



Plan Vivo Project Design Document (PDD) CommuniTree Carbon Program (formerly Limay Community Carbon Project)



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SECTION A. General program description

A.1. Title and location of program

The program takes place in the municipalities of San Juan de Limay, in the department of Estelí, and Somoto, in the department of Madiz, Nicaragua. The program area encompasses the entirety of both municipalities.

A.2. Description of program aims and activities

To use reforestation as a tool to restore ecosystems, improve livelihoods and tackle climate change.

The program has the following aims:

- Mitigate climate change
- Increase and diversify smallholder farmers' income
- Increase local species and biodiversity habitat
- Reduce future forest degradation by addressing drivers of forest degradation and deforestation
- Increase forest cover and water retention within the municipalities
- Gender mainstreaming in forestry

These aims will be achieved through the following activities:

- The establishment of mixed native species forest plantations for sustainable management (carbon crediting activity)
- Provision of extension services to participating smallholder farmers
- Provision of direct payments to participating smallholder farmers based on successfully reaching pre-determined establishment and growth milestones
- Creation of processing facilities to create a market for participating smallholders' plantation products (supporting activity)
- Land use planning around critical watersheds (supporting activity)
 - The program's boundaries are chosen to take into account critical watersheds that suffer from seasonal water shortages and flooding
- Establishing gender employment policies and ongoing community consultations

A.3. Program participants

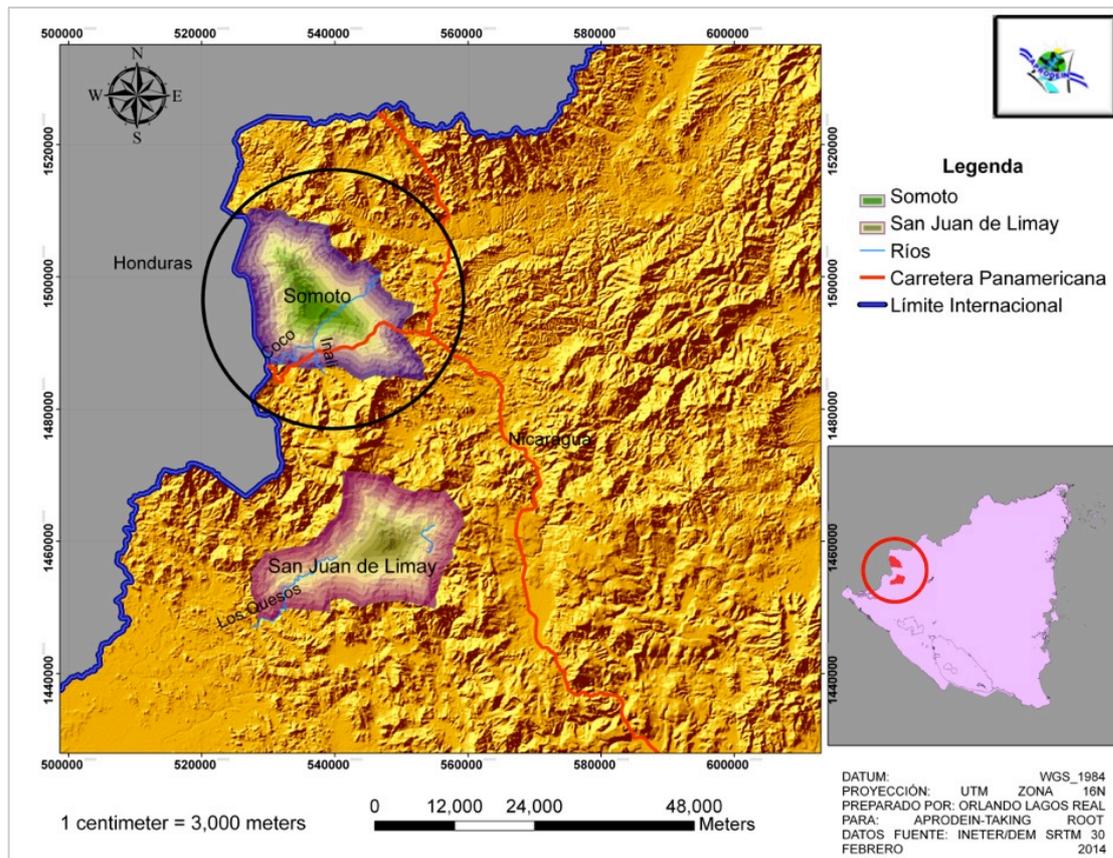
Participating smallholders are located throughout the municipalities of San Juan de Limay and Somoto. Participants must have long-term tenure rights to economically underutilized land that is in need of reforestation, be in close proximity to road access and must demonstrate that participating in the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

Nicaragua is the poorest country in Central America and the second poorest country in the Western Hemisphere with a GDP per capita income of \$4,500¹. Although reliable income statistics for the program area are unavailable, San Juan de Limay and Somoto are known to be among the poorest regions of Nicaragua.

A.4. Description of location and boundaries of the program

Project activities will take place on multiple landholdings located within the municipalities of San Juan de Limay and Somoto, which are used as the program boundary. These are respectively located in the departments of Esteli and Madriz, Nicaragua. The exact location and UTM coordinates are shown below in Figure 1.

Figure 1 – Map of program locations, San Juan de Limay and Somoto



¹ CIA world fact-book, Nicaragua: <https://www.cia.gov/library/publications/the-world-factbook/geos/nu.html>

A.5. Description of the program objectives and target groups

The overall objective of the program is to make reforestation an economically viable land-use option for smallholder farmers to mitigate climate change, improve livelihoods and restore ecosystems.

Background

The San Juan de Limay watershed, which lies within the program area, has been identified as the most environmentally critical area within the municipality. The majority of San Juan de Limay's scarce water resources come from that specific watershed so an increase in forest cover in that area would have strategic benefits for the entire municipality. Reforestation will increase water retention during the dry season and reduce flooding from the heavy rains in the wet season. Furthermore, this watershed is the birthplace of the river Los Quesos, which joins the river Rio Negro, which flows into the Estero Real. The Estero Real is the biggest estuary on Nicaragua's Pacific coast recognized by the Ramsar Convention as a wetland of international importance² as it provides unique habitat for numerous species, notably for migratory birds, shrimp and mangroves. A process of community consultations and meetings with local governments and experts has resulted in a very positive reception of the program by local communities (see annex 9 &10 for details of community visits).

Due to the benefits to farmers and the ecological importance of the watershed, the program has been welcomed by numerous government agencies, including the Ministry of the Environment's department of climate change (Nicaragua's Designated Operational Entity), the municipal government of San Juan de Limay and Somoto and Nicaragua's National Fund for the Development of Forestry (FONADEFO).

Primary objectives of the program

- Improve the socio-economic conditions of families located within the program boundary through alternative income sources generated from:
 - Payments for ecosystem services (PES)
 - Revenue from the sale of sustainably produced forest products
- Increase the efficiency of land-use planning and resources
- Restore degraded landscapes through native species reforestation
- Sequester quantifiable volumes of CO₂ from the atmosphere
- Increase water security within the program area

²http://www.ramsar.org/cda/en/ramsar-pubs-notes-anno-nicaragua/main/ramsar/1-30-168%5E16106_4000_0__

A.6. Description of the program area

Climate Conditions

The region's climate is characterized as dry tropical savannah with a small sub-humid zone at altitude. Temperatures range between 24-34° C with distinct wet and dry seasons. The wet season begins in May and ends in October. Annual precipitation within the program boundary is 1,394 mm per year, almost all of which falls during the wet season.

Present land-use / type of vegetation

Throughout the municipality of San Juan de Limay, approximately 3,140 hectares are dedicated to agriculture, which represents just over 7% of the territory. In Somoto, 7,463 hectares are dedicated to agriculture and pasture, 15,116 hectares are forested, and 13,316 hectares are covered with shrubby vegetation.

In the program region the main crops are sorghum, corn, and beans; coffee is cultivated in areas of higher elevation. Average yields are usually low and are therefore predominantly used for subsistence. The predominant land-use in the area is cattle grazing. However, due to the prolonged dry season, an estimated 1.4 hectares of pasture is required to support one head of cattle throughout the year. A common land-use strategy in the region is to grow grains for a couple of years then convert the area to pasture. Once the area becomes too degraded to support pasture, it is abandoned for several years, and is eventually cleared again for agriculture.

During the "Green Revolution," which began in the 1950s, vast areas of dry tropical forest in Nicaragua were cleared for large-scale cotton production. This land conversion caused serious environmental damage due to heavy erosion and the excessive use of pesticides³. According to elders in the region, this deforestation drastically changed the region's landscape and ecology. By 1980, cotton was Nicaragua's second largest export earner but by the end of the decade production dropped drastically due to a drop in world cotton prices.

Prior to the 1950s the program area was forested with abundant precipitation and wildlife. Over the span of one lifetime, the area was almost entirely deforested and converted into a seasonal desert. Currently, a few patches of secondary forest remain at higher elevations and some pine forests remain on the steeper summits of the taller mountains. A few of the giant trees that were typical of the region remain scattered throughout the valley. The most common mature trees are *Enterolobium cyclocarpum*, *Ceiba pentandra*, and *Albizia saman*. These are extremely fast growing trees that are not particularly valuable timbers. Although not entirely extinct from the area, valuable timber trees such as Pacific Mahogany (*Swietenia humilis*) and Spiny Cedar (*Bombacopsis quinata*) were once abundant.

Following are maps of the program boundaries displaying the hydrology, political Boundaries, and vegetation cover.

³ Federal Research Division of the Library of Congress. (1993). Nicaragua Country Studies Series. <http://countrystudies.us/nicaragua/38.htm>

Figure 2 – Political and Hydrological map of the San Juan de Limay region

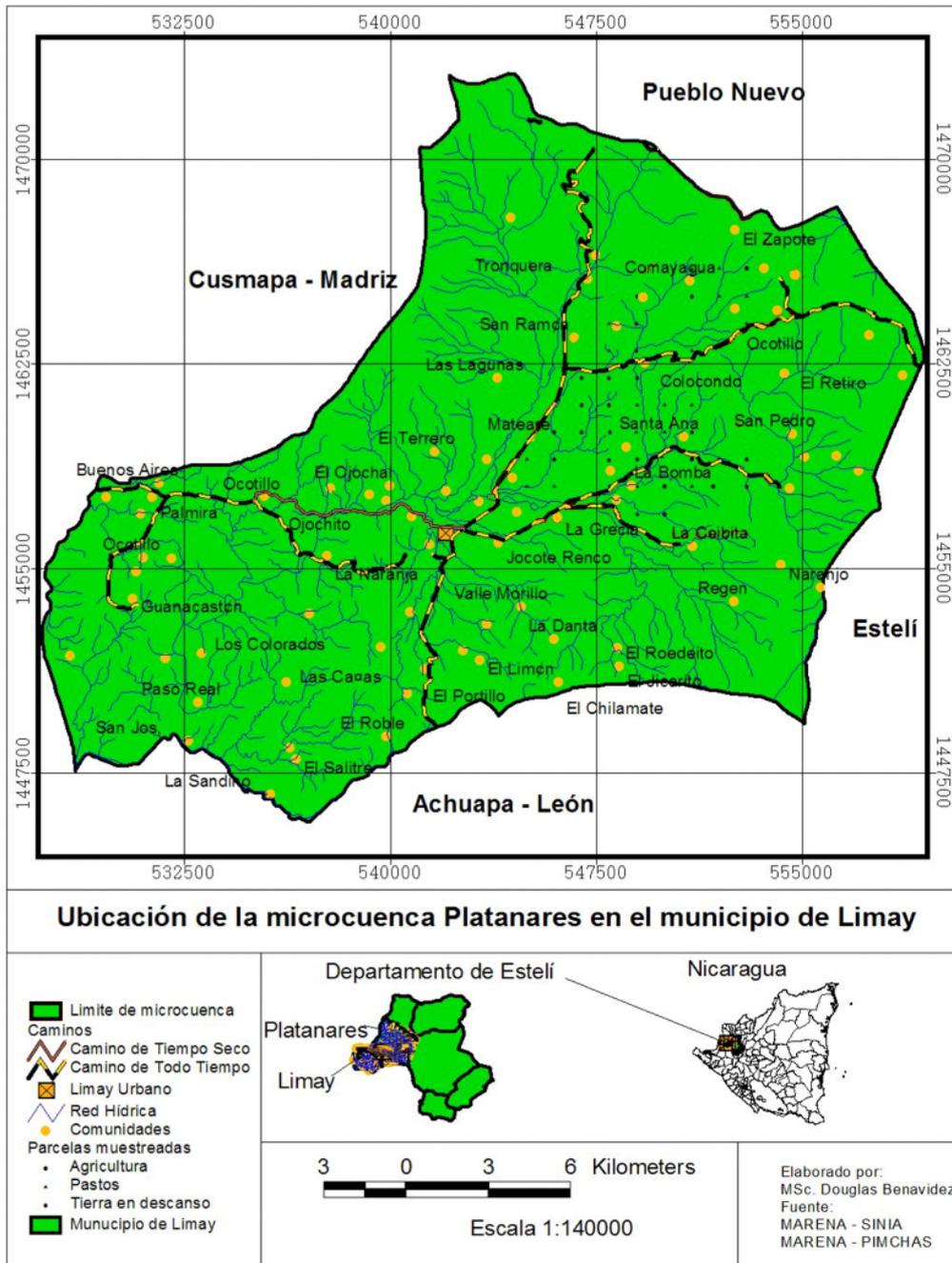
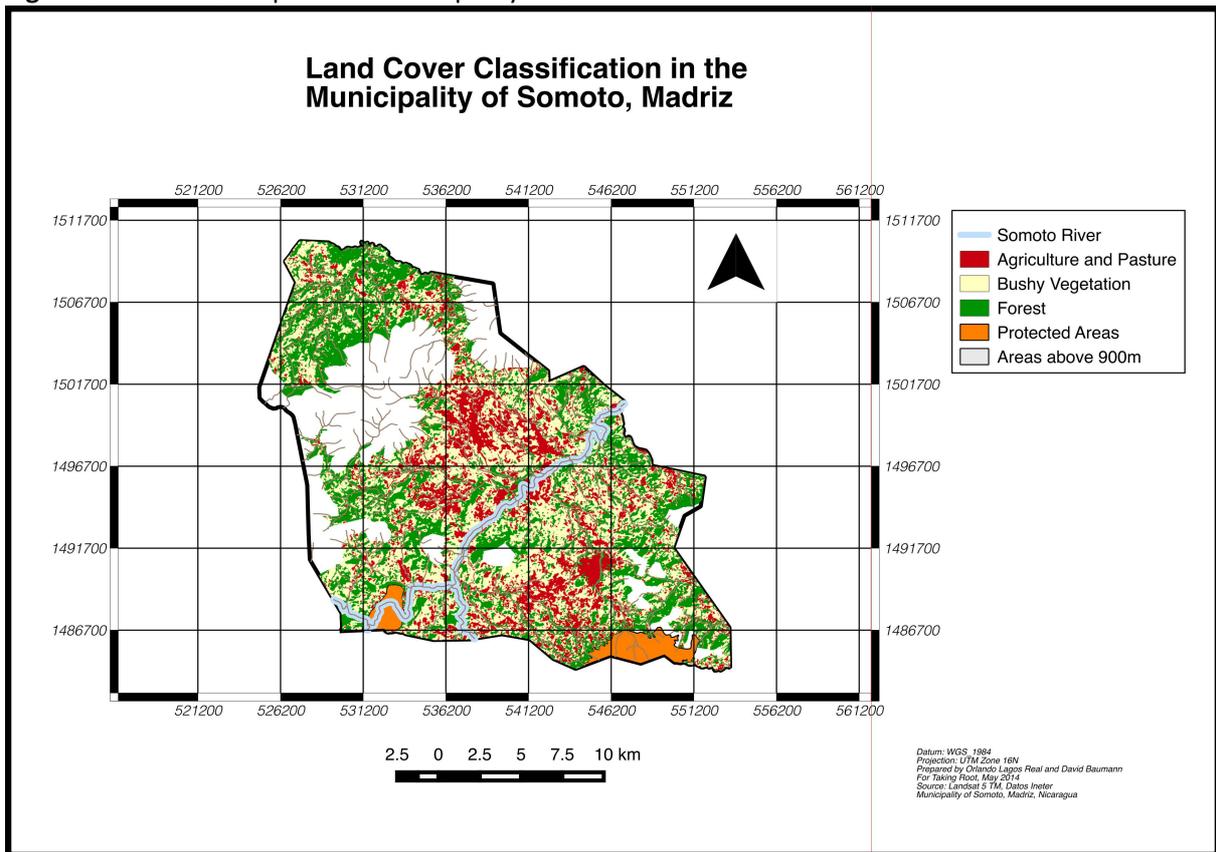


Figure 3: Land Use Map of the Municipality of Somoto.



A.7. Description of socio-economic context and land tenure of the program area

San Juan de Limay

The following socio-economic information is available for the entire Municipality of San Juan de Limay:

Population

Urban inhabitants: 3,668
 Rural inhabitants: 9,787
 Total inhabitants: 13,455
 Population density: 31.5/km²
 Indigenous population: 5,519

Predominant religions: Catholic and evangelical

Firewood use

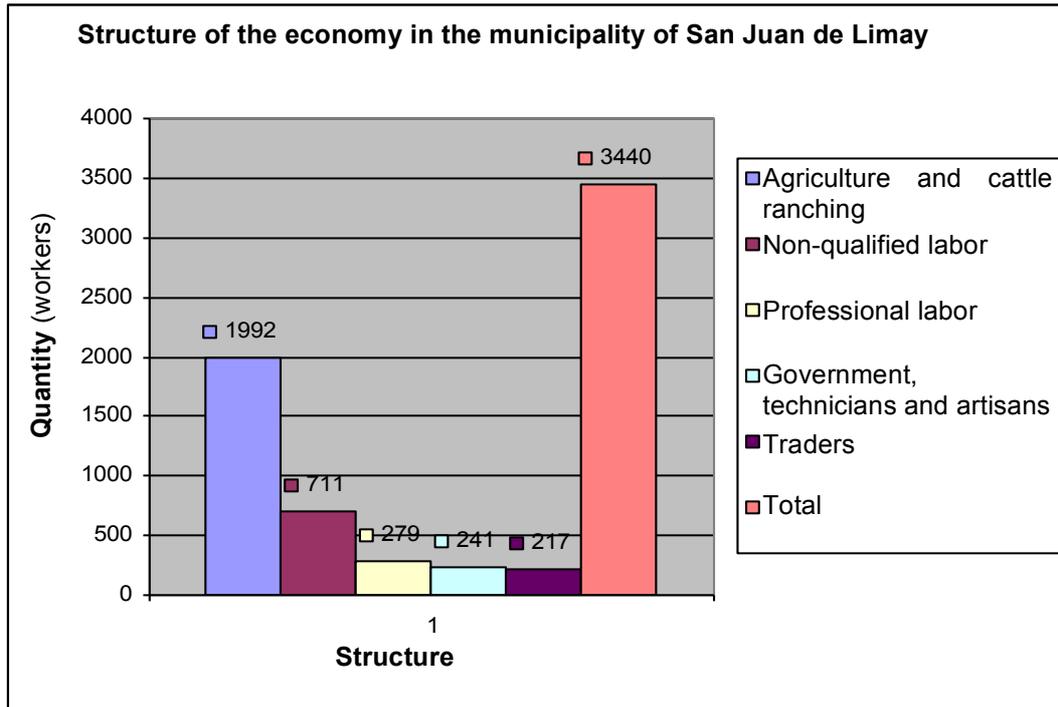
Within the entire municipality, 95.5% of the population uses wood for cooking. Outside of the urban centre, this percentage increases to 99.2%⁴. The collection of this firewood puts continual pressure on surrounding forest resources, as next to none of it is sustainably produced. Regionally, and nationally, forests are becoming increasingly scarce making it increasingly difficult to gather sufficient firewood. As a result, a cubic metre of firewood in larger urban centres, such as Somoto, is sold for up to USD \$50.00⁵.

A secondary consequence of burning so much wood within the household is the negative effects it has on people's vision and respiratory tracts caused by excessive smoke inhalation.

⁴ Limay Census (2009). Limay municipal database. Municipality of San Juan de Limay, Esteli, Nicaragua.

⁵ Baker, K et al. (2014). The use of fuelwood market segmentation and product differentiation to assess opportunities and value: a Nicaraguan case study. *Energy for Sustainable Development*, (18), 58-66

Figure 4 – Structure of local economy



- 58% of people earn their sustenance directly from farming beans, corn, sorghum, dairy and cattle (this is the program's target group)
- 21% work as unqualified labourers, generally working on farms or doing general construction
- 8% work as professionals in offices or as technicians
- 7% work for the government as officers or as artisans, predominantly carving soapstone
- The remaining 6% are traders, generally buying and selling farmers agricultural surplus

Agriculture is directly (through production) and indirectly (through trade and processing) the predominant form of livelihood in the region. However, agriculture commonly takes place with no regard for zoning or the optimal potential of the area. Most farming in the region is done purely for subsistence rather than business, as overall productivity is low. This is largely due to the poorly distributed rainfall in the region and a lack of access to financing despite farmers owning relatively large properties with fertile soils.

SOMOTO

The following socio-economic information is available for the municipality of Somoto.⁶

Urban inhabitants: 15,974
 Rural inhabitants: 16,406
 Total inhabitants: 32,380

Somoto is a "young town" with nearly half of the population in the age groups of 0-4 years (15.5%), 5-9 years (14.2%), and 10-14 years (14.5%) as of 2000.

⁶ Nicaraguan Institute of Municipal Promotion (Instituto Nicaragüense de Fomento Municipal). *Ficha Municipal de Somoto*. Source: <http://inifom.gob.ni>

Socio-economic baseline

Prior to the program's start in 2009 baseline socio-economic data was collected in the municipality of Limay. Information was gathered through a process of interviews led by the municipality of San Juan de Limay in August 2009. In total, 391 interviews were done in the following 14 communities: Aguas Calientes, Comayagua, El Pedernal, Graneros, La Grecia, Las Brisas, La Fraternidad, Mateares, Plantanares 1, Platanares 2, San Antonio, Santa Ana, Santa Cruz and Santa Pancha. The areas of impact considered for the socio-economic baseline are detailed in Table A.7.1. In 2014, the municipality of Somoto was added to the program but no baseline socio-economic data was collected.

Table A.7.1

Area of impact	Items of measurement
Local incomes	<ul style="list-style-type: none"> • Percentage of households that have electricity • Percentage of households that own their house • Percentage of households that own land <ul style="list-style-type: none"> ○ Less than 2 mazanas (1 manzana = 0.744 hectares) ○ Between 2 and 5 mazanas ○ Between 6 and 10 mazanas ○ Between 11 and 50 mazanas ○ More than 50 mazanas • Illiteracy rate
Local food production	<ul style="list-style-type: none"> • Percentage of households that have improved pasture • Percentage of households that use irrigation
Landless families	<ul style="list-style-type: none"> • Percentage of landless households
Women	<ul style="list-style-type: none"> • Percentage of households with fuel-efficient cook stoves • Percentage of women who own their own house • Percentage of women who own cattle

These areas of impact were used for the following reasons:

- Percentage of households that own their house:
With a higher income, it becomes possible for families to build their own houses and stop renting or squatting, which in turn can positively affect their living conditions.
- Percentage of households that own land:
With a higher income, it becomes possible for families to buy more land and expand their farming, cattle or forestry activities.
- Illiteracy rate:
With a higher income, parents can afford to keep their children in school and give them access to higher education. Adults can also decide to go back to school to learn to read and write in order to better manage their business.
- Percentage of households that have improved pasture:
With the support of Taking Root, participating families will be taught how to manage their pastures more sustainably.
- Percentage of households that use irrigation:
With a higher income, families can decide to invest in different irrigation systems that can increase their yield and local food production.
- Percentage of landless households:
With a higher income and a healthier business, participating families can create jobs by hiring members of their communities. In time, those employees can save money and become landowners themselves.
- Percentage of women who own their own house:
Taking Root wants to evaluate the programs' impacts on women's lives. Will the programs increase women's income and make it possible for them to buy land? Will the programs have an impact on the sharing of land ownership between men and women?

- Percentage of women who own cattle:
Taking Root wants to evaluate the program's impacts on women's lives. Will the programs increase women's income and make it possible for them to buy cattle?

The results of the baseline socio-economic assessment are presented in Table A.7.2

Table A.7.2

Areas of impact	Items of measurement	Results
Local incomes		
	Percentage of households that own their house	93%
	Percentage of households that own land	80%
	Less than 2 manzanas	20%
	Between 2 and 5 manzanas	37%
	Between 6 and 10 manzanas	8%
	Between 11 and 50 manzanas	15%
	More than 50 manzanas	1%
	Illiteracy rate	30%
Local food production		
	Percentage of households that have improved pasture	5%
	Percentage of households that use irrigation	9%
Landless families		
	Percentage of landless households	20%
Women		
	Percentage of households with fuel-efficient cook stoves	23%
	Percentage of women who own their own house	41%
	Percentage of women who own cattle	46%

A.8. Description of the Plan Vivo technical specifications (methodologies):

Intervention: Reforestation

Title: Mixed Species Forest Plantation

Brief Description:

This system involves the planting and intensive management of multi-purposed mixed species forest plantations. All of the selected species are, or were, commonly found within the municipalities of San Juan de Limay and Somoto and are native to the region. The plantations consist of alternating rows of fast growing firewood species (*Caesalpinia velutina* & *Gliricidia sepium*) and longer-lived hardwood species (*Swietenia humilis*, *Bombacopsis quinata* & *Albizia saman*). The firewood species are nitrogen fixing and will be coppiced at an early age, providing an early harvest of firewood while fertilizing the soil. Due to the spacing between rows, there is enough room for the shoots to grow back for a second harvest before being entirely crowded out by the hardwood species. The hardwood species are of variable growth rates and shapes allowing for variable thinning before the entire stand reaches maturity.

This system is designed to provide benefits to participants in the short, medium and long-term. In the short term, participants receive payments for the ecosystem services; in the medium-term, participants benefit from the subsistence harvest or sale of fuelwood; and in the long-term participants benefit from the harvest and sale of high valued timber. The revenue from the sustainable managed harvests create incentive for the farmers to continue participating in the program since the revenue is expected to be larger than the ecosystem payments of the first phase of the program.

During the span of the program, participants will receive continual education on the environmental, economic and social benefits of the program.

Intervention: Reforestation

Title: Barrier Planting

Brief Description:

This proposed system involves the planting and intensive management of a multi-purposed, mixed species boundary planting system. The selected species are commonly found within the program region and are native to the region. The design consists of the planting of *Caesalpinia velutina*, *Swietenia humilis* and *Bombacopsis quinata* along existing property boundaries such as fences. *C. velutina* is a short rotation fast growing tree whereas *B. quinata* and *S. humilis* are highly valued longer rotation species commonly used for sawn wood.

C. velutina will predominantly be used for the production of posts for new fences or rural construction. As existing fence posts start to decay, the planted *C. velutina* trees can be used to support the barbed wire. As such, two *C. velutina* trees will be planted between alternations of *B. quinata* and *S. humilis*. The *C. velutina* trees are harvested and replanted at alternating intervals so that at least one tree is always present to support the fencing.

This barrier planting design will provide ecosystem services through carbon dioxide sequestration, produce timber for, fence post and rural construction and in the long run, produce highly prized sawn wood. This system will also improve adjacent pasture by increasing biomass additions to the soil all the while providing the function of a fence. During the program lifespan, producers will receive continual education on the environmental, economic and social benefits of the program.

Intervention: Reforestation (*technical specification in development*)

Title: Silvopastoral planting

Brief Description:

Silvopastoral planting represents an alternative system that integrates trees and pasture with livestock. The system takes advantage of the synergies between components with beneficial effects for the environment and smallholders' livelihoods.

This proposed system involves the planting and intensive management of a multi-purposed, mixed species silvopastoral planting system. The selected species are commonly found within the program region and are native to the region. The design consists of the planting of improved pasture seeds and the following tree species: *Caesalpinia velutina*, *Swietenia humilis* and *Bombacopsis quinata*, at regular intervals throughout pasturelands. *C. velutina* is a short rotation fast growing leguminous tree predominantly used for fence posts or rural construction. Whereas *B. quinata* and *S. humilis* are highly valued longer rotation species commonly used for locally and internationally marketable sawn wood

For the first few years of establishment, the silvopastoral system must be implemented in areas where cattle is temporarily removed or three large wooden stakes must be placed around each tree to prevent trampling. The trees selected in this design are not palatable to cattle. As an additional precaution, it is suggested that producers only put smaller cattle in these areas for the first few years. After the first year of planting, when the seedlings have established themselves and to minimize competition, improved pasture seeds will be sown throughout the pasture to improve the number of cattle the land can support. The planting design consists of trees planted at 5 x 5 x 5 meter spacing with every second tree being *C. velutina* alternating *B. quinata* and *S. humilis*. As the crown cover of the system increases, the *C. velutina* trees will be thinned out leaving behind a young stand of high value timber trees. Half of these trees will be thinned out until the stand reaches maturity with a final density of 10 x 10 x 5 meters. Since all of these species coppice well, new trees will regenerate as older ones are removed keeping the stand semi-forested at all times.

This silvopastoral planting design will provide ecosystem services through carbon dioxide sequestration, produce timber for, fence post and rural construction and in the long run, produce highly prized sawn wood. Additionally, the system will improve adjacent pasture by increasing biomass additions to the soil. During the program lifespan, producers will receive continual education on the environmental, economic and social benefits of the program.

A.9. Description of land tenure in relation to the rights to provide carbon services

Private landownership in Nicaragua

Prior to the Sandanista Revolution in 1979, the Somoza dictatorship and his allies owned the majority of property in Nicaragua while the majority of the population was landless. After the revolution, the Sandanista government undertook massive agrarian reform, confiscating the properties of large landholders and redistributing it to peasants in the form of cooperatives. Over time, the cooperatives dissolved and the land was generally divided informally amongst its members. Consequently, very few legal land titles exist in rural areas of the country, including Limay, which has been a major impediment to development. As a result, the Nicaraguan government, in cooperation with the World Bank and the Nordic Development Fund, launched PRODEP, a programme designed to legalize land ownership. The department of Esteli is a priority area for PRODEP and the programme has been underway for several years in San Juan de Limay. As a result, a massive mapping exercise has been carried out in the entire region, facilitating Taking Root's work. The municipality of Somoto is more connected to the country's infrastructure and therefore has more legal land titles.

For smallholders to enter into long-term carbon contracts, and to avoid land tenure disputes, program participants must demonstrate their land tenure right in one of the following three ways:

- 1) Have a legal deed to their land
- 2) Have a legal deed to the land in their parent's name with a legal contract demonstrating their right to a specified fraction of the property
- 3) If the first two options are unavailable, an official letter from the local government testifying that they are the true owners of the land

The sale of land title in the region is quite low. Land ownership is generally past on from parents to children. However, in the case that a property is sold with a current Plan Vivo agreement, the contract will be passed along to the new owner.

10. program organisational structure, governance and community participation:

Figure 1: Organizations involved and working structure

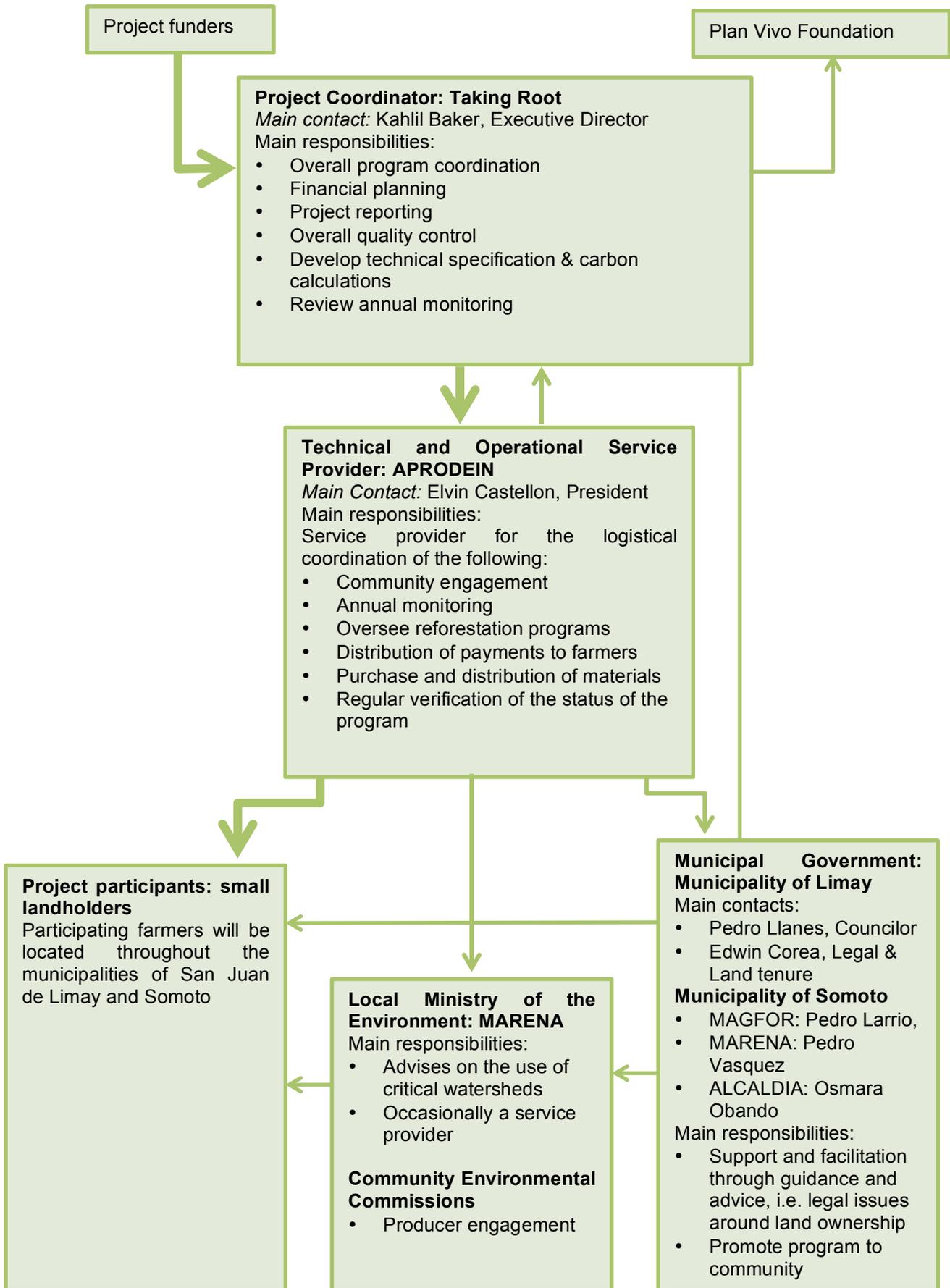


Table A10.

Key Function	Organisation	Type and legal status	Brief description of activities
Project Coordination + administration	Taking Root	Canadian federally incorporated, independent not for profit organization with operations in Nicaragua and Canada	<ul style="list-style-type: none"> Oversee program implementation and development Negotiate and record carbon sales with buyers Manage Plan Vivo fund including yearly payments to APRODEIN based on internal annual monitoring Process and record Plan Vivos, producer sale agreements and other producer information Store reports and documentation Coordinate external reviews Report to the Plan Vivo Foundation Assess the security of land tenure rights Receive reports from APRODEIN Interface with local governments and APRODEIN
Project Coordination	APRODEIN	Independent, not for profit Nicaraguan association	<ul style="list-style-type: none"> Administer yearly payments to producers Arrange community meetings for participants to discuss issues associated with the program and advise Taking Root on how to address these issues Improve local organizational capacity Conduct workshops with participating producers
Project Technical Operations	Taking Root	As above	<ul style="list-style-type: none"> Develop technical specifications Develop carbon modelling Review internal annual monitoring
Project Technical Operations	APRODEIN	As above	<ul style="list-style-type: none"> Assist in all technical aspects of program development Provide technical support and training for producers Assisting in community training workshops Assist in the identification of relevant professionals and resources when needed. Collecting other data when required Carry out internal annual monitoring
Community Engagement/ Participation	APRODEIN	As above	<ul style="list-style-type: none"> Meet with individuals in target communities and community groups to discuss issues associated with the program and its operations

A.11. Relationship to national organisations

Taking Root and its programs are privately funded and executed in partnership with individual smallholder farming families and therefore do not require the approval of government authorities. However, the objective of the program is to work with and address the needs of the community and the various stakeholders involved.

This program falls within the government's long-term sustainable development objectives and is fully supported by the Mayor's administration of both municipalities (see appendix 8, letter of support).

Although no government approval is required for planting, all harvesting and sustainable management of forest resources requires approval by the local office of the national forestry institute (INAFOR). Therefore, after planting, all reforestation programs and management plans will be registered with the local INAFOR representative, who is regularly involved with the program. This process legally pre-approves the utilization of the forest plantations.

A.12. Technology transfer and training

The majority of the program components were developed and designed by stakeholders through community and expert consultations, (for an example, see appendix #11). Most community training sessions were designed using the "campesino a campesino" (farmer to farmer) method, facilitated by Elvin Castellon from APRODEIN. The "campesino a campesino" philosophy is based on utilizing the collective knowledge and experiences of different members of the community and sharing it amongst peers so that individuals may learn from each other. This philosophy values and promotes local knowledge and will continue being the basis of this program.

Biomass surveys

Biomass surveys were conducted jointly with program technicians, members of APRODEIN and Taking Root, and local foresters. Joint training activities were carried out and covered the following concepts:

- Identification of land-use and land cover strata
- Compass navigation and basic GPS training
- Use and purpose of random and well distributed sampling techniques
- Forest measurement techniques, including deadwood
- Use of nested circular and square plots
- Data entry

Participatory threat analysis

With community representatives, members of the community and members of APRODEIN, Taking Root carried out a threat assessment using a pairwise ranking technique to determine the leading causes of deforestation in terms of area and intensity (for greater details, see appendix #10).

Forest plantation establishment and management

Adequate land use, planning and silvicultural management, developed through Plan Vivos, are the most relevant components to the smallholder farmers participating in the program. All training is provided through project technicians as extension services.

Monitoring of Plan Vivos

Monitoring of Plan Vivos is carried out by community technicians and internally verified by program technicians, both of which receive training from Taking Root.

Training of technicians was provided by BioClimate Research and Development (BioClimate) who facilitate and advise on numerous technical components of the program and provide on-going guidance.

A.13. Program financial structure:

The pilot program was established using funding from a variety of sources including small grants, private donations and Taking Root internal funding. Future funding is designed to predominantly come from the sale of Plan Vivo Certificates and private investments towards the delivery of future Plan Vivo Certificates.

The use of funds acquired from the sale of Plan Vivo Certificates will be divided into two broad categories. 40% will go to program operations and development whereas the remaining 60% will go into a separate Plan Vivo Trust Fund. This fund is effectively a distinct Canadian USD account administrated by Taking Root and earmarked for payments to producers.

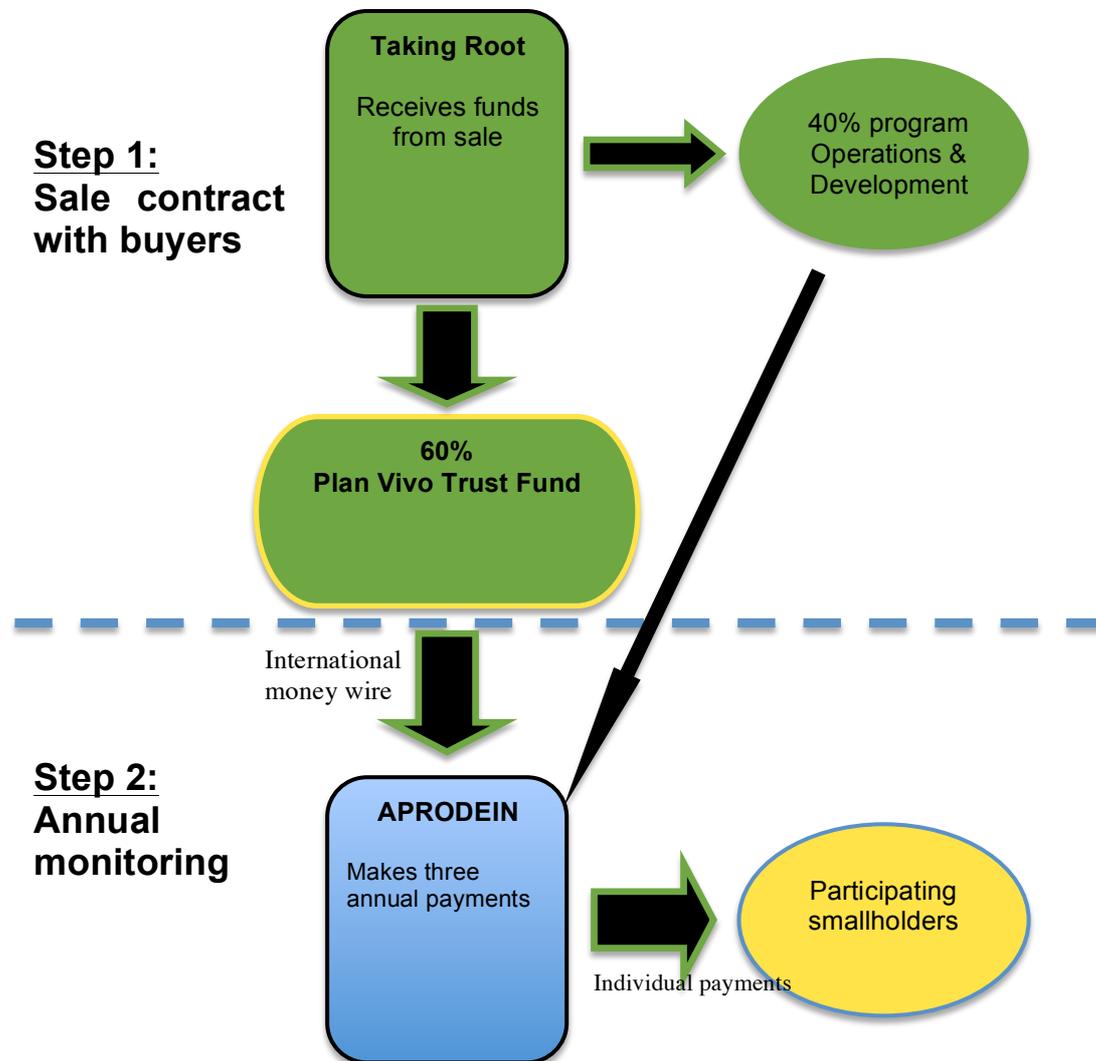
In the first years of planting, there are three payments given to provide the capital that the producers need to plant. In May 50% of producer's annual payment is given for planting or replanting. In July and September, the second and third payments, each 25% of the annual payment are given for cleaning and weeding the area around the trees.

Once producers reach technical specifications' density target, an internal monitoring of each Plan Vivo is done annually. Over the project lifetime, payments are issued to the producer according to a predetermined schedule based on project targets. Successful evaluation is determined by a combination of on the ground technician judgement and in-office data analysis. If both the technicians and the data suggest that the producer has met the target, full payment is received. If the target has not been met but the threshold is achieved, partial payment is made and corrective actions are implemented. If the threshold is not met, payments are withheld until targets are reached the following year. In accordance with the carbon accounting model, the majority of the producers will reach 100% planting by the first year. If they miss the target, they will replant to 100% capacity by the following year.

Funds are transferred from APRODEIN to individual producers by individual cheques. There are no financial institutions in San Juan de Limay but producers can cash the cheques with their national identity cards at local merchants for a 1% commission. Banks are available in Somoto.

Figure 9

This process is illustrated through the following diagram.



At the beginning of each year, Taking Root signs agreements with producers indicating a set price to be paid per offset generated. This amount represents 60% of the average sale price per offset. However, this average price cannot be determined until the end of the year when all sales have been made. This means that there is inevitably a discrepancy between the actual average price and the contractual price agreed upon with the producer.

To address this, Taking Root will establish a price paid to producers based on the previous year's average and a conservative estimate of the upcoming year's forecasted sales. Any surplus earned by the end of the year will be used to cover costs for community-related programs, including, but not limited to nursery costs. Such expenditures will be made in consultation with the communities involved and with APRODEIN, and will be reported in the Plan Vivo Annual Report each year.

Plan Vivo Trust Fund (60% of funds)

- **60%** of funds go directly to the participating smallholders who generate the carbon benefit produced by the new forest plantations. These funds will be distributed periodically over a ten-year period based on annual verifications according to the technical specifications. Prior to disbursement, the money will be kept in a special fund and the interest will be used to cover the financial transaction fees of paying the producers.

Project Operations & Development (40% of funds)

USD \$0.40 is used to cover the issuance and registry fee for each Plan Vivo Certificate generated.

Project coordinator costs

- Salary for program coordination staff
- Payments to APRODEIN for site coordinators, field workers, community technicians, and monitoring staff
- Research and other work subcontracted to technical service providers and other institutions (e.g. universities)
- Overhead costs related to the program: office infrastructure costs and rent, utilities, IT and telecommunications, professional fees (legal, audit, banking), publicity, stationery and consumables, hosting community meetings, field supplies, travel, and subsistence
- Submission of annual reviews to the Plan Vivo Foundation
- Third party audits
- Helping participating producers develop and access markets for their firewood and sustainably managed forest products
- Submission of new technical specifications
- Periodic public and expert consultations
- Other costs related to organisational development

The program will review the benefits sharing structure from time to time in consultation with the Plan Vivo Foundation. This review will be done through continuous consultations with the communities and participants are invited to discuss alternative arrangements.

This pricing structure is intended to be transparent and shared with the municipality of San Juan de Limay and Somoto and publically available to all.

A.14. Estimated amount of net anthropogenic GHG removals by sinks and/or avoided GHG emissions over the program lifetime:

Table A.14

Technical Specification	Estimated long-term potential carbon benefit tCO ₂ e			
	tCO ₂ to be sequestered (tCO ₂) - 2014	tCO ₂ to be sequestered (tCO ₂) - 2015	tCO ₂ to be sequestered (tCO ₂) - 2016	Total estimated realisable potential (tCO ₂)
Mixed species forest plantation	43,700	43,700	43,700	131,100
Silvopastoral planting (technical specification not yet developed)	13,800	13,800	13,800	41,400
Barrier Planting	13,900	13,900	13,900	41,700
Total	71,400	71,400	71,400	214,200

SECTION B. Duration of the program activity and crediting period

B.1. Proposed duration of program activities and crediting period

Taking Root has been developing reforestation programs with smallholder farmers in the municipality of San Juan de Limay since 2007. However, the 2010 planting season was the first year Taking Root generated VERs using the Plan Vivo Standard. The 2010 planting season was therefore the program's pilot cycle, which was validated.

Crediting period

This is a long-term program generating ex-ante carbon offsets using the average sequestered volume over the crediting period.

The average crediting period is 50 years from each participant's starting year. For example, the program period for the producers that join the program in 2012 will last until the beginning of the planting cycle in 2062. This time period was selected to allow sufficient time for transition from a non-forested landscape to a plantation forest, to a sustainable, managed forest. This demonstrates the program's intent to generate permanent land-use change and allow for the variability of carbon stocks over the harvest and re-growth period to be averaged out.

Payment period

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

Project period

The program has a rolling ten-year program period. The program is annually extended at the time of payment for signed ecosystem service agreements. This annual extension continues for ten years after the start year.

SECTION C. Technical specifications to be used

C.1. Estimated long-term carbon benefits for program activities, per hectare

Each Technical Specification has its own carbon benefit per hectare. The table below summarises the net carbon benefit for each approved Technical Specification.

Name of Technical Specification	Net carbon benefit per unit (tCO ₂)
Mixed Species Forest Plantation	299.7 / ha
Barrier planting	214.80 / km
Silvopastoral planting	191.9 / ha

SECTION D. Measures to ensure permanence and address leakage

D.1. Measures to address risks and ensure permanence

Projects will only succeed if land-use practices are viable over the long-term and provide sustainable economic benefits to communities over and above carbon payments. Activities need to have more than just long-term carbon sequestration benefits; they must be designed as part of an integrated plan for sustainable land-use that incorporates risk management. Producers are given extensive and regular support and training to ensure that ecosystem benefits and sustainable resource-use are not only initiated, but become embedded in the area. Additionally, 15% of the carbon benefit generated is unsold and used as a risk buffer to potential early reversal. The table below outlines various risk factors to permanence and outlines a mitigation strategy.

Risk Factor	Mitigation Strategy
Legal/Social	
Disputes caused by conflict of program aims/activities with local communities/organisations	Participatory planning and continued stakeholder consultation over program life span.
Land claim disputes	Close collaboration with the municipality to ensure clear land tenure.
Project Organisation	
Management of activities not carried out effectively	Adequate training of project managers and staff.
Double-counting due to poor record keeping	Transparent record-keeping procedures written in project design document and quality mapping of program activities and area; up-to-date database with records of all carbon monitored and sold.
Project not practically viable in long-term due to lack of resources/skills/expertise	Careful selection of program staff and training.
Economic	
Rising land-opportunity costs endanger program viability	Development of business plans (reviewed periodically) for economically viable management; Continuous development of markets for forest products.
Financial failure	
Natural	
Fire	Regular plantation clearing to minimize deadwood fuel load plus the local government has recently imposed heavy restrictions on the use of fire to clear land. The forest cover in the area is minimal and isolated making it difficult for fires to spread.
Pests and diseases	Careful selection of tree species.
Extreme climatic events	Site selection criteria; takes into account of slope of land and proximity to shifting riverbeds.

D.2. Measures to address Leakage:

Since a significant portion of the land area within the program boundary is either not or minimally utilized for any economic activities (i.e. occasional firewood collection), leakage is relatively easy to minimize as long as appropriate land use planning is employed. Every participating smallholder that uses a technical specification is required to demonstrate through the creation of an individual farm management plan (a Plan Vivo) that they have sufficient land for their agricultural and pasture needs, and sufficient space for reforestation activities.

Both positive and negative leakage needs to be considered as a result of this program. The two principal economic activities that could be responsible for leakage are the increase of pastureland and agricultural land outside the program boundary.

For a complete analysis, see the leakage section of each Technical Specifications at: <http://www.planvivo.org/projects/registeredprojects/communitree-carbon/>

SECTION E. Monitoring and Technical Support Plan

E.1. Monitoring of carbon indicators

Indicator	Measurement
Tree Planting	% Planted
Clearing	% Cleared
Survival	Survival rate
Pruning	% Pruned
Growth	Change in diameter at breast height (DBH) and height.
Inventory	Basal area per hectare (BAHA) of the different species

During annual internal verifications, a community technician is responsible for filling out an internal verification report for every producer using this program intervention. Although it is the community technician's responsibility to carry out the internal monitoring, it is done with the participating smallholder so that they have a clear understanding of how the process is carried out.

Systematically distributed permanent plots, covering a minimum of 10% of the area, using each technical specification have been established. Annual monitoring is conducted to gather information on plantation density, species composition, mortality, height, and diameter at breast height. Based on these results, participating producers receive ecosystem service payments upon successfully meeting established management and growth targets. This monitoring and research results are used to modify management on a continual basis to ensure that carbon sequestration objectives are being met. This system of adaptive forest management is achieved by allowing room for natural regeneration and early or delayed harvest of firewood species based on actual stand growth.

E.2. Verification of monitoring

Internal monitoring: A program technician must check 10% of community technician monitoring reports for inconsistencies.

E.3. Technical support and review

Technical Specifications

The technical specifications are developed using local knowledge and experience combined with technical input from the local INAFOR representative, expert consultations with local members of the ministry of the environment (MARENA), the ministry of Agriculture and Forestry (MAGFOR), professionals from APRODEIN and Taking Root. Bioclimate, Research & Development provided guidance on methodology and accounting methods.

Tree nurseries

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

Forest Plantation Management

Professional local foresters lead workshops for the community technicians and the participating smallholder on how to establish and manage the forest plantations at the various stages of development. Under the guidance of community technicians, each smallholder is responsible for the management of their own Plan Vivo. However, it is not uncommon for various participants to form work parties and take turns working on each other's properties.

E.4. Administrative support

Information management

Community technicians are responsible for ensuring smallholders meet the requirements of the program, assisting producers in writing their individual Plan Vivos, and digitizing all of the information. This information is then sent to Taking Root's administrative office for review. Taking Root's office staff is responsible for the management of PES agreements with producers (for an example, see appendix #4), sale contracts with buyers, the preparation of annual reports and general administration.

Taking Root's proprietary system, the Smallholder Carbon Project Information Management System (SC PIMS), is an indispensable highly customized tool for managing a smallholder carbon project. It addresses the basic needs of organizing, finding, tracking, sharing, monitoring and reusing the technical and financial information from the project as well as communicating it with the entities and people that depend on that information. These entities and people include: the Plan Vivo Foundation for annual reporting, the third party project validators and verifiers, the project management team and the technicians.

For potential participating smallholders, the SC PIMS tracks and records the farmer's name, their Plan Vivo, a copy of their identification card, verification of their land tenure right, the area dedicated to the prospective technical specification (i.e. the area to be planted), the amount of fencing needed and the amount of initial capital required to hire the help needed to implement the program. A second component of the SC PIMS tracks the sale of Plan Vivo Certificates. This records who the purchaser is, the quantity purchased, the date purchased, the planting season associated with the purchase, the price purchased and the proportionate amount of money directed towards the Plan Vivo Trust Fund.

The SC PIMS also provides analytics from annual monitoring listed by year, producer, and parcel (e.g. tree species, density, height, diameter, survival) and exports annual reports

prepared to Plan Vivo reporting requirements. Since the SC PIMS is directly integrated into iPod Touches®, the project technicians can enter data directly into the SC PIMS system, ensuring efficiency and fidelity in the data-entry process. Using the monitoring data the system calculates the payment amount to be given to the producer. By automating and streamlining this process, errors in data entry and analysis are greatly reduced. Furthermore, this automation allows for large cost savings in labour by reducing what would otherwise take months to complete to a matter of minutes.

SECTION F. Environmental impacts of the proposed activities

F.1. Expected environmental impacts of the proposed activities

The CommuniTree Carbon Program takes a holistic approach to land-use management in areas that has suffered from intense environmental degradation for several decades. As a result of environmental degradation, communities suffer from heavy soil erosion, water shortages, flooding, and drastic declines in wildlife and tree species. Although carbon finances are used to fund the program, its scope integrates watershed management, sustainable resource use and land use planning. The table below provides a summary of the expected impacts.

Title of technical specification	Biodiversity impacts	Water availability impacts	Soil conservation impacts	Air quality impacts
Mixed Species Forest Plantation, Silvopastoral, Boundary Planting	Positive impact: Increase forest cover and thus, wildlife habitat through the use of rare native tree species.	Positive impact: Prioritizing critical watersheds reducing the probability of flooding in the wet season and increasing water retention in the dry season.	Positive impact: Forest cycle and use of nitrogen fixing trees nourishes the soil while increasing forest cover reduces erosion.	Positive impact: Retain humidity and reduce particulate matter in the air, particularly in the dry season; Sequester CO ₂ and produce oxygen.

F.2. Monitoring of environmental impacts of the proposed activities

Biodiversity Impacts

Factors that increase biodiversity

- Establishment of plantations on underutilized lands with minimal biodiversity
- Emphasis is placed on collecting tree species seeds within the community to promote variation within species
- Increased forest cover increases wildlife habitat

Method of assessing ecosystem impacts

Biodiversity and threats to biodiversity surveys

Soil quality

Factors that increase soil quality

- Increased forest cover
- Use of nitrogen fixing species

Method of assessing soil quality

Comparison of soil depth, humidity and nutrient content in technical specification areas and alternative land use areas

Water**Factors that increase water benefits**

- Increased forest cover (increased water retention and decreased evaporation)
- Planting in the vicinity rivers and streams
- Planting in environmentally important watersheds

Method of assessing water benefits

Regular monitoring of water retention rate in communal and private wells

Air quality**Factors that increase air quality**

- Increased forest cover increases humidity, which reduces particulate matter, especially in the dry season
- Increased forest cover increases oxygen production within communities

Method of assessing water benefits

The carbon sequestered is directly monitored and quantified through annual monitoring

SECTION G. Socio-economic impacts of the proposed activities

G.1. Expected socio-economic impacts of the proposed activities

The areas of impact considered for baseline socio-economic status include the following:

Area of impact	Items of measurement
Local well-being	<ul style="list-style-type: none"> • Percentage of households that have electricity • Percentage of households that own their house • Percentage of households that own land <ul style="list-style-type: none"> ○ Less than 2 mazanas (1 manzana = 0.744 hectares) ○ Between 2 and 5 manzanas ○ Between 6 and 10 manzanas ○ Between 11 and 50 manzanas ○ More than 50 manzanas • Illiteracy rate
Local food production	<ul style="list-style-type: none"> • Percentage of households that have improved pasture • Percentage of households that use irrigation
Landless families	<ul style="list-style-type: none"> • Percentage of project employees who are landless farmers
Gender	<ul style="list-style-type: none"> • Percentage of women employed by the project

These methods of measurement were used for the following reasons:

- Percentage of households that own their house:
With a higher income, it becomes possible for families to build their own houses and stop renting or squatting, which in turn can positively affect their living conditions.
- Percentage of households that own land:
With a higher income, it becomes possible for families to buy more land and expand their farming, cattle or forestry activities.
- Illiteracy rate:
With a higher income, parents can afford to keep their children in school and give them access to higher education. Adults can also decide to go back to school to learn to read and write in order to better manage their business.
- Percentage of households that have improved pasture:
With the support of Taking Root, participating families will be taught how to manage their pastures more sustainably.
- Percentage of households that use irrigation:
With a higher income, families can decide to invest in different irrigation systems that can increase their yield and local food production.
- Percentage of landless households:
With a higher income and a healthier business, participating families can create jobs by hiring members of their communities. In time, those employees can save money and become landowners themselves.
- Percentage of households with fuel-efficient stove:
With the support of Taking Root, a fuel-efficient stove will be built in each participant's house.
- Percentage of women who own their own house:

Taking Root wants to evaluate the programs' impacts on women's lives. Will the programs increase women's income and make it possible for them to buy land? Will the programs have an impact on the sharing of land ownership between men and women?

- Percentage of women who own cattle:
Taking Root wants to evaluate the program's impacts on women's lives. Will the programs increase women's income and make it possible for them to buy cattle?

SECTION H. Additional activities supported by the program

H.1. Additional activities to be supported by the program

Market creation for forest products

Part of Taking Root's vision is to use carbon finance as a catalyst for long-term sustainable land-use management and optimal resource use. The majority of the land in the program region is considered ideal for forestry. Due to the relief of the land and the uneven distribution of rainfall, agricultural yields tend to be quite low making the opportunity cost of the land equally low. Conversely, forest species that are well adapted to the region can be very productive despite the environmental conditions and represent a more profitable long-term use of the land. In addition to the lack of local experience with forestry, the principal barriers that prevent people participating is that the investment period required before paybacks are received is too long. Furthermore, individual producers lack the ability to bring their products to market and therefore rely on intermediaries that have complete control of the price offered. Through the use of carbon finance, Taking Root works to fill the revenue gap in the early years of a forest plantation but in the long-term aims to transition away from a reliance on international finance for local economic sustainability. By helping smallholders identify and transport their sustainably produced forest products directly to market, less distorted price signals should further stimulate the establishment of new reforestation initiatives.

Annexes

Annex 1: List of responsible staff and contact information

Organization	Key Contact	Participant and position	Nationality	Role(s)
Taking Root Nicaragua	Kahlil Baker kahlil@takingroot.org	Kahlil Baker, Executive Director	Canadian	Oversees project implementation and development
				Coordinating external reviews
				Developing and maintaining relationships with international project funders
		David Baumann, Technical and Financial Director	American	Manage financial transactions
				Manage organizational information and conducts project analysis
		Brooke van Mossel- Forrester, Business Development and Communications Director	Canadian	Leads all marketing and communications
Manage and develop all local carbon credit sales				
APRODEIN	Elvin Castellon elvin@takingroot.org	Elvin Castellon, President	Nicaraguan	Coordinating ongoing community consultations and training
				Overseeing all operational components of the project
				Administering payments to producers
				Provide fiduciary responsibility to organization
		Community Technician (currently 6 full time)		Engage families to participate in project
				Verify and provide land tenure rights documents
				Provide technical training for projects
				Conduct the annual monitoring
				Conduct biomass surveys
		Celio Lenin		Collect other data necessary for projects
Celio Lenin	Provide bookkeeping and accounting for APRODEIN			

Annex 2: Information regarding public and other sources of co-funding

Taking Root is an independent not for profit organization with private funding partnerships in North America, Europe and Nicaragua. Additionally, an increasing number of individuals, private businesses and institutions in Canada form a diverse funding base to support the organization's on-going activities.

Some financial support from the Canadian public sector was received in the form of grants and wage subsidies.

Annex 3: Technical specifications

See: <http://www.planvivo.org/projects/registeredprojects/communitree-carbon/>

Annex 4: Producer agreement template

See: Appendix4_Acuerdo_de_venta.pdf

Annex 5: Monitoring plan

See: Appendix5_Monitoring_template_yr1.pdf

Annex 6: Database template

See: Appendix6_Taking_Root_Database_Template

Annex 7. Forest Management Plans

N/A

Annex 8. Permits and legal documentation

See: Appendix8a_Limay_Alcaldia_Support.pdf,
Appendix8b_Somoto_Alcaldia_Support

Annex 9. Stakeholders' comments

See: Appendix9_attendance_sheet.pdf & Appendix9_Municipality.pdf

Annex 10. Stakeholders' comments: Community Consultation

Community leaders & Threat assessment

See: [Appendix10_attendance_sheet.pdf](#) & [appendix10_community_leaders.pdf](#)

Annex 11. Stakeholders' comments: Community Consultation 2

Producer groups

See: [Appendix11_attendance_sheet.pdf](#) and [appendix11_community_consultation.pdf](#)

Annual Reports

Field Visit Reports

Verification Reports

Corrective Action Reports