Working Paper

Carbon-forestry projects in the Philippines: potential and challenges

The Ikalahan Ancestral Domain forest-carbon development

Raquel C. Lopez, Emma P. Abasolo and Rodel D. Lasco

Southeast Asia

World Agroforestry Centre
TRANSFORMING LIVES AND LANDSCAPES

Carbon-forestry projects in the Philippines: potential and challenges

The Quirino forest-carbon development project in Sierra Madre Biodiversity Corridor

Raquel C. Lopez, Maria Noriza Q. Herrera and Rodel D. Lasco

Working Paper no. 132

World Agroforestry Centre
TRANSFORMING LIVES AND LANDSCAPES

Correct citation

Lopez RC, Herrera MN, Lasco RD. 2011. *Carbon-forestry projects in the Philippines: potential and challenges: the Quirino forest-carbon development project in Sierra Madre Biodiversity Corridor*. Working Paper no. 132. Bogor, Indonesia: World Agroforestry Centre (ICRAF) Southeast Asia Program. DOI: 10.5716/WP11057.PDF

This research project was carried out under an agreement between the World Agroforestry Centre (ICRAF), Nairobi, Kenya, and the Ecology and Natural Resources Division, Center for Development Research (ZEF), Bonn, Germany.

Titles in the Working Paper series disseminate interim results on agroforestry research and practices to stimulate feedback from the scientific community. Other publication series from the World Agroforestry Centre include agroforestry perspectives, technical manuals and occasional papers.

Published by the World Agroforestry Centre (ICRAF)
Southeast Asia Regional Program
PO Box 161, Bogor 16001
Indonesia

Tel: +62 251 8625415
Fax: +62 251 8625416
Email: icraf-indonesia@cgiar.org
Website: http:// www.worldagroforestry.org/sea

Working Paper no. 132

About the authors

Raquel C. Lopez is a post-doctoral fellow under a cooperation agreement between the World Agroforestry Centre, Nairobi, Kenya, and the Center for Development Research (ZEF), Bonn, Germany. She works on the project, 'Overcoming barriers to smallholder carbon forestry projects in The Philippines'. She holds a PhD in Agriculture from University of Bonn, Germany, a Master of Science in Natural Resources Conservation from the Asian Institute of Technology in Thailand, a Master of Management in Public Management from the University of the Philippines, Visayas, Philippines, and a Bachelor of Science in Forestry from Visayas State University, Leyte, Philippines. Her experience includes working for eight years as a forester handling various projects and programs for the Community Environment and Natural Resources Office, the frontline implementing agency of the Philippines' Department of Environmental and Natural Resources; as a research associate at the Asian Institute of Technology; as assistant to the director of the Asia-Europe Environmental and Technology Center in Thailand for four years; and as junior researcher at the Center for Development Research (ZEF) in Bonn, Germany, for another four years. She also worked for 1.5 years in Indonesia as an integrate-associate researcher with the German-Indonesian cooperation project, Stability of Rainforest Margins (STORMA).

Maria Noriza Herrera was the researcher assisting Raquel C. Lopez carry out the case study of Quirino forest carbon project. She holds a Bachelor of Science degree in Agribusiness Management from the University of Philippines Los Baños. She is currently undertaking a Master of Science degree in Environmental Science at the same university.

Rodel D. Lasco has been the Coordinator of the World Agroforestry Centre Philippines office since 2004. Prior to that, he was the youngest full professor at the College of Forestry and Natural Resources, University of the Philippines, Los Baños. He has over 28 years experience in natural resources and environmental research, conservation, education and development nationally and internationally. He is a member of the Intergovernmental Panel on Climate Change, which was the 2007 co-winner of the Nobel Peace Prize. He is also a member of the National Academy of Science and Technology in the Philippines. He is a multi-awarded scientist with publication in over 80 national and international journals dealing with various aspects of natural resources conservation and environmental management. In the last five years, he has pioneered research in the Philippines on climate change adaptation in the natural resources sector, the role of tropical forests in climate change and global warming and the policy implications of the Kyoto Protocol.

Abstract

The forest-carbon development project in Quirino covers the fragmented open forest patches within the Quirino Protected Landscape, which forms part of the Sierra Madre Biodiversity Corridor. This project is part of Conservation International Philippines (CI Philippines) effort in building alliances with local communities, the private sector, government agencies and NGOs to improve the management of the Sierra Madre Biodiversity Corridor and strengthen the enforcement of environmental laws.

Acting as the project proponent and intermediary, CI Philippines can potentially institutionalise the project. Not only is such a purpose part of their mission as a non-government organization but also they have the technical capacity to do so. The project is to be implemented as community-based forest management, involving local communities (represented by three people's organizations) made up of 96 individual and household landholders, Palacian Economic Development Association Inc (a local NGO), the provincial government, Department of Environment and Natural Resources Region 2 and the Municipal Environment and Natural Resources Office and the project monitoring team of CI Philippines. MoreTrees, a non-profit carbon offset provider, funds the project.

A total of 177 ha, consisting of small landholdings (110 parcels) in five barangays within the municipalities of Maddela (94 ha) and Nagtipunan (83 ha), has been delineated as the project area. The 108 parcels are within classified forestlands (162 ha) and most landholders have certificate of stewardship contracts as their tenure instruments; there are only two parcels of private land (15 ha) with ownership titles.

The project deploys an agroforestation scheme, conducting reforestation activities by planting native tree species on a total of 155 ha and an agroforestry system by planting fruit trees on 22 ha.

Just like other project proponents, CI Philippines also attempted to participate under the Clean Development Mechanism afforestation/reforestation (CDM A/R) framework. It initially drafted a plan for 13 000 ha as a CDM A/R project but is now targeting the Verified Carbon Standards. Validation by a third party has already been conducted under the Climate, Community and Biodiversity Standards after some corrective action, including revision of the project design document and subsequent revalidation.

Keywords: Carbon market, climate change, forest-carbon development, mitigation, community-based forest management, Sierra Madre Biodiversity Corridor, Quirino forest carbon

Acknowledgements

The authors would like to thank the World Agroforestry Centre (ICRAF) Philippines and the Center for Development Research (ZEF), Bonn, for all their financial and technical contributions to this publication.

We would also like to thank Dr Paul LG Vlek of ZEF for his technical contribution and comments, the field personnel of CI Philippines for their information, Yoji Natori of CI Japan for commenting and providing updated information, and Robert Finlayson for editing and Tikah Atikah for design, both of the World Agroforestry Centre Southeast Asia Program.

Acronyms

A/R	Afforestation/Reforestation
CDM	Clean Development Mechanism
CI	Conservation International
PDD	Project Design Document
PEDAI	Palacian Economic Development Association Inc
NGO	Non-governmental Organization
QPL	Quirino Protected Landscape
VCU	Verified Carbon Units

Contents

List of figures

List of tables

List of boxes

1. Introduction

Rationale of the study

The inclusion of afforestation and reforestation (A/R) activity in the Clean Development Mechanism (CDM) for trading greenhouse gas emissions offsets has prompted interest in the Philippines (Lasco et al. 2008) in emerging carbon markets and rewards for ecosystem services schemes. These mechanisms are seen as opportunities for the Philippines to obtain financial support for rehabilitation and sustainable management of its natural resources, in particular, forests.

To address the impact of climate change, both mitigation and adaptation are necessary and interdependent. These two strategies can be implemented by rehabilitating denuded forests and degraded land. Forest-carbon development by agroforestation[1] is one of the ways of achieving reduction of emissions and other positive environmental impacts. Aside from carbon sequestration and storage, agroforestation addresses other ecological issues such as improvement of land and soil quality, habitat restoration, watershed rehabilitation and enhancement of landscape beauty. However, to undertake this development, the project needs to build institutional capacity, find investment capital, procure technological know-how, develop appropriate incentive mechanisms and garner political support (local, national and international).

This project assessment sets out to identify the institutional approaches, technological innovations and policy reforms necessary to enable carbon-forestry projects in the Philippines to participate in the carbon market and other mechanisms and to discover ways to reduce barriers for smallholders and small-scale projects.

The Conservation International Philippines (CI Philippines) carbon-forestry project in Quirino Protected Landscape is used as a case study.

[1] Agroforestation implies a land rehabilitation scheme through establishing purely forest-tree species as reforestation component and an agroforestry farm development component

Objectives of the study

This study aimed to identify the potential of, and challenges for, the project. Specifically, three objectives were set.

1. Identify the strengths and limitations of the forest-carbon development project to engage in carbon markets and other payments for environmental services schemes.
2. Identify the key issues associated with the carbon-forestry project's development and implementation.
3. Determine the actions needed for project management and policy development to institutionalise the project in relation to the carbon markets and other payments for environmental services schemes and identify the research focus.

Background of the study

Sierra Madre Biodiversity Corridor covers approximately 1.7 million ha and is one of the most biologically important areas of the Philippine. It includes 15% of the remaining closed canopy *Dipterocarp* forests in the country as well as 47% of the remaining mossy forests. Aside from the diverse habitat types, the corridor is also home to the endangered Philippines eagle and Philippines crocodile.

CI Philippines launched a carbon sequestration and monitoring program that they planned would provide investment opportunities for sustainable protection of the central Sierra Madre area, particularly along the Corridor. The project in Sierra Madre is being established at two locations: within Quirino Protected Landscape (QPL) in Quirino Province and in Peñablanca Protected Landscape and Seascape (PPLS) in Cagayan Province.

The project in Quirino lies in the municipalities of Maddela and Nagtipunan and partly within the QPL.

Project development chronology

2002 & 2004	Feasibility studies by CI Philippines, Center for Environmental Leadership in Business and the World Agroforestry Centre through funding from CI
2006–2008	CI Philippines and Japan, Mitsubishi Research Institute and the World Agroforestry Centre Philippines collaborated on a feasibility study in Quirino Province through funding from the Global Environment Center of Japan, resulting in the initial draft plan for the 13 000 ha CDM A/R project
	World Agroforestry Centre Philippines were commissioned to conduct a carbon-stock assessment of land uses at the proposed site of the carbon sequestration project in the Corridor
2008	CI Philippines established a 20 ha pilot area for the forest-carbon project in Quirino, a reforestation and agroforestry farm area
2008–2009	CI was able to secure a donor (moreTrees[2]) for reforestation of 41 ha with the possibility of expanding to 177 ha. Formulated a memorandum of agreement among project partners
2009	CI produced a project design document for Climate, Community and Biodiversity Standards and a project description for Verified Carbon Standards submitted to Rainforest Alliance for validation in June 2009. In the process of addressing the corrective actions requested by the Alliance, the memorandum with moreTrees was amended to cover the expenses for the full 177 ha. Also, project management and field implementation (planting) began
2010	The Alliance conducted an reassessment audit of the revised project design document[3]. The project was validated under the Climate, Community and Biodiversity Standards at the Gold level on 17 June 2010

2. Methodology

There are several conditions to be fulfilled in order to participate in the carbon markets and payments for environmental services mechanisms, especially if registering the project under the Verified Carbon Standards[4].

[2] MoreTrees is a Japanese intermediary organization with a mission to maintain and conserve forest and forestation activity in Japan and overseas, provide a carbon offset service associated with forests and plan, manufacture and distribute thinning wood products. Source: http://www.more-trees.org/

[3] The revised and final PDD, dated May 2010 (posted March 2011).

The project proponent (intermediary of the smallholders or the smallholders themselves) should consider the conditions at the planning stage. For the project to become operational, a project plan is vital. Thus, planning is the first step.

Sources of data and method of data collection

Primary and secondary data were collected for the case study. The assessment started in 2009, initially by conducting literature reviews from reports, research publications, drafts of the project design and activity plans for the proposed 1300 ha CDM A/R project and other documents about the project site. We also conducted field observations and unstructured, informal interviews with households and individual participants and other stakeholders.

The initial 13 000 ha project was not pursued. Project plans and the project design document (PDD) for the project in Quirino had already been prepared to comply with the voluntary carbon market. There were two PDDs prepared for the 177 ha forest carbon project following the template required for the Climate, Community and Biodiversity Standards[5] and Verified Carbon Standards validation.

---

[4] Work to develop the Verified Carbon Standard was initiated by The Climate Group, the International Emissions Trading Association and the World Economic Forum in late 2005. Version 1 of the VCS was released on 28 March 2006 as both a consultation document and a pilot standard for use in the market. VCS version 2 was released in October 2006 as a consultation document and did not replace Version 1 as the market standard. 150 written submissions were received from carbon market stakeholders on VCS versions 1 and 2. After the release of version 2, a 19-member Steering Committee was established to consider all of the stakeholder comments and develop the final standard. Within the Committee seven technical working groups provided advice on VCS governance, additionality, validation and verification, registries, land-use change and forestry, general policy issues and performance standards. The World Business Council for Sustainable Development joined the initiative as a founding partner in 2007. After two years of work, VCS 2007 was released on 19 November 2007. Source: http://www.v-c-s.org/about.html

[5] The Climate, Community and Biodiversity Alliance is a partnership of international NGOs and research institutes seeking to promote integrated solutions to land management around the world. With this goal in mind, the Alliance

For the case study, data were taken primarily from the PDDs for the two standards. The validation remarks of the Rainbow Alliance ('Alliance') were also used. However, from May 2009 to June 2010, corrective actions and revisions were made to the PDDs. The final revised version after the validation report was available only in March 2011. Thus, there could be information presented herein that is not the most up-to-date. CI Philippines and Japan personnel involved in the project planning, documentation and implementation were interviewed. The research framework and the outline of the case study—along with the information gathered and a draft report of the assessment—were also presented for verification and clarification.

Method of analysis

With reference to the overall framework (Appendix 1) developed for the research project entitled 'Overcoming barriers to smallholder forest-carbon development in the Philippines', we analysed the potential for, and challenges to, the carbon-forestry project against three measures:

1) effectiveness of institutionalising;
2) efficiency of resource use and mobilisation; and
3) impact.

We based our assessment on the project development plan extracted from the PDDs and other related documents focusing on site development, resource use and mobilisation and socio-economic and environmental services management.

The key issues of the project were identified in the strengths, weaknesses, opportunities and challenges (SWOC) analysis, specifically, the weaknesses and constraints of the technical management (site selection, definition of project area, implementation strategy for ecological services provision) and administrative management (project administration, resource use and mobilisation, socio-economic management, environmental services management).

---

has developed voluntary standards to help design and identify land management activities that simultaneously minimise climate change, support sustainable development and conserve biodiversity. Source: http://www.climate-standards.org/index.html

3. Results and discussion

Description of the project

Site description

The project site in Quirino is located near the towns of Maddela and Nagtipunan, Province of Quirino, Luzon (Figure 1). It is characterised by rolling-to-mountainous terrain with an elevation ranging from 100 m to 700 m with slopes ranging from 18% to 50%. Quirino Province has a mean annual temperature of 26.6°C with a mean maximum of 32.6°C and a minimum of 22.2°C. The annual rainfall within the province ranges from less than 1500 mm in the northeast towards the Cagayan River Valley to over 2100 mm at the southernmost border with Aurora Province. Rainfall distribution is not constant throughout the years.

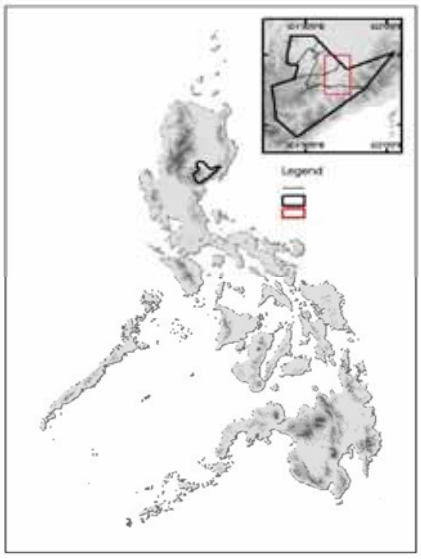


Figure 1. Location map of the project

Two agro-climatic regions were identified in the Quirino Region, namely moist and dry zones. The moist zone is characterised by an annual rainfall from 1500 to 2500 mm and a growing period of 210–270 days. This zone covers most of the present agricultural and expansion areas in the lowland, upland and hilly areas. It represents by far the largest area of the province.

Soils in the area are of various types. In lowland areas, soil types include the Maligaya clay loam, Quinga clay loam and Quinga silt loam. In gently sloping areas, San Manuel silt loam

dominates. Bolinao clay loam and Cauayan clay loam are found in slightly sloping to rolling areas. In steep areas, Rugao clay and Rugao sandy loam predominate, while on very steep slopes, soil types include Luisiana clay loam, Luisiana Anna complex, undifferentiated mountain soils and Faraon clay.

There are two major rivers that traverse the project site: the Addalam and Upper Cagayan. Minor tributaries of the Addalam River include the Angad and Tabanuang creeks while tributaries of the Upper Cagayan River include the Ngilinan and Tungcab rivers. These streams all drain into the Cagayan River, the longest river system in the country.

Land use and land cover of the project site can be classified into open or grassland, brush land, plantation crops, mixed crops, cultivated area and built-up area. Originally, the vegetative cover of the site composed mainly of *Dipterocarp* Molave forest with patches of grassland. However, through time and a series of human interventions and disturbances the natural, old growth forest was converted into grass and brush land dominated by lesser-used species and croplands (mainly corn and banana).

We could only find information from the municipality of Maddela that indicates the extent of deforestation and land-use and land-cover changes (Table 1).

Table 1. Land-use and land-cover changes in Maddela municipality, 1993 and 2003

	Area (ha)		**Change**	
Land use and cover	**1993**	**2003**	**ha**	**%**
Natural forest	32 666	27 057	-5609	-17.2
Remnant forest	29 626	17 106	-12 520	-42.3
Shrubs and grasslands	2030	10 823	8793	433.2
Agriculture	10 610	7478	-3132	-29.5
Built-up	470	761	291	61.9
River	330	892	562	170.3
Non-vegetation/open land	0	3387	3387	-
Agroforestry	0	1185	1185	-
Tree plantation	0	6993	6993	-
Fish ponds	0	50	50	-
TOTAL	75 732	75 732		-

Source: CI Philippines 2010

Area

The project area is within grass- and cropland portions of the QPL. The grassland (51 ha) is described as generally dominated with *Imperata cylindrica* (*cogon*) and *Themeda saccharum* (*talahib*). The croplands (126 ha) are described as marginal cultivation with maize and banana (Appendix 2).

The project covers an aggregate of 177 ha consisting of 110 parcels in five barangays within the municipalities of Maddela (94 ha) and Nagtipunan (83 ha). The 108 parcels are within public land (162 ha), tenured through certificate of stewardship contracts under the Integrated Social Forestry (ISF) program of the Department of Environment and Natural Resources, and two parcels classified as private land (15 ha) with private title ownership (Figure 2).

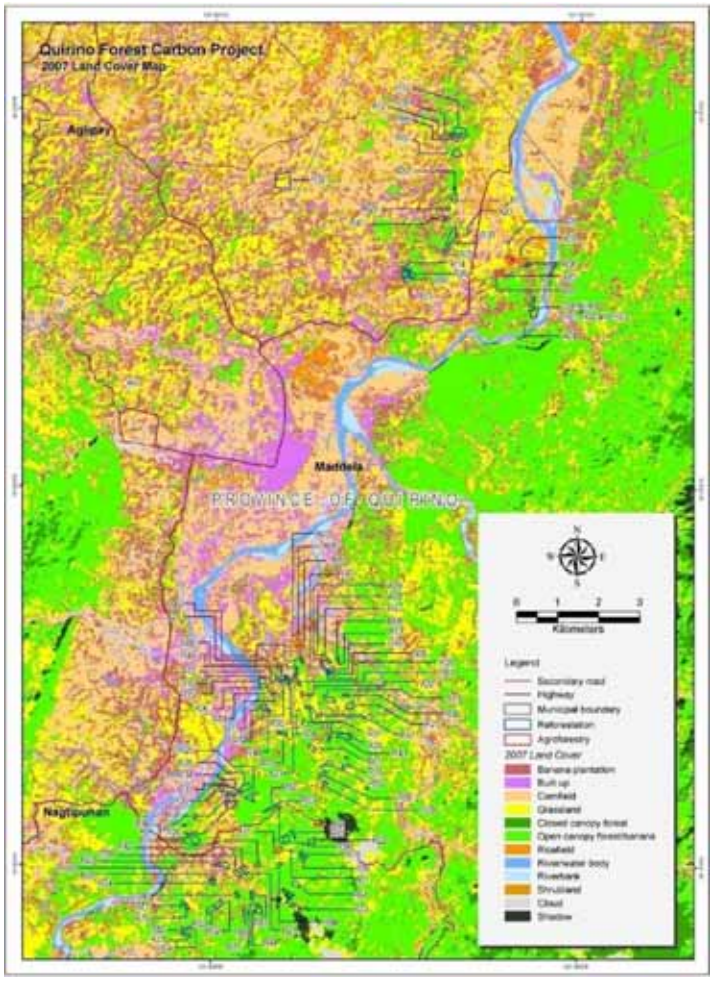


Figure 2: The 108 landholdings within the two municipalities

Project objectives

Aside from carbon sequestration, the establishment of a forest-carbon project in the area aimed to target three other benefits:

1) poverty alleviation, to create an alternative source of income for local people;
2) biodiversity conservation, to protect and improve habitat; and
3) watershed rehabilitation, to stabilise the watershed for steady water supply.

Technical operation

Implementation strategy

The project plans to use an agroforestation scheme.

a. Purely forest tree establishment on 155 ha (87 parcels) as the reforestation component, planting indigenous species in 3 m x 3 m spacings. Species to be planted are *narra* (*Pterocarpus indicus*), *molave* (*Vitex parviflora*), *dao* (*Dracontomelon dao*), *palosapis* (*Shorea palosapis*), *balakat-gubat* (*Sapium luzonicum*), *kalantas* (*Toona kalantas*) and *tuai* (*Bischofia javanica*). The specific number of each species will vary depending on land characteristics (for example, elevation, topography and soil characteristics). During the early growth period, maize will be planted in-between and banana on the boundaries.

b. Agroforestry farm development on 22 ha (23 parcels) to provide income to farmers. Fruit tree species will be planted at 8 m x 8 m spacings. The fruit species to be planted are *lanzones* (*Lansium domesticum), rambutan* (*Nephelium lappaceum*) and citrus family (*Citrus sp.*) while cash and food crops (maize and banana) will be intercropped.

During the 23-year crediting period (2007–2029), it was estimated that the project (177 ha area) would sequester 41 576 tonne of CO_2 equivalent (t CO2e) with an annual average of 1808 t CO2e. (Appendix 3).

Field implementation is described in Box 1.

Project development approach

The project adopts a community-based approach, which involves three local people's organizations: the Divisoria Sur Agroforestry Farmers Association, Sto. Niño Integrated Social Forestry Association and Sangbay Upper Basin Ecological Farmers Association.

Technical arrangements

The nursery operations will be carried out by the respective people's organization at each location. Planting materials and other input (fertilisers) will be provided to each farmer. The number of seedlings to be provided will correspond to the requirements of the landholding, with reference to the project plan.

Households and individual participants will work on their own landholdings. For the reforestation component (planting of indigenous forest tree species), a reforestation contract will be signed between individual landholders and CI Philippines, as the direct intermediary of the project.

The project pays the establishment cost of the reforestation component, which includes the labour for land preparation (brushing, staking and hole digging), hauling of planting materials and planting; maintenance costs, such as regular weeding of the planted area and fertiliser application; and protection (patrolling and fire-line establishment).

For the agroforestry component, the project provides the seedlings and fertilisers, but labour for establishment, maintenance and protection of the agroforestry farm area is the responsibility of the farmer.

The project also provides technical support to assure proper establishment, maintenance and protection in both reforestation and agroforestry plantations. Training will be regularly provided to the project participants to keep them abreast of developments. Site visits to successful areas will also be undertaken.

Field activity operation for forest-carbon development in Quirino

Nursery operation

The 300 m^2 nursery area in Maddela will be use while the 2 central nurseries are constructed. Temporarily, the seedlings will be brought from Nueva Vizcaya, where the indigenous tree species and fruit tree species are available. The central nurseries will be established in Maddela (December 2009) and Nagtipunan (first quarter of 2010. Each nursery will raise both seedlings of indigenous forest tree and fruit tree species needed by all farmer participants in Maddela and Nagtipunan.

Field/land preparation

The land preparation shall be done by manual labor.

Brushing - 2m diameter spot brushing for fruits and 1m strip brushing following the contour for the forest tree species. The cleared vegetation will be put on the uncleared spots/strips;

Staking - shall be done to guide the exact planting location of each seedling, and for easy monitoring of planted seedlings. The stick poles to be used in staking shall be one meter high or higher to become visible. The size of hole to be dug depends on the size of the plastic bag used; and

Hole digging – size of potted seedlings to be planted will determine the depth and size of the holes. Top soils are separated from the subsoil. During planting the top soils will be put back or filled first then the subsoil. Basal application of organic fertilizer will be done, if deemed necessary.

Forest Carbon Planting

Actual planting shall be done with extra care to avoid disturbing the root system. Seedlings are transported from nursery to the planting area with the use of animal driven sledge or cart, or otherwise manually carried using sturdy containers for minimal disturbance. In planting the seedlings, a knife or bolo will be used in tearing plastic pots holding the seedlings.

Forest Carbon Maintenance

Maintenance shall be done by replanting, weeding, cultivating, mulching, fertilizing, watering and controlling pests and diseases. The replanting shall be done after one year if mortality rate exceeds to 10%.

Silvicultural activity such as thinning shall be done to avoid overcrowding of plants. At the height of 5 m, tree density should be 900 stems/ha, at the stand of 10-12m, 500 stems/ha and at the stand of 20m, 300 stem/ ha (this is known to be productive thinning).

Organic fertilizer application will also be done in the plantation. The Department of Agriculture allows 50 (inorganic) -50 (organic) utilization of fertilizer (Reference). Irrigation is not much of a concern since Quirino province has a well-defined wet and dry season,

Monitoring and Protection

To ensure high survival of plantations, replanting and constant monitoring shall be conducted. Also, fire lines and fire breaks will be established for both the agroforestry and reforestation sites.

Green plants such as *kakawate or Gliricidia sepium* will be used as fire lines. A 5m wide firebreak which is 200m long will be constructed in the plantation area. The firebreaks will be placed on the sides or edges of the parcel of land to avoid the spread of fire from neighboring areas.

Streams/gullies, green corridors and roads that surround the parcel of land are considered fire breaks.

The trails and pathways will be maintained through manual labor. Roads and trails were considered in transporting/mobilizing the seedlings and in the future marketing of the produce.

Box 1. Field activities

Socio-economic arrangements

After providing the individual landholdings with seedlings, the people's organizations are able to sell the excess seedlings from the nursery. The price range for seedlings for reforestation is Php 3–5 per forest tree seedling and for the agroforestry farm component Php 25 per fruit tree seedling.

Aside from paying for labour, additional livelihood streams such as vegetable farming, pig and goat raising and food processing will be established by Palacian Economic Development Association Inc (PEDAI) (project sub-grantee). The community can benefit from the net revenue.

In principle, community benefits can increase in two ways.

1. Increase the project performance in sequestering CO_2 (that is, better maintenance).
2. Reduce the project implementation cost (that is, better efficiency).

Management

CI Philippines is in charge of the project's operations. A program manager from Sierra Madre Biodiversity Corridor, assisted by five technical staff, provides direct technical support.

CI Headquarters and CI Japan extend technical, managerial and coordination support to CI Philippines.

The provincial local government unit, together with the Community, Environment and Natural Resources Office, will help with administrative matters and assist with documentation and facilitation.

The Department of Environment and Natural Resources, local government units, partners and implementers of local and national laws are responsible for anticipating and mitigating conflicts.

PEDAI is to help execute the reforestation and field activities and provide technical support for implementation and external links, including assistance in securing additional financial resources.

Under the supervision of CI Philippines, PEDAI will conduct the measurement and monitoring of the actual greenhouse gas removals and possible leakage generated by the project; facilitate the processes and involvement of partners in the collection of data and information leading to the documentation of activities for the project.

Technical support

Department of Environment and Natural Resources Region 2

The Department is to ensure that existing departmental laws, rules and regulations are observed; enforce forest protection in collaboration with provincial and municipal governments, Divisoria Sur Agroforestry Farmers Association, Sto. Niño Integrated Social Forestry Association and Sangbay Upper Basin Ecological Farmers Association.

Department of Environment and Natural Resources, Community Environment and Natural Resources Office

- Prepare quarterly reports to provide information for PEDAI and CI in identifying problems and improvements for the project management. Documentation will be done through regular group meetings. Information dissemination to occur through participation in conferences, training sessions and workshops on climate change that will be shared to other local NGOs, local government units and people's organizations.
- Help in identifying and delineating eligible areas for the project in collaboration with local government units and people's organizations.
- Facilitate issuing land tenure instruments and resolve land conflicts (if any) and claims for the project site.
- Provide technical assistance for seedling production, plantation establishment, protection and maintenance.
- Provide information, education and communications support (for example, information materials).

- Support and facilitate certification process and the subsequent validation of the project site.
- Assist in monitoring project performance.
- Designate a person(s) responsible for implementation of the project.

Palacian Economic Development Association Inc (PEDAI)

- Provide technical support for the development of the PDD, the validation and the first verification process by a third party (Rainforest Alliance) as chosen by moreTrees and CI following the standards prescribed under the Climate, Community, Biodiversity Standards and the Verified Carbon Standards that would lead to issuing verified carbon units (VCUs) .

The World Agroforestry Centre Philippines calculated the potential carbon sequestration for the crediting period.

The local government unit's environmental group will document people's organizations' activities and outputs; and promote sustainable resource use and development.

Policy support

The local government unit facilitates the resolution of the concerns of the people's organizations.

There are existing national and local laws related to the project.

- *Philippines Climate Change Act (RA 9729)*: mainstreams climate change responses into government policy formulations, establishes the framework strategy and programs on climate change, created the climate change commission, and other matters.
- *Presidential Proclamation No. 584:* established the Quirino Protected Landscape.
- *Forest Land-Use Plan* for Maddela and Nagtipunan.
- *Quirino Forestry Master Plan*: policies on preparation of Forestry Master Plan by the provincial local government unit.

- *Quirino Protected Landscape Management Plan (NIPAS Act)*: particularly the provision for preparing a Protected Area Management Plan.
- *RA 9285 or ADR Act*: 'Katarungang Pambarangay' or the barangay justice system had been in place at the community level under the Local Government Code of 1991 (RA 7160, Book, Chapter 7) and the Alternative Dispute Resolution Act of 2004.

Financial support

CI has concluded a grant agreement with moreTrees. MoreTrees provided USD 280 000 for the development of 41 ha in 2009.

In 2010, a new agreement was signed and all operational expenses for the entire 177 ha through to 2029 will be covered by moreTrees.

Other support

Mitsubishi Research Institute was contracted to evaluate the potential amount of carbon that could be sequestered by the project and supported the development of the project description for the Verified Carbon Standards.

Rainforest Alliance was commissioned for the validation of the PDD for the Climate, Community, Biodiversity Standards.

Potential and challenges of the proposed project

The potential and challenges of the project are presented in Table 2.

Table 2. Potential and challenges of the Quirino forest-carbon development project

Indicators	Potentials	Challenges
(1) Effectiveness of institutionalising the project		
Site suitability	Identified and delineated the parcels for the project	Expanding the area (177 ha)
	Pass the eligibility criteria of the voluntary carbon market, validated under the VCS	Compared to the land within the QPL that needs forest rehabilitation, the 177 ha project area is small
Development operation	Prepared project design document and project description following the standard template required for CCBS and VCS validation. The 2 PDD have already validated by a third party under CCBS with Gold level and under VCS	Submitting the project for VCS registration and VCU issue
Environmental services marketing	Able to catalyse donor	Ensuring funding availability, if ever the project area is expanded to more than 177 ha
(2) Efficiency of resource use and mobilisation		
Technological	Presented agroforestation scheme as strategy of implementation	Ensuring sustainability of the project development approach
Social	Community-based activity	Convincing participants whose landholdings are the targets for rehabilitation and eligible lands for forest-carbon development
		Ensuring validity of project participants' tenure
Financial	Memo of agreement with moreTrees was amended from 41 ha to cover the expenses for 177 ha	Ensuring that project can register under the VCS registry and moreTrees Inc can market the VCUs that will be generated by the 177 ha.
(3) Impact		
Social acceptance	Engaged the participation of three local people's organizations and households and individual landholders of 110 parcels	Engaging all other target landholders of suitable lands within the entire QPL
Political/public response	Memo of agreement to collaborate signed by stakeholders	Ensuring the active and sustained support of the major stakeholders
Economic consideration	The project provides opportunities to landholders to develop their idle landholdings or enhance productivity of their marginal cultivation areas	Ensuring the economic viability of the agroforestation scheme is a challenge considering the low soil fertility level of grasslands and other marginal land
Environmental services provision	Increased carbon sequestration and storage potential of the grasslands	Ensuring appropriate measurement and valuation of environmental services
	Rehabilitation of denuded forests and degraded lands can support habitat restoration, watershed functions, improved land-soil quality, and enhance scenic beauty of the entire landscape	

Effectiveness of institutionalising the project

Site suitability

> *Does the proposed project meet the eligibility criteria and fulfil the 'additionality' condition under the CDM A/R criteria? These criteria follow the EB 35 report Annex 18: 'Procedures to define the eligibility of lands for afforestation and reforestation (AR) project activities'.*
>
> *Or is the project able to comply with the standards of the voluntary carbon market?*

The landscape is generally dominated by an agriculture–forests mosaic. There are no natural forests near the project area that could be potential seed sources for natural regeneration.

The parcels selected for the project area coverage are within grass- and cropland. The grassland is generally dominated with grasses such as *cogon* and *talahib*. The cropland is marginal cultivation with maize and banana.

These land-cover characteristics meet CDM A/R eligibility criteria. However, the area is small (177 ha) and not contiguous. Farmers have generally provided only small portions of their landholdings to the project because the project is not intended to support commercial, agricultural uses.

Under the Verified Carbon Standards, the project needs only to provide proof that the project area had 'non-forest' status 10 years before the project starts.

If the project ever applied for emission reduction crediting under the forestry CDM, it would need to present a land-cover map as proof of its non-forest status as of 1990 and even further back.

Land-cover and land-use status in Maddela for 1993 and 2003 are presented below. However, if the project plans to participate under the CDM forestry criteria it will need to justify that it can fulfil the 'additionality' requirement. As yet, there is no historical, time-series, baseline map (for example, 1990, 2000 and 2010) for the other municipalities where projects are

undertaken or for the entire QPL. Land-use and land-soil assessment is also not available, which would also assist with indicating the lack of change of its non-forest and degraded status until project implementation.

Development operation

> *The goal is to institutionalise the project in order to participate in the carbon market. Project participation under CDM A/R requires designated national authority endorsement and approval of voluntary participation. This includes a project application for evaluation by the Department of Environment and Natural Resources (Philippines' designated national authority) and third-party validation by a designated operational entity.*

To institutionalise the project, a feasibility study of forestry-carbon projects in the Sierra Madre Biodiversity Corridor was conducted. A 20 ha pilot area (as a reforestation and agroforestry farm area) was established and a forest-carbon development plan formulated along with a memorandum of agreement among the project partners. The 177 ha forest-carbon development with indigenous forest and fruit tree species as an agroforestry system was planned for 2010. Project management and implementation of plantation establishment started in 2009.

The two PDDs were prepared following the standard templates. The Climate, Community, Biodiversity Standards PDD, dated May 2009, was validated in June 2009. But corrective measures were undertaken on the ground and revisions were made on the documents between May 2009 to May 2010 until it was finally was approved on 17 June 2010 and validated with Gold level.

The third-party validation by the Rainforest Alliance of the project in Quirino under the CCB Standards was primarily for project design. The report stated the project demonstrated conformance to the standard of their audit related to the planning, development and design of the project in the inception and start-up phases.

The Alliance further stated that the CCB Standards were designed to be a tool to demonstrate high-quality project design that should lead to multiple benefits in addition to carbon sequestration and emission reductions. The standards were not used to measure project implementation, thus conformance to the standard was not meant to evaluate any delivery of

emission reductions, community or biodiversity benefits, or other results hoped to be achieved through future performance of the project. Use of the standards may increase confidence in forest-carbon projects.

A summary of the Alliance's validation report follows.

> *The first version (May 2009) of the Quirino Forest Carbon PDD was subjected to a validation audit in June 2009. The result showed conformance with only five (5) of the fifteen (15) required criteria of the CCB Standard Version 1, 2005. These were in the areas of management capacity, land tenure, 'leakage', off-site community and biodiversity impacts. The project was redesigned and a second validation audit was conducted of the project in November 2009. The outcome showed an additional eight of the required criteria to which the project design conformed to, for a total of thirteen. The two remaining criteria to which the project had to measure up to were on description of original site conditions Doc. No. C-24 09Feb07 Page 4 and baseline projections. The latest PDD (May 2010) was subjected to a reassessment audit (7 to 11 June 2010), which established that the project proponents were able to meet with all the required, plus seven of the optional, criteria.*

The revised PDD for the Verified Carbon Standards was validated in 2011. Under these standards, after the project proponent has submitted the project description to the body that validates the project design and greenhouse gas emission reductions against the Standard's rules and the body provides a validation report, the proponent can submit the project description to the Verified Carbon Standards for registration.

To register[6] for certified emission reduction credits under the CDM A/R guidelines, the project proponent has to submit a project application document, which is the project proposal along with other required documents, and/or the PDD, for designated national authority[7] evaluation and designated operational entity[8] evaluation.

[6] Registration is the formal acceptance by the Executive Board of a validated project as a CDM A/R project. Registration is the prerequisite for the verification, certification and issue of certified emission reductions related to the A/R activity.

[7] For designated national authority approval, the project development plan/proposal has to be consistent with the sustainable management agenda of the Philippines. When designing a project, there are three pillars that should be considered. These are the environmental dimension, for example, carbon sequestration as the main goods but with environmental co-benefits (watershed and

Environmental services marketing

> *The project must be able to negotiate an agreement for support with potential carbon and environmental services' buyers either under the CDM or the Verified Carbon Standards and/or generate funding support for its operations, including field implementation, through innovative mechanisms.*

CI Philippines was able to secure funds for the project. The implementation of the project is according to the terms of the agreement entered into between moreTrees Inc and CI. MoreTrees, has provided financing for the 177 ha project until 2029. Funds to cover all activities to generate VCUs are already ensured.

Thus, CI needs to ensure that project can register under the Verified Carbon Standards so moreTrees can market the VCUs that will be generated by the 177 ha.

Under the Standards, once validation and verification reports are complete, the project proponent must open an account with an approved registry operator in the Standards' registry system. Project proponents must submit all documents and reports before VCUs can be issued.

The Standards' registry system currently consists of three independent registries linked to the Standards' project database. This allows project proponents to choose a preferred registry operator while still ensuring that all projects, documents and VCUs are centrally and transparently listed in a fully searchable database.

Account holders are free to move VCUs between registry operators at any time. The registry operator must post all project documents to the Standards' project database before issuing VCUs to the project proponent's account. Each VCU is assigned a unique serial number so it

---

biodiversity/habitat restoration); the economic dimension, for example, it can provide livelihoods and incomes for stakeholders (direct implementers) and the local community as a whole; and the social dimension, for example, it will not displace people who are directly dependent for their survival on the resource.

[8] For designated operational entity validation, before any projects can produce certified emission reductions that could be credited as offset to the emission reduction target, the project developer from the host country must submit first the PDD following the standard template. Validation is the process of independent evaluation of A/R activity by a designated operational entity.

can be tracked across its life cycle in the project database. Project proponents may hold VCUs or sell or retire them at any time.

Efficiency of resource use and mobilisation

Technological

> *If referring to the CDM A/R methodologies, this means conducting A/R project activity on land that has been deforested for at least 50 years or before 1990, where 'deforested' means the vegetation on the land has been below the thresholds adopted by the host country for definition of 'forest'.*
>
> *The Philippines Government defines 'forest' as land having trees with tree-crown cover or equivalent stocking level of > 10%, an area of more than > 0.5 ha, and the trees should be able to reach a minimum height of 5 m at maturity in situ. The 'forest' consists of either closed forest formations with trees at various storeys and undergrowth cover of a high proportion of the ground or open formation with continuous vegetation cover in which tree-crown cover exceeds 10%.*

The QPL is part of the national protected areas system, which is recognised as a Key Biodiversity Area[9] of global significance. Critically endangered species of fauna and flora could be found in the region where forest carbon project is situated. Thus, rehabilitating the denuded and deforested portions within and surrounding the QPL through forest-carbon development by agroforestation is deemed significant and highly needed.

[9] Site conservation is among the most effective means to reduce global biodiversity loss. Therefore, it is critical to identify those sites where unique biodiversity must be conserved immediately. To this end, the concept of key biodiversity areas has been developed, seeking to identify and, ultimately, ensure that networks of globally important sites are safeguarded. This methodology builds up from the identification of species conservation targets (through the IUCN Red List) and nests within larger-scale conservation approaches. Sites are selected using standardized, globally applicable, threshold-based criteria, driven by the distribution and population of species that require site-level conservation (Eken et al. 2004).

The Quirino forest-carbon project deploys an agroforestation scheme as an A/R activity. This is undertaken as two land-use management systems (indigenous forest tree species establishment as the reforestation component and fruit trees as agroforestry farm development). At 3 m x 3 m distance, the 155 ha area will be reforested with potential stock of 172 205 forest trees (1111 trees per hectare). Since this is intended for permanent forest, the issue of 'permanence'[10] for the entire crediting period can be addressed. The 22 ha agroforestry farm will have a potential stock of 3432 fruit trees (156 trees per hectare).

Compared to the forest tree area, the agroforestry farm will have an equivalent stocking level of fruit trees of > 10%. Fruit tree species selected can reach heights above 5 m at maturity. The issue of 'permanence' for the entire crediting period can be addressed only when the fruits are to be harvested.

The carbon sequestration and storage potential of the two land-use management schemes would be different, favouring the forest tree area if only aboveground biomass is included in measurements. The reforestation component (155 ha) is wider in coverage than the agroforestry system (22 ha).

Overall, the total area (177 ha) of the project is only a small portion of the land within and surrounding the QPL that need rehabilitation or revegetation.

Social

> *This refers to whether the project has the local people's involvement, particularly the main stakeholders (people dependent on the land), has not displaced any people (in case the land is currently occupied), and the nature of the technical and socio-economic arrangements as well as the administrative structure.*

[10] One of the issues affecting carbon markets is that of 'permanence'. In essence, it is difficult to guarantee the permanence of forests, which may be susceptible to clearing, burning or mismanagement. However, the proposed forest is intended to be controlled 'permanent forest', that is, not plantation timber that will be cut, which sufficiently addresses the 'permanence' criteria.

Local community participation means adopting community-based forest management, which is the national strategy in the Philippines for managing the country's forest resources by virtue of Executive Order No. 263, 1995.

The project has ensured that activities will be undertaken as a local community effort by employing a community-based approach with the three people's organization (Divisoria Sur Agroforestry Farmers Association, Sto. Niño Integrated Social Forestry Association and Sangbay Upper Basin Ecological Farmers Association). These organizations are signatories to the project's memorandum of agreement.

Adopting a 'family' approach, field activities (for example, land preparation, planting, maintenance and protection) will be undertaken by individuals and household participants on their landholdings. The respective people's organizations will manage (assist, supervise and monitor) the field activities.

As to the status of land tenure, the landholdings selected for the project are either under a stewardship contract or a private title of ownership. Under the ISF program of the Department of Environment and Natural Resources, a certificate of stewardship is awarded to qualified households occupying public land as stewards of the land. The certificate is valid for a 25 years and renewable for a succeeding 25 years. Households and individual landholders are organized under peoples' organizations, which provide support for sustainable use of land resources and implementation of farm plans for generating economic benefits for the landholders. To achieve the aggregate total area of 177 ha, the project asked each certificate holder to submit a portion of their land to be part of the project.

The owner of the only private land that voluntarily participated in the project demonstrated a clear intent and obtained an individual reforestation contract. The project guarantees that it will operate only within these land parcels and will not encroach uninvited on private, community or government property.

The technical and socio-economic arrangements have been established. Agreements, technical and socio-economic arrangements are indicated in the memorandum of agreement signed by stakeholders. As to the benefit-sharing arrangement, the community (represented by the three people's organizations) will collectively benefit from the project, but how this will be shared or

among household and individual participants is still not clear. The details of the benefit-sharing arrangement have not been documented and is still under development.

The administrative structure (Appendix 4) is still under revision. As mentioned above, CI Philippines is in charge of overall project implementation and a program manager from Sierra Madre Biodiversity Corridor, assisted by five technical staff, has been delegated to provide technical support.

Of the seven municipalities within the QPL and Quirino province, only two municipalities (Maddela and Nagtipunan) are involved in the project. In Maddela, only 47 farmers with land covering an aggregate 94 ha are involved, compared to the potential area as presented in Table 1 (2030 ha shrub and grasslands in 1993 and 10 823 ha in 2003). Convincing other potential participants, whose landholdings are the targets for rehabilitation, remains a challenge considering the financial implications of expanding the project area.

Financial

> *The project is able to generate funding support for its operations and field implementation and/or negotiate with potential buyers of carbon credits or environmental services.*

CI was able to secure a donor (moreTrees) who provides the funds for the 177 ha of forest-carbon activities through to 2029.

The implementation of the project is according to the terms of the agreement entered into between moreTrees and CI such that moreTrees funding covers all operational costs of the project. MoreTrees will market the carbon credits from the project through the Verified Carbon Standards to recover the investment to the project. Thus, the project needs to ensure that it can register under the Standards' registry and moreTrees can market the VCUs that will be generated. However, it was stated the arrangement has been made with moreTrees such that their provision of project funding is independent of the carbon credit sales.

Impact of the proposed project

Social acceptance

> *For a holistic approach to rehabilitation, conservation and sustainable development, the project must engage the participation of the community within Quirino Protected Landscape.*

The project was able to engage the participation of three local people's organizations and convince landholders with tenure (both stewardship certificates and private title) to include portions of their land in the project.

While there are secondary stewardship certificate holders (who acquired the land by buying the rights of the original certificate holders), land claims with tenure instruments (stewardship certificates) are mostly small landholdings. Generally, smallholders still prefer to do purely agricultural crop cultivation rather than plant trees because the return on investment takes too long.

Considering that the project targets a 23-year crediting period for CO_2 removal, sustaining community support and smallholder participation could be a challenge. To engage the active involvement of the main stakeholders and, most especially, the landholders of suitable parcels (land needing rehabilitation) within the QPL and the entire region is a challenge if logistics are not provided.

Political/public response

> *The project needs to have engaged cooperation from all sectors to provide technical and logistic support, including policy measures.*

The entities[11], Department of Environment and Natural Resources Region 2, provincial government of Quirino, municipal governments of Maddela and Nagtipunan, people's organizations (Divisoria Sur Agroforestry Farmers Association, Sto. Niño Integrated Social Forestry Association and Sangbay Upper Basin Ecological Farmers Association), PEDAI and

[11] This refers to the lower-level government agencies, local NGOs and people's organizations that are highly likely to provide support to the project and interact directly with the local people.

CI signed a memorandum of agreement for cooperation to support the project. But the core of collaborative efforts only revolves around the work plan for the project, including the different activities from project planning, implementation and monitoring and protection.

Economic considerations

> *The project needs to provide sources of income aside from the carbon payment or environmental services incentives.*

The project will provide income alternatives to the participating landholders through direct project employment in the project activities. Aside from paying for labour (nursery operations conducted thru the respective people's organizations), the project can potentially improve farm production through agroforestry systems. The benefit-sharing scheme of the potential payments for environmental services that can be potentially provided from the project is currently under development.

Ecological services provision

> *Carbon sequestration and storage potential (actual net greenhouse gas removal by sinks) and other co-ecological benefits are essential elements of the project.*

This project is intends to revegetate deforested and degraded forest and marginal lands within and in the vicinity of the QPL, which forms part of the Sierra Madre Biodiversity Corridor.

Without the proposed project the parcels will remain fallowed, covered with invasive weeds, characterised as grasslands or under marginal cultivation. If the land is revegetated as forest, it is expected that ecological functions of the area will improve.

Rehabilitating the area through an agroforestation scheme will provide opportunities to sequester carbon from the atmosphere. Although a purely tree-based system and agroforestry farms have different carbon sequestration potential, the two land uses become a net CO_2 sink (41 576 t CO_2e with an annual average of 1808 t CO_2e) owing to the potentially higher biomass compared to grassland or marginally cultivated conditions.

As indicated in the PDD, if the parcels remained as cornfield (30 t CO_2e/ha), banana plantation (77.45 t CO_2e/ha) or grassland (42.17 t CO_2e/ha), the carbon sequestration potential is less. The current total carbon stock of the 177 ha was estimated at only 8 306.6 t CO_2e.

Lasco and Pulhin (2003) indicate that grassland has the lowest stock of carbon (< 50 t C/ha) compared to primary and secondary *Dipterocarp* forests (> 250 t C/ha).

Aside from carbon sequestration, the improved forest connectivity will potentially benefit a variety of wildlife species vulnerable to extinction. However, the project parcels are dispersed across a landscape of non-forest (grassland, cropland and shrubland) and further measures to increase the connectivity of forest patches would be beneficial for ecosystem restoration. The establishment of a forest-carbon project in the area is also expected to support the rehabilitation of watershed functions, improve the land-soil quality and enhance the scenic beauty of the entire landscape. The values of other environmental services that can be provided by the project are yet to be determined.

Strengths and limitations of the proposed project

It is assumed that the technical and administrative management plans of the project reflect the institutional capacity of the proponent to undertake the project and ensure its sustainability.

The SWOC analysis is based on the PDDs and other documents related to the project. The assessment focuses on the following indicators: site development, resource-use and mobilisation and socio-economic and environmental services management.

The strengths and limitations (Table 3) of the operational aspects are extracted from the SWOC analysis.

Table 3. Strengths and limitations of the proposed forest-carbon project

INDICATORS	STRENGTHS	LIMITATIONS
A. Site Development		
1. Area identification	177 ha project area consisting of 108 parcels already delineated	Project area is small and not contiguous
2. Implementation strategy	Farmer's preference is the priority Adopting the agroforestation scheme as an A/R project	No valuation and measurement of the economic benefits of a purely tree-based system compared to an agroforestry system to ensure viability of the entire agroforestation scheme
3. Project development approach	Community-based initiative involving the local people's organizations and individual and household landholders	Limited capacity of people's organizations to manage the field operations
B. Resource use and mobilisation		
1. Administrative support	CI Philippines in charge of the overall project	Limited capacity of PEDAI (direct link to people's organizations) to manage field implementation
2. Technical support, public and private	Existence of signed memorandum of agreement for collaborate support	Active engagement of major stakeholders in all aspects of the project
3. Political support	Engaged support from provincial and municipal governments	It has not yet elaborately drawn the specific activities of engagement, including policies to support the project
4. Financial support	Catalysed fund donor	It has yet to present and clarify the project implementation costs, moreTrees Inc operational cost recovery, Verified Carbon Standards' levy including the potential carbon market price (for VCUs) so as to form an estimate of net revenue
C. Socio-economic		
	Technical and socio-economic provisions have been presented	Estimate of project implementation costs has not been presented so it is impossible to clarify the efficiency and sufficiency of the support provision
D. Environmental services management		
	Increase carbon sequestration and storage potential Co-benefits: - Support habitat - Watershed restoration - Soil quality improvement and conservation - Landscape beauty enhancement	Cost-effectiveness of environmental services assessment, especially carbon baseline measurement and estimation, has yet to be presented Monitoring and verifying the environmental services provided

Site development

This pertains to area (land-cover status of the project's sites, delineated area for the project), the strategy of forest-carbon implementation (specific land management scheme) and the project development approach (how the project's operations and specific field activities are to be carried out).

Strengths

(1) The 177 ha in 108 parcels has been delineated. This has already been validated by the Rainforest Alliance under the Climate Change Biodiversity Standards.

Parcels included in the project area have tenure instruments.

The project boundary was selected based on a land-cover map, satellite imagery and a detailed field survey with GPS, as described in A4.2. in the PDD CCBS, May 2010. The land-cover map was produced using satellite data and ground information.

(2) While targeting carbon sequestration potential, the forest-carbon project is designed to support habitat restoration for biodiversity and address economic concerns.

(3) The forest-carbon development is implemented as a community-based project.

Limitations

(1) Total area is only a small portion or the deforested land needing rehabilitation or revegetation within the QPL and the province of Quirino.

Quirino province is one of the Philippines' biodiversity conservation priorities. The area's value for bird habitat has been recognised through Important Bird Area designation and subsequently as a Key Biodiversity Area. Threatened species are found in the QPL.

Total land area of the QPL is 206 875 ha, comprising the five municipalities (Diffun, Cabarroguis, Aglipay, Maddela and Nagtipunan) in Quirino province. However, the forest-carbon project only covers two municipalities.

Considering that the establishment of a forest-carbon project in the area aims to target the other three benefits of poverty alleviation, biodiversity conservation and watershed rehabilitation, the 177 ha is too small to achieve such objectives.

Although for the Climate, Community and Biodiversity Standards a 1990 baseline is not a requirement and the Verified Carbon Standards require that the area is non-forest 10 years before the project starts, there is only information on the extent of deforestation and land–use and land-cover change for the municipality of Maddela. There is no baseline map of Quirino province, the QPL or Nagtipunan municipality.

(2) Aside from carbon sequestration, other potential benefits have not been presented (economic and ecological benefits that can be derived from the purely forest tree establishment and agroforestry farm development).

If optimum economic benefits cannot be directly derived from participating in the project, this should be clear to the project participants from the beginning. An alternative incentive mechanism should be set-up and this should be agreed by the participants, especially households and individual landholders.

Although the project includes only parcels that are not currently used for primary agricultural activities—either left fallow, idle owing to marginal productivity (low fertility) or under marginal cultivation—landholders still generally prefer to undertake traditional agricultural cultivation (for example, maize and banana).

We should bear in mind that the benefits of planting fruit trees (the 22 ha agroforestry component) can only be enjoyed after the fruits are harvested. While for the reforestation component, it is for permanent protection in order to comply with the issue of 'permanence' of the project area as a carbon sink. Thus, it cannot be harvested for commercial timber production.

(3) The project has yet to build the capacity of PEDAI to administratively and technically manage operations. It is also recognized that the local people's organizations do not have sufficient technical capacity yet to undertake full responsibility for supervision of the field activities.

Resource use and mobilisation

This pertains to the administrative (administrative set-up of the project, including the functions of each stakeholder), technical (who will obtain and provide the technical support), public and private, financial (how financial support is sourced or what are the innovative funding schemes) and political support (if the operational plan considers the existing policies as well as identifying the needed policy support for its implementation).

Strengths

The project is part of CI's concerted efforts to build alliances with local communities, the private sector, government agencies and NGOs to facilitate the management of the Sierra Madre Biodiversity Corridor and strengthen enforcement of environmental laws (Lasco and Pulhin 2003).

CI serves as an overall coordinator of the partners and project activities. moreTrees, the private entity funding the project, connects to the carbon market.

There is a memorandum of agreement signed by all project partners, namely, moreTrees, Quirino provincial government, municipal governments of Maddela and Nagtipunan, PEDAI, the three people's organizations and CI. PEDAI manages day-to-day project implementation with the people's organizations.

Limitations

It is indicated in the administrative structure that PEDAI will be the direct link to the people's organizations. However, PEDAI still has limited capacity to manage the project. Thus, capacity building of the field implementers occupies an important part in the development activities.

To achieve active engagement by multi-stakeholders, the plan has not presented the specific activities of engagement for the crediting period.

Socio-economic management

> *This pertains to the field-level technical arrangement and socio-economic provision (how these are facilitated) and benefit-sharing arrangement (identification of the potential benefits that can be derived from the project and how these will be distributed among the participants).*

Strengths

The technical and socio-economic arrangements are established.

Each landholder will use their own landholding. The respective people's organizations will be in charge of the nursery operations. The cost of nursery operations—including labour for

construction and maintenance and planting materials—will be paid by CI Philippines. Each participant will receive seedlings (forest and fruit-tree seedlings) corresponding to their landholding requirement. Only the labour for planting forest trees under the reforestation component will be paid by CI Philippines. For the agroforestry farm component, labour for planting will be provided free by the landholder, considering that the cost of fruit tree seedlings is much more expensive than forest tree seedlings.

To ensure project sustainability, there will be training provided to participants. The training will include financial management, technical skills and livelihood alternatives. Farmers will be trained to produce seedlings for sale.

Limitations

CI acknowledged that the project area is limited to 177 ha, consistent with the funding agreement from moreTrees. However, the estimate of project implementation costs has not yet been presented to clarify the efficiency and sufficiency of the funding. Also, there is no signed agreement that clarifies the benefit-sharing (carbon and other environmental services payments) scheme.

For transparency, accountability and sense of ownership, it is crucial that participants are aware of the implementation costs. This will help to determine the labour payments, subsidies, incentives or rewards for participating and the environmental services that can be potentially provided. This is also to determine what will be the value of participants' input.

Generally, there is still a feeling of uncertainty among the landholders as to whether it is economically feasible to include their land (be it currently idle or under-productive) in the project. Potential landholders generally hold this 'wait and see' attitude before they will join the project.

Besides, most landholders with tenure instruments are smallholders. Most are hesitant to include their land in the project. They are afraid that they will not have any land to cultivate and are not sure if joining the project would provide them with a livelihood and better income.

Environmental services management

This pertains to the carbon sequestration potential for ecological benefits. How watershed rehabilitation and protection, habitat restoration and biodiversity conservation management, land-soil quality improvement and landscape scenic beauty enhancement are considered in the project's planning and field design.

Strengths

It is estimated that the 177 ha will remove about 41 576 t CO_2 e during the 23-year project accounting period.

Also, it is expected that the project will support forest rehabilitation for biodiversity conservation and watershed management rehabilitation.

Limitations

There is no estimated valuation or quantification of the other potential benefits that can be derived from the project. The 177 ha is too small to undertake quantification of other ecological services that could be provided.

4. Conclusion

The project can potentially be institutionalised and be able to participate in the carbon market and other payments for environmental services mechanisms. Acting as intermediary entity, CI Philippines has a pool of technical staff and proven resource mobilisation capacity. It has been able to engage the support of the Department of Environment and Natural Resources at regional, provincial and community level and the local government unit's Municipal Environment and Natural Resources Office. Most importantly, it was able to engage moreTrees Inc, a private entity providing the upfront costs to prepare the PDDs, implement field activity and the third-party validation.

The project area is part of the national protected system, which is recognised as a Key Biodiversity Area of global significance. Critically endangered species of fauna and flora are within this area. Thus, rehabilitating the denuded and deforested portions through forest-carbon development by agroforestation is deemed significant and highly needed.

The community-based approach is employed as strategy of implementation, involving the local people's organizations and an NGO. Landholders directly involved in field activities (plantation establishment) have tenure instruments, either stewardship certificates or titles of ownership. The majority of parcels included in the project are currently under-utilised portions of landholdings.

The limitation of the project is that the area is limited only to 177 ha. This is just a small area in which to try and have a real impact on the environment and bring benefits to the local community. Also, the area is a small proportion of the initial 13 000 ha identified for rehabilitation within the QPL.

The project is already validated in conformance with the Climate, Community and Biodiversity Standards (2010) and the Verified Carbon Standards (2011). But the project has yet to apply for registration to be viable to obtain VCUs and market them.

5. Recommendations

Administrative issues

- In the administrative structure, PEDAI is indicated has having a direct link to the local people's organizations. If PEDAI will eventually take over supervision and project management, then its role and responsibilities should be clearly defined.
- Implement and information, education and communications strategy to encourage other landholders of suitable parcels to participate in the project and the adoption of the agroforestation scheme.
- Enhance knowledge and skills of local communities in forest resource management, (technology, agroforestry systems, land quality management, soil and water conservation).
- Farmer-participants should learn to be self-sufficient and not merely depend on the financial incentives, to avoid the project only being sustained as long as there is continued funding.
- Draw up legally binding agreements (aside from technical, socio-economic and benefit-sharing arrangements) to integrate the accountabilities of each stakeholder.
- Stakeholders should know their duties and responsibilities and how to properly execute them. Teamwork is the key to success of the project and should be inculcated into all project participants.

Technical issues

- Carbon sequestration and monitoring was launched to provide investment opportunities for sustainable protection of the central Sierra Madre area, particularly along the Sierra Madre Biodiversity Corridor. It is crucial to identify and delineate areas for rehabilitation and suitable land for the project using the historical land-use and land-cover change scenario of its non-forest and degraded status.

- If the project is to expand, the project team will need an historical, baseline, land-use and land-cover map for the municipality, the entire QPL and/or Corridor to identify potential areas and ensure site suitability (to pass the eligibility criteria and the 'additionality' conditions). This includes the extent of forested land that needs to be protected and conserved and the areas that are deforested or non-forested that critically need rehabilitation by revegetation, reforestation or afforestation .
- Ensure that the project compliments the land-use or forest land-use plans of the municipalities.
- All the supporting documents required for registration need to be complied. The revised version (after corrective measures) of the PDD is crucial.
- For efficiency's sake, the project team should consider expanding the project's area.
- The project should consider producing planting materials on farms. If seedlings are not raised on site there may be a high mortality rate.
- For easy monitoring and verification there must be a record of how many trees and which specific species are planted on each landholding. Each landholder should have a record of their planting activities.

Policy issues

- The project team should undertake a land tenure status inventory within each barangay, municipality, the QPL and/or Corridor. This will determine which landholders and claimants hold original or secondary stewardship certificates and their validity.
- Although the sale or transfer (to another person who is not a family member) of a stewardship certificate is prohibited, some landholders are already secondary holders. This is the case at most Department of Environment and Natural Resources' Integrated Social Forestry sites, which later devolved to the local government unit, pursuant to general policies on devolution as contained in RA 7160 and the Department's Administrative Order No. 30, Series of 1992, prescribing the guidelines for the transfer and implementation of departmental functions to local government units.
- From the date of issue of a stewardship certificate, the land-cover status can also be verified because only open and occupied forest land is given stewardship under the

Integrated Social Forestry program. The stewardship certificate specifies the land-cover and land-use status of the parcel. It is valid for 25 years and renewable for another 25. After the 25 years, the tenure can be renewed under the name of any family member or passed on to the heirs.

- Documentation and mapping should be improved. We had difficulty retrieving documents and obtaining the list of Integrated Social Forestry beneficiaries within the QPL. A control map of the area showing parcels with stewardship certificates is needed.
- A land-use assessment and land-soil characterisation are vital to determine soil degradation status.

The technical and socio-economic arrangements should be clarified, especially as to who is directly responsible for the management and supervision of the project, the specific roles and functions of each participant, who provides what to who what support is needed.

Stakeholders should be realistic about what are the scope and limitations of the project in the form of livelihoods and what potential sources of income and benefits (rewards) the landholders can derive from engaging with the project.

Calculate that carbon prices would recover the actual costs of investment. This includes the cost of developing, operating and managing the project.

To sustain local community involvement, project partners (the provincial and municipal local government units) could allocate resources from their development funds to support participation through complementary livelihoods, technical and marketing assistance.

- The project plan should include a cost estimate.
- Detailed information on the financial aspects is necessary for investors to decide if investment is viable as well as for transparency for the participants.
- The financial aspects would show the viability of the project. Alternative funding sources (other innovative sources) could also help the project become sustainable.

Research issues

Supporting studies on the viability of the choice of species and the economic feasibility of the land management will help ensure sustainability. The viability of selected forest tree and fruit tree species, including integrated crops, should be examined, taking into account the land-soil characteristics and the circumstances of the whole landscape.

- An economic valuation of the two land-use management systems (purely tree-based plantations and agroforestry farms) is needed. Inadequate and unstable household income to support food and basic needs can lead project participants to divert their attention to other sources and may lead to project abandonment.
- Incentives and rewards mechanisms that are feasible and acceptable by the project participants should be investigated.
- A land assessment, including soil-quality analysis of the parcels, should be carried out to determine the feasibility of the multi-crop agroforestry farms.
- The project team needs to learn cost-effective measurement, monitoring and verification as well as valuation of environmental services.
- Baseline or reference data needs to be established that will serve as the basis of claim for carbon credits. Simplified methods should be used for carbon estimation based on the proposed agroforestation.
- For carbon sequestration, a database needs to be established on the biometrics of the tree species (for example, biomass and carbon content at certain ages) to be planted and registered for carbon credits. In this way, landholders can also monitor and estimate carbon storage based on the number of trees on their land.
- Develop low-cost and effective systems for monitoring and verifying carbon sequestration that are farm specific and with landholders' participation.

6. Lessons learned

- When proposing a forest-carbon development project, the area should be clearly defined and parcels/landholdings and boundaries delineated. Site suitability—not only land eligibility and fulfilling additionality but also the size of the project area—is important. This is the foremost criteria that should be given attention in the project proposal before any other criterion is considered. This will prevent waste of finances, time and effort.
- Aside from the technical capacity of the project proponent and the technical support team, proper information and understanding of the project development process, including rules and guidelines of the carbon and environmental services rewards market, is crucial.
- The engagement of the donor is attributed to the capacity (networks) of the proponent. CI Philippines has the technical capacity to support networking. However, the series of corrective actions undertaken and project document revision and revalidation made shows the difficulty of complying with the criteria. The project activity development document has still to be submitted for registration.

For this project, since it is applying under the voluntary market, two project documents had to be submitted for validation: a PDD to the Climate, Community and Biodiversity Standards; and another to the Verified Carbon Standards. The latter is yet to be submitted.

Under the CDM guidelines, the validation of a PDD by a third party is not an automatic assurance of designated national authority approval. The PDD has yet to be submitted to the Department of Environment and Natural Resources' CDM Secretariat and Forest Management Bureau (the technical evaluation committee).

- The land management strategy has to specify how many hectare will be planted with purely forest tree species and whether the plantations are intended for permanent protection, for production forests or parts of both.
- The validity of the tenure instrument of the parcels included in the project has to match to the project's duration, which is the crediting period. The status of the land

tenure instruments must be verified, especially for stewardship certificates issued under the forest land classification, such as confirming the validity of the issue and whether the name on the certificate corresponds to the current steward. For privately owned parcels under the Alienable and Disposable land classification, a check should be carried out to see if there are other claimants, no pending case in court, and not under any form of mortgage.

The political will and strong commitment of major stakeholders to implement the project is vital. Particularly, the involvement of government agencies working in the locality is crucial. They should be the first to spearhead the undertaking and realise the benefits.

References and further readings

[CI Philippines] Conservation International Philippines. 2010. *Sierra Madre Biodiversity Corridor Project Design Document Revised: May, 2010*. Manila: Conservation International Philippines. Available from http://www.climate-standards.org/projects/index.html.

De Gryz S, Durschinger L. 2009. *Payment for ecosystem services: developing forest carbon projects in Nepal*. A case study under the USAID TRANSLINK program. Washington, DC: Enterprise Works/VITA; Terra Global Capital; ANSAB.

Eken G, Bennun L, Brooks TM, Darwall W, Fishpool LDC, Foster M, Knox D, Langhammer P, Matiku P, Radford E, Salaman P, Sechrest W, Smith ML, Spector S, Tordoff A. 2004. Key biodiversity areas as site conservation targets. *BioScience* 54(12): 1110–1118.

[DENR] Department of Environment and Natural Resources. 2004. *Administrative Order No. 2005-17 Subject: Rules and Regulations Governing the Implementation of Executive Order No. 320, Series of 2004, Designating the DENR as the National Authority for the Clean Development Mechanism.* Quezon City, Philippines: Department of Environment and Natural Resources.

[DENR] Department of Environment and Natural Resources. 2009. *Special Order No. 2009-795 Series of 2009. Creating the Project Steering Committee and Technical Working Group for the Project 'Linking Communities in Southeast Asia to Forestry-Related Verified Carbon Markets' (TCP/RAS/3210).* Quezon City, Philippines: Department of Environment and Natural Resources.

[FMB] Forest Management Bureau. 2007. *Circular No. 01 Series of 2007. Rules and regulations governing the evaluation for the Clean Development Mechanism (CDM) Afforestation/Reforestation (Affo/Refo) project activities.* Quezon City, Philippines: Forest Management Bureau.

[FMB] Forest Management Bureau. 1990–2008. *Philippine Forestry Statistics*. Quezon City: Forest Management Bureau. Available from htp://forestry.denr.gov.ph/statbook.htm.

[IGES] Institute for Global Environmental Strategies. 2009. *CDM in CHARTS v. 7.0 February 2009*. Updated up to the results of the EB45. Tokyo: Institute for Global Environmental Strategies.

Gosling L, Edwards E. 1995. *Toolkits: a practical guide to assessment, monitoring, review and evaluation.* London: Save the Children.

Lal R. 1995. *Sustainable management of soil resources in the humid tropics*. Tokyo: United Nations University Press.

Lasco, R.D. 2008. Tropical forests and climate change mitigation: the global potential and cases from the Philippines. *Asian Journal of Agriculture and Development* 5(1): 81–98.

Lasco RD, Pulhin FB. 2003. Philippine forest ecosystems and climate change: carbon stocks, rate of sequestration and the Kyoto Protocol. *Annals of Tropical Research* 25(2): 37–51.

Lasco RD, Pulhin FB, Sanchez PA, Villamor GB, Villegas KA. 2008. Climate change and forest ecosystems in the Philippines: vulnerability, adaptation and mitigation. *Journal of Environmental Science and Management* 11(1): 1–14.

Nair PKR. 1993. *An introduction to agroforestry*. Dordrecht, The Netherlands: Kluwer Academic Publishers.

Sandabacka J. 2004. *Be sure: the importance of confidence in project management*. Nordnet Conference on Successful Project Management, 29 September–2 October. Helsinki: Nordnet. Available from http://www.icoste.org/Roundup1204/Sandabacka.pdf. Accessed 1 October 2010.

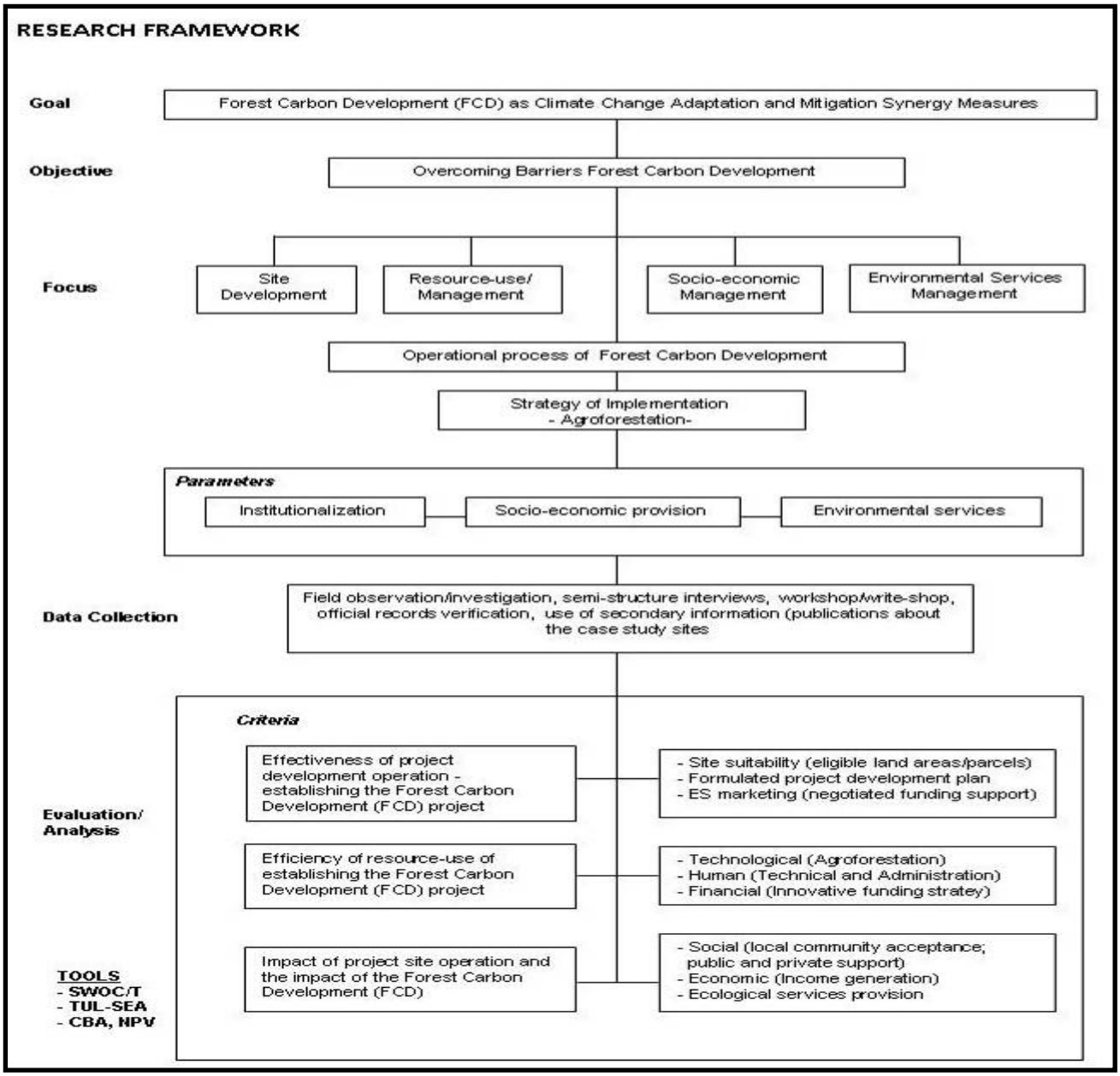
[UNFCCC] United Nations Framework Convention on Climate Change. *Guidelines for Completing CDM-AR-PDD and CDM-AR-NM.* Version 10. New York: United Nations Framework Convention on Climate Change.

Verified Carbon Standards. 2009. http://www.v-c-s.org/programs.html and http://www.v-c-s.org/docs/ VCS%20ProjectDevelopers%20091910.pdf. Accessed on March 2010.

Yin RK. 1984. *Case study research, design and methods*. Los Angeles: Sage Publications.

Appendices

Appendix 1. Research project framework: 'Overcoming barriers of smallholder forest carbon development in the Philippines'



Appendix 2. Description of participating land parcels

Lot ID	Barangay	Area (ha)	People's Organization (PO)	Landowners/stewardship certificate holders	Year to renew certificate	Vegetation	Year to plant
Agroforestry							
A01	Sangbay, Nagtipunan	1.3	SUBEFO	CSC	2012	cropland	2010
A02	Sangbay, Nagtipunan	0.7	SUBEFO	CSC	2010	cropland	2010
A03	Sto Nino, Maddela	1.3	STISFA	CSC	2014	cropland	2009
A04	Divisoria Sur, Maddela	0.8	DSAFA	CSC	2013	cropland	2007
A05	Sto Nino, Maddela	1.0	STISFA	CSC	2014	cropland	2009
A06	Sto Nino, Maddela	1.7	STISFA	CSC	2014	cropland	2009
A07	Cofcaville, Maddela	2.5	DSAFA	CSC	2013	cropland	2009
A08	Divisoria Sur, Maddela	2.1	DSAFA	Private land owner/A & D		cropland	2007
A09	Sto Nino, Maddela	0.9	STISFA	CSC	2014	cropland	2009
A10	Sto Nino, Maddela	0.4	STISFA	CSC	2014	cropland	2009
A11	Sangbay, Nagtipunan	0.5	SUBEFO	CSC	2012	cropland	2010
A12	Cofcaville, Maddela	0.6	DSAFA	CSC	2013	cropland	2010
A13	Sto Nino, Maddela	0.5	STISFA	CSC	2015	cropland	2009
A14	Sto Nino, Maddela	0.5	STISFA	CSC	2016	cropland	2009
A15	Divisoria Sur, Maddela	0.9	DSAFA	CSC	2013	cropland	2010
A16	Divisoria Sur, Maddela	3.0	DSAFA	CSC	2013	cropland	2010
A17	Divisoria Sur, Maddela	1.3	DSAFA	CSC	2013	cropland	2010
A18	Sto Nino, Maddela	0.1	STISFA	CSC	2014	cropland	2010
A19	Sto Nino, Maddela	0.6	STISFA	CSC	2013	cropland	2010
A20	Cofcaville, Maddela	0.4	DSAFA	CSC	2013	cropland	2010
A21	Sto Nino, Maddela	0.3	STISFA	CSC	2017	cropland	2009
A22	Sto Nino, Maddela	0.2	STISFA	CSC	2018	cropland	2009
A23	Sto Nino, Maddela	0.6	STISFA	CSC	2019	cropland	2009
Reforestation							
R01-	Divisoria Sur,	4.8	DSAFA	CSC	2013	cropland	2007
R03	Maddela						
R04	Sangbay, Nagtipunan	0.9	SUBEFO	CSC	2011	grassland	2010
R05	Sto Nino, Maddela	0.6	STISFA	CSC	2014	cropland	2009
R06	Divisoria Norte, Maddela	0.7	DSAFA	CSC	2013	cropland	2009
R07	Sto Nino, Maddela	0.8	STISFA	CSC	2014	cropland	2009
R08	Sto Nino, Maddela	0.6	STISFA	CSC	2014	cropland	2009
R09	Sto Nino, Maddela	0.8	STISFA	CSC	2014	cropland	2009
R10	Sto Nino, Maddela	2.6	STISFA	CSC	2014	cropland	2009

R11	Sto Nino, Maddela	0.6	STISFA	CSC	2014	cropland	2009
R12	Cofcaville, Maddela	4.5	DSAFA	CSC	2014	cropland	2009
R13	Sto Nino, Maddela	2.6	STISFA	CSC	2014	cropland	2009
R14	Cofcaville, Maddela	3.1	DSAFA	CSC	2014	cropland	2009
R15	Sto Nino, Maddela	2.0	STISFA	CSC	2014	cropland	2009
R16	Sangbay, Nagtipunan	1.1	SUBEFO	CSC	2013	cropland	2010
R17	Cofcaville, Maddela	1.6	DSAFA	CSC	2013	cropland	2010
R18	Sangbay, Nagtipunan	1.1	SUBEFO	CSC	2011	grassland	2010
R19	Cofcaville, Maddela	1.1	DSAFA	CSC	2013	cropland	2010
R20	Sangbay, Nagtipunan	4.2	SUBEFO	CSC	2012	cropland	2010
R21	Sangbay, Nagtipunan	0.5	SUBEFO	CSC	2013	cropland	2010
R22	Sangbay, Nagtipunan	1.5	SUBEFO	CSC	2013	grassland	2010
R23	Sangbay , Nagtipunan	3.4	SUBEFO	CSC	2014	grassland	2010
R24	Sangbay, Nagtipunan	3.1	SUBEFO	CSC	2014	grassland	2010
R25	Sangbay, Nagtipunan	2.9	SUBEFO	CSC	2013	cropland	2010
R26	Cofcaville, Maddela	0.6	DSAFA	CSC	2015	cropland	2010
R27	Sto Nino, Maddela	2.4	STISFA	CSC	2014	cropland	2010
R28	Sangbay, Nagtipunan	3.5	SUBEFO	CSC	2012	cropland	2010
R29	Cofcaville, Maddela	0.6	DSAFA	CSC	2013	cropland	2010
R30	Sangbay, Nagtipunan	2.8	SUBEFO	CSC	2014	cropland	2010
R31	Cofcaville, Maddela	6.1	DSAFA	CSC	2012	cropland	2010
R32	San Salvador, Maddela	12.8	DSAFA	Private land owner/A & D		grassland	2010
R33	Sangbay, Nagtipunan	2.4	SUBEFO	CSC	2012	grassland	2010
R34	Sangbay, Nagtipunan	1.8	SUBEFO	CSC	2012	grassland	2010
R35	Sangbay, Nagtipunan	1.4	SUBEFO	CSC	2012	cropland	2010
R36	Sto Nino, Maddela	0.6	STISFA	CSC	2014	cropland	2010
R37	Sto Nino, Maddela	1.3	STISFA	CSC	2014	cropland	2010

R38	Sangbay, Nagtipunan	3.7	SUBEFO	CSC	2014	cropland	2010
R39	Cofcaville, Maddela	1.7	DSAFA	CSC	2013	cropland	2010
R40	Cofcaville, Maddela	0.6	DSAFA	CSC	2013	cropland	2010
R41	Sangbay, Nagtipunan	0.4	SUBEFO	CSC	2011	cropland	2010
R42	Sangbay, Nagtipunan	1.0	SUBEFO	CSC	2015	grassland	2010
R43	Sangbay, Nagtipunan	3.8	SUBEFO	CSC	2015	cropland	2010
R44	Sangbay, Nagtipunan	1.3	SUBEFO	CSC	2011	cropland	2010
R45	Sto Nino, Maddela	1.0	STISFA	CSC	2014	cropland	2010
R46	Sto Nino, Maddela	0.7	STISFA	CSC	2014	cropland	2010
R47	Sto Nino, Maddela	4.2	STISFA	CSC	2014	cropland	2010
R48	Sto Nino, Maddela	1.6	STISFA	CSC	2014	cropland	2010
R49	Sto Nino, Maddela	1.4	STISFA	CSC	2014	cropland	2010
R50	Sto Nino, Maddela	0.9	STISFA	CSC	2014	cropland	2010
R51	Cofcaville, Maddela	2.6	SUBEFO	CSC	2013	grassland	2010
R52	Sangbay, Nagtipunan	2.7	SUBEFO	CSC	2014	grassland	2010
R53	Sangbay, Nagtipunan	2.5	SUBEFO	CSC	2010	cropland	2010
R54	Sto Nino, Maddela	2.4	STISFA	CSC	2015	cropland	2010
R55	Sangbay, Nagtipunan	2.2	SUBEFO	CSC	2014	cropland	2010
R56	Sangbay, Nagtipunan	1.9	SUBEFO	CSC	2013	cropland	2010
R57	Sto Nino, Maddela	2.1	STISFA	CSC	2014	cropland	2010
R58	Sangbay, Nagtipunan	2.0	SUBEFO	CSC	2011	grassland	2010
R59	Sangbay, Nagtipunan	2.0	SUBEFO	CSC	2010	grassland	2010
R60	Cofcaville, Maddela	2.0	DSAFA	CSC	2009	grassland	2010
R61	Sangbay, Nagtipunan	2.0	SUBEFO	CSC	2014	grassland	2010
R62	Sangbay, Nagtipunan	1.8	SUBEFO	CSC	2014	cropland	2010
R63	Sangbay, Nagtipunan	1.0	SUBEFO	CSC	2012	cropland	2010
R64	Sangbay, Nagtipunan	1.5	SUBEFO	CSC	2010	grassland	2010
R65	Sangbay, Nagtipunan	1.5	SUBEFO	CSC	2009	grassland	2010
R66	Cofcaville, Maddela	1.4	DSAFA	CSC	2013	grassland	2010

R67	Sangbay, Nagtipunan	1.4	SUBEFO	CSC	2015	cropland	2010
R68	Sangbay, Nagtipunan	1.4	SUBEFO	CSC	2010	cropland	2010
R69	Sangbay, Nagtipunan	1.0	SUBEFO	CSC	2011	cropland	2010
R70	Sto Nino, Maddela	1.4	STISFA	CSC	2013	cropland	2010
R71	Sangbay, Nagtipunan	1.3	SUBEFO	CSC	2010	grassland	2010
R73	Sangbay, Nagtipunan	1.2	SUBEFO	CSC	2011	cropland	2010
R74	Sangbay, Nagtipunan	1.2	SUBEFO	CSC	2009	grassland	2010
R75	Sangbay, Nagtipunan	1.2	SUBEFO	CSC	2014	cropland	2010
R76	Sangbay, Nagtipunan	0.9	SUBEFO	CSC	2012	cropland	2010
R77	Sangbay, Nagtipunan	1.1	SUBEFO	CSC	2012	cropland	2010
R78	Sangbay, Nagtipunan	1.1	SUBEFO	CSC	2010	cropland	2010
R79	Sangbay, Nagtipunan	1.1	SUBEFO	CSC	2012	cropland	2010
R80	Sangbay, Nagtipunan	1.0	SUBEFO	CSC	2011	cropland	2010
R81	Sangbay, Nagtipunan	1.0	SUBEFO	CSC	2012	cropland	2010
R82	Sangbay, Nagtipunan	1.0	SUBEFO	CSC	2012	grassland	2010
R83	Sangbay, Nagtipunan	1.0	SUBEFO	CSC	2009	grassland	2010
R84	Sangbay, Nagtipunan	0.9	SUBEFO	CSC	2014	cropland	2010
R85	Sangbay, Nagtipunan	0.7	SUBEFO	CSC	2014	cropland	2010
R87	Sangbay, Nagtipunan	0.8	SUBEFO	CSC	2011	grassland	2010

* DSAFA: Divisoria Sur Agroforestry Farmers Association; STISFA: Sto. Nino Integrated Social Forestry Association; SUBEFO: Sangbay Upper Basin Ecological Farmers Organization.

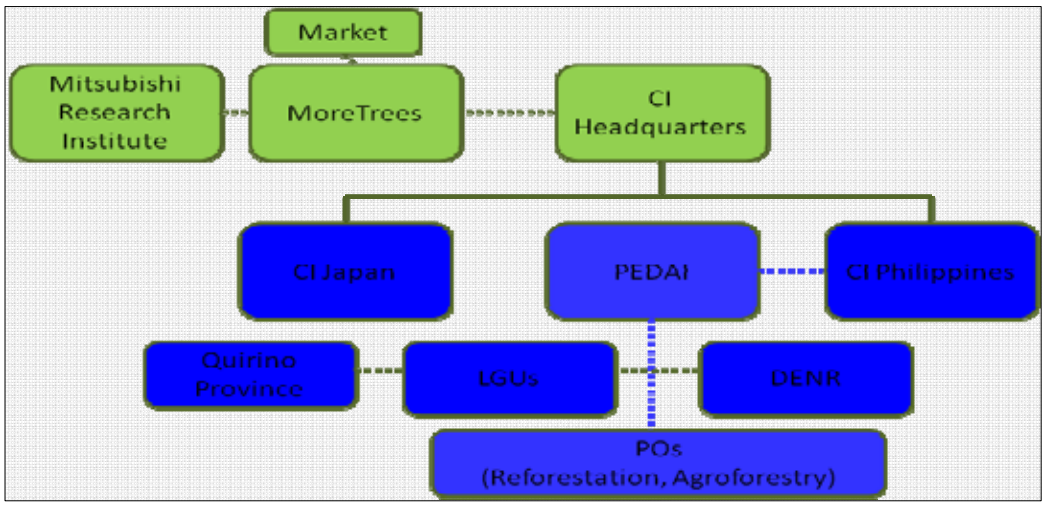
** CSC: Certificate of Stewardship Contract; A and D: Alienable and Disposable (meaning private land

Appendix 3. Estimate of potential greenhouse gas (GHG) removals generated by the project

Year	Area (ha)	Baseline net GHG removals (t CO_2e)	Leakage (t CO_2e)	Annual Anthropogenic GHG (t CO_2e)			Net GHG (tCO_2e)
				Grassland AR-AMS0	Cropland AR-AMS000	Total	
2007	8	0	0	0	107	107	107
2008	8	0	0	0	104	104	211
2009	36	0	0	0	509	509	720
2010	177	0	0	843	1,931	2,774	3,494
2011	177	0	0	824	1,793	2,617	6,112
2012	177	0	0	817	1,882	2,699	8,811
2013	177	0	0	813	1,472	2,285	11,096
2014	177	0	0	-271	145	-126	10,970
2015	177	0	0	811	1,700	2,511	13,482
2016	177	0	0	809	1,863	2,672	16,154
2017	177	0	0	807	1,193	2,000	18,154
2018	177	0	0	-986	-998	-1,985	16,169
2019	177	0	0	807	1,859	2,666	18,835
2020	177	0	0	805	1,855	2,660	21,496
2021	177	0	0	804	1,852	2,656	24,151
2022	177	0	0	802	1,745	2,547	26,699
2023	177	0	0	801	1,847	2,648	29,347
2024	177	0	0	800	1,495	2,296	31,642
2025	177	0	0	799	1,514	2,313	33,955
2026	177	0	0	798	1,841	2,640	36,595
2027	177	0	0	798	1,554	2,351	38,946
2028	177	0	0	797	1,833	2,630	41,576
2029	177	0	0	796	876	1,672	43,247
	Total	0	0	13,275	29,972	41,576	

*The carbon sequestration in the last year (shaded) is not counted toward the total as the final verification to be conducted during this year will not include this full amount.

Appendix 4. Administrative structure of the Quirino forest-carbon project



WORKING PAPERS IN THIS SERIES

2005

1. Agroforestry in the drylands of eastern Africa: a call to action
2. Biodiversity conservation through agroforestry: managing tree species diversity within a network of community-based, nongovernmental, governmental and research organizations in western Kenya.
3. Invasion of *prosopis juliflora* and local livelihoods: Case study from the Lake Baringo area of Kenya
4. Leadership for change in farmers organizations: Training report: Ridar Hotel, Kampala, 29th March to 2nd April 2005.
5. Domestication des espèces agroforestières au Sahel : situation actuelle et perspectives
6. Relevé des données de biodiversité ligneuse: Manuel du projet biodiversité des parcs agroforestiers au Sahel
7. Improved land management in the Lake Victoria Basin: TransVic Project's draft report.
8. Livelihood capital, strategies and outcomes in the Taita hills of Kenya
9. Les espèces ligneuses et leurs usages: Les préférences des paysans dans le Cercle de Ségou, au Mali
10. La biodiversité des espèces ligneuses: Diversité arborée et unités de gestion du terroir dans le Cercle de Ségou, au Mali

2006

11. Bird diversity and land use on the slopes of Mt. Kilimanjaro and the adjacent plains, Tanzania
12. Water, women and local social organization in the Western Kenya Highlands
13. Highlights of ongoing research of the World Agroforestry Centre in Indonesia
14. Prospects of adoption of tree-based systems in a rural landscape and its likely impacts on carbon stocks and farmers' welfare: The FALLOW Model Application in Muara Sungkai, Lampung, Sumatra, in a 'Clean Development Mechanism' context
15. Equipping integrated natural resource managers for healthy Agroforestry landscapes.
17. Agro-biodiversity and CGIAR tree and forest science: approaches and examples from Sumatra.
18. Improving land management in eastern and southern Africa: A review of policies.

19. Farm and household economic study of Kecamatan Nanggung, Kabupaten Bogor, Indonesia: A socio-economic base line study of Agroforestry innovations and livelihood enhancement.
20. Lessons from eastern Africa's unsustainable charcoal business.
21. Evolution of RELMA's approaches to land management: Lessons from two decades of research and development in eastern and southern Africa
22. Participatory watershed management: Lessons from RELMA's work with farmers in eastern Africa.
23. Strengthening farmers' organizations: The experience of RELMA and ULAMP.
24. Promoting rainwater harvesting in eastern and southern Africa.
25. The role of livestock in integrated land management.
26. Status of carbon sequestration projects in Africa: Potential benefits and challenges to scaling up.
27. Social and Environmental Trade-Offs in Tree Species Selection: A Methodology for Identifying Niche Incompatibilities in Agroforestry *[Appears as AHI Working Paper no. 9]*
28. Managing tradeoffs in agroforestry: From conflict to collaboration in natural resource management. *[Appears as AHI Working Paper no. 10]*
29. Essai d'analyse de la prise en compte des systemes agroforestiers pa les legislations forestieres au Sahel: Cas du Burkina Faso, du Mali, du Niger et du Senegal.
30. Etat de la recherche agroforestière au Rwanda etude bibliographique, période 1987-2003

2007

31. Science and technological innovations for improving soil fertility and management in Africa: A report for NEPAD's Science and Technology Forum.
32. Compensation and rewards for environmental services.
33. Latin American regional workshop report compensation.
34. Asia regional workshop on compensation ecosystem services.
35. Report of African regional workshop on compensation ecosystem services.
36. Exploring the inter-linkages among and between compensation and rewards for ecosystem services CRES and human well-being
37. Criteria and indicators for environmental service compensation and reward mechanisms: realistic, voluntary, conditional and pro-poor
38. The conditions for effective mechanisms of compensation and rewards for environmental services.
39. Organization and governance for fostering Pro-Poor Compensation for Environmental Services.

40. How important are different types of compensation and reward mechanisms shaping poverty and ecosystem services across Africa, Asia & Latin America over the Next two decades?
41. Risk mitigation in contract farming: The case of poultry, cotton, woodfuel and cereals in East Africa.
42. The RELMA savings and credit experiences: Sowing the seed of sustainability
43. Yatich J., Policy and institutional context for NRM in Kenya: Challenges and opportunities for Landcare.
44. Nina-Nina Adoung Nasional di So! Field test of rapid land tenure assessment (RATA) in the Batang Toru Watershed, North Sumatera.
45. Is Hutan Tanaman Rakyat a new paradigm in community based tree planting in Indonesia?
46. Socio-Economic aspects of brackish water aquaculture (*Tambak*) production in Nanggroe Aceh Darrusalam.
47. Farmer livelihoods in the humid forest and moist savannah zones of Cameroon.
48. Domestication, genre et vulnérabilité : Participation des femmes, des Jeunes et des catégories les plus pauvres à la domestication des arbres agroforestiers au Cameroun.
49. Land tenure and management in the districts around Mt Elgon: An assessment presented to the Mt Elgon ecosystem conservation programme.
50. The production and marketing of leaf meal from fodder shrubs in Tanga, Tanzania: A pro-poor enterprise for improving livestock productivity.
51. Buyers Perspective on Environmental Services (ES) and Commoditization as an approach to liberate ES markets in the Philippines.
52. Towards Towards community-driven conservation in southwest China: Reconciling state and local perceptions.
53. Biofuels in China: An Analysis of the Opportunities and Challenges of Jatropha curcas in Southwest China.
54. Jatropha curcas biodiesel production in Kenya: Economics and potential value chain development for smallholder farmers
55. Livelihoods and Forest Resources in Aceh and Nias for a Sustainable Forest Resource Management and Economic Progress
56. Agroforestry on the interface of Orangutan Conservation and Sustainable Livelihoods in Batang Toru, North Sumatra.
57. Assessing Hydrological Situation of Kapuas Hulu Basin, Kapuas Hulu Regency, West Kalimantan.
58. Assessing the Hydrological Situation of Talau Watershed, Belu Regency, East Nusa Tenggara.
59. Kajian Kondisi Hidrologis DAS Talau, Kabupaten Belu, Nusa Tenggara Timur.

60. Kajian Kondisi Hidrologis DAS Kapuas Hulu, Kabupaten Kapuas Hulu, Kalimantan Barat.
61. Lessons learned from community capacity building activities to support agroforest as sustainable economic alternatives in Batang Toru orang utan habitat conservation program (Martini, Endri et al.)
62. Mainstreaming Climate Change in the Philippines.
63. A Conjoint Analysis of Farmer Preferences for Community Forestry Contracts in the Sumber Jaya Watershed, Indonesia.
64. The highlands: a shared water tower in a changing climate and changing Asia
65. Eco-Certification: Can It Deliver Conservation and Development in the Tropics.
66. Designing ecological and biodiversity sampling strategies. Towards mainstreaming climate change in grassland management.
67. Towards mainstreaming climate change in grassland management policies and practices on the Tibetan Plateau
68. An Assessment of the Potential for Carbon Finance in Rangelands
69 ECA Trade-offs Among Ecosystem Services in the Lake Victoria Basin.
69. The last remnants of mega biodiversity in West Java and Banten: an in-depth exploration of RaTA (Rapid Land Tenure Assessment) in Mount Halimun-Salak National Park Indonesia
70. Le business plan d'une petite entreprise rurale de production et de commercialisation des plants des arbres locaux. Cas de quatre pépinières rurales au Cameroun.
71. Les unités de transformation des produits forestiers non ligneux alimentaires au Cameroun. Diagnostic technique et stratégie de développement Honoré Tabuna et Ingratia Kayitavu.
72. Les exportateurs camerounais de safou (Dacryodes edulis) sur le marché sous régional et international. Profil, fonctionnement et stratégies de développement.
73. Impact of the Southeast Asian Network for Agroforestry Education (SEANAFE) on agroforestry education capacity.
74. Setting landscape conservation targets and promoting them through compatible land use in the Philippines.
75. Review of methods for researching multistrata systems.
76. Study on economical viability of *Jatropha curcas* L. plantations in Northern Tanzania assessing farmers' prospects via cost-benefit analysis
77. Cooperation in Agroforestry between Ministry of Forestry of Indonesia and International Center for Research in Agroforestry
78. "China's bioenergy future. an analysis through the Lens if Yunnan Province
79. Land tenure and agricultural productivity in Africa: A comparative analysis of the economics literature and recent policy strategies and reforms

80. Boundary organizations, objects and agents: linking knowledge with action in Agroforestry watersheds
81. Reducing emissions from deforestation and forest degradation (REDD) in Indonesia: options and challenges for fair and efficient payment distribution mechanisms

2009

82. Mainstreaming climate change into agricultural education: challenges and perspectives
83. Challenging conventional mindsets and disconnects in conservation: the emerging role of eco-agriculture in Kenya's landscape mosaics
84. Lesson learned RATA garut dan bengkunat: suatu upaya membedah kebijakan pelepasan kawasan hutan dan redistribusi tanah bekas kawasan hutan
85. The emergence of forest land redistribution in Indonesia
86. Commercial opportunities for fruit in Malawi
87. Status of fruit production processing and marketing in Malawi
88. Fraud in tree science
89. Trees on farm: analysis of global extent and geographical patterns of agroforestry
90. The springs of Nyando: water, social organization and livelihoods in Western Kenya
91. Building capacity toward region-wide curriculum and teaching materials development in agroforestry education in Southeast Asia
92. Overview of biomass energy technology in rural Yunnan (Chinese – English abstract)
93. A pro-growth pathway for reducing net GHG emissions in China
94. Analysis of local livelihoods from past to present in the central Kalimantan Ex-Mega Rice Project area
95. Constraints and options to enhancing production of high quality feeds in dairy production in Kenya, Uganda and Rwanda

2010

96. Agroforestry education in the Philippines: status report from the Southeast Asian Network for Agroforestry Education (SEANAFE)
97. Economic viability of Jatropha curcas L. plantations in Northern Tanzania- assessing farmers' prospects via cost-benefit analysis.
98. Hot spot of emission and confusion: land tenure insecurity, contested policies and competing claims in the central Kalimantan Ex-Mega Rice Project area
99. Agroforestry competences and human resources needs in the Philippines
100. CES/COS/CIS paradigms for compensation and rewards to enhance environmental Services

101. Case study approach to region-wide curriculum and teaching materials development in agroforestry education in Southeast Asia
102. Stewardship agreement to reduce emissions from deforestation and degradation (REDD): Lubuk Beringin's Hutan Desa as the first village forest in Indonesia
103. Landscape dynamics over time and space from ecological perspective
1.04. A performance-based reward for environmental services: an action research case of "RiverCare" in Way Besai sub-watersheds, Lampung, Indonesia
105. Smallholder voluntary carbon scheme: an experience from Nagari Paningahan, West Sumatra, Indonesia
106. Rapid Carbon Stock Appraisal (RACSA) in Kalahan, Nueva Vizcaya, Philippines
107. Tree domestication by ICRAF and partners in the Peruvian Amazon: lessons learned and future prospects in the domain of the Amazon Initiative eco-regional program
108. Memorias del Taller Nacional: "Iniciativas para Reducir la Deforestación en la region Andino - Amazónica", 09 de Abril del 2010. Proyecto REALU Peru
109. Percepciones sobre la Equidad y Eficiencia en la cadena de valor de REDD en Perú –Reporte de Talleres en Ucayali, San Martín y Loreto, 2009. Proyecto REALU-Perú.
110. Reducción de emisiones de todos los Usos del Suelo. Reporte del Proyecto REALU Perú Fase 1
111. Programa Alternativas a la Tumba-y-Quema (ASB) en el Perú. Informe Resumen y Síntesis de la Fase II. 2da. versión revisada
112. Estudio de las cadenas de abastecimiento de germoplasma forestal en la amazonía Boliviana
113. Biodiesel in the Amazon
114. Estudio de mercado de semillas forestales en la amazonía Colombiana
115. Estudio de las cadenas de abastecimiento de germoplasma forestal en Ecuador
116. How can systems thinking, social capital and social network analysis help programs achieve impact at scale?
117. Energy policies, forests and local communities in the Ucayali Region, Peruvian Amazon
118. NTFPs as a Source of Livelihood Diversification for Local Communities in the Batang Toru Orangutan Conservation Program
119. Studi Biodiversitas: Apakah agroforestry mampu mengkonservasi keanekaragaman hayati di DAS Konto?
120. Estimasi Karbon Tersimpan di Lahan-lahan Pertanian di DAS Konto, Jawa Timur
121. Implementasi Kaji Cepat Hidrologi (RHA) di Hulu DAS Brantas, Jawa Timur
122. Kaji Cepat Hidrologi di Daerah Aliran Sungai Krueng Peusangan, NAD,Sumatra
123. A Study of Rapid Hydrological Appraisal in the Krueng Peusangan Watershed, NAD, Sumatra

2011

124. An Assessment of farm timber value chains in Mt Kenya area, Kenya
125. A Comparative financial analysis of current land use systems and implications for the adoption of improved agroforestry in the East Usambaras, Tanzania
126. Agricultural monitoring and evaluation systems
127. Challenges and opportunities for collaborative landscape governance in the East Usambara Mountains, Tanzania
128. Enhancing Knowledge Management to Advance Integrated Natural Resources Management Research, Development and Advocacy
129. Carbon-forestry projects in the Philippines: potential and challenges. The Mt Kitanglad Range forest-carbon development
130. Carbon forestry projects in the Philippines: potential and challenges. The Arakan Forest Corridor forest-carbon project
131. Carbon-forestry projects in the Philippines: potential and challenges. The Laguna Lake Development Authority's forest-carbon development project

Who we are

The World Agroforestry Centre is the international leader in the science and practice of integrating 'working trees' on small farms and in rural landscapes. We have invigorated the ancient practice of growing trees on farms, using innovative science for development to transform lives and landscapes.

Our vision

Our Vision is an 'Agroforestry Transformation' in the developing world resulting in a massive increase in the use of working trees on working landscapes by smallholder rural households that helps ensure security in food, nutrition, income, health, shelter and energy and a regenerated environment.

Our mission

Our mission is to advance the science and practice of agroforestry to help realize an 'Agroforestry Transformation' throughout the developing world.

United Nations Avenue, Gigiri - PO Box 30677 - 00100 Nairobi, Kenya
Tel: +254 20 7224000 or via USA +1 650 833 6645
Fax: +254 20 7224001 or via USA +1 650 833 6646
Southeast Asia Regional Programme - Sindang Barang, Bogor 16680
PO Box161 Bogor 16001, Indonesia
Tel: +62 251 625 415 - Fax: +62 251 625 416
www.worldagroforestry.org