FROM WASLALA, NICARAGUA COFFEE FARMS

Farm data, plot data, tree data and tree species information collected by Edwin Alpizar 31 March to 2nd April 2009 on farms selected by ECOM trading company. (Excel)