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

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Working Paper no. 133

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Correct citation
Lopez RC, Abasolo EP, Lasco RD. 2011. *Carbon-forestry projects in the Philippines: potential and challenges: the Ikalahan Ancestral Domain forest-carbon development.* Working Paper no. 133. Bogor, Indonesia: World Agroforestry Centre (ICRAF) Southeast Asia Program.

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
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Indonesia

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Working Paper no. 133

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Emma P. Abasolo is currently the researcher in charge of the Rewarding Upland Poor for Environmental Services (RUPES) project at the World Agroforestry Centre Philippines. She is the facilitator of two project sites: 1) Kalahan, Nueva Vizcaya, a pilot site for a carbon sequestration mechanism; and 2) Bakun, Benguet, a pilot site for a payments for watershed services mechanism. She also assists at Lantapan, Bukidnon, which is another RUPES site examining payments for watershed services. She completed an undergraduate degree in forest products engineering and studied the characterisation of gums, a non-timber forest product from a local tree species. Her Masters in Environmental Science involved research on the sustainability of Almaciga resin production, assisted by a grant from the International Tropical Timber Organization. Her PhD in Environmental Engineering, which she studied for in Japan, examined 'ecosystem services-related quality of life analysis in urban areas'.

Rodel D. Lasco has been the Coordinator of the World Agroforestry Centre (ICRAF) 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 proposed forest carbon development project in the Ikalahan Ancestral Domain aims to improve the environmental and natural resource management of watersheds in Kalahan and lead to participation in the carbon and environmental services markets. This will be done by converting 900 ha of marginal, abandoned agricultural land to productive tree-based systems, improving the livelihoods of communities through agroforestry and protecting the watershed, enhancing biodiversity and improving the aesthetic values of the landscape for potential tourism.

The World Agroforestry Centre Philippines has assisted the Ikalahan, the indigenous people of the region, through their Kalahan Educational Foundation (KEF) by building their capacity to enter into the international carbon markets. KEF initially planned to participate in the market through the United Nations' Framework Convention on Climate Change's Clean Development Mechanism (CDM) then later through the Verified Carbon Standards and is now exploring the possibility of engaging with the Reducing Emissions from Deforestation and Degradation plus conservation (REDD+) scheme.

The study was conducted to assess the potential of, and challenges for, the proposed project to participate in carbon trading and rewards for environmental services mechanisms. We wanted to examine the strengths of the proposed forest-carbon development as well as the limitations that are hindering its institutionalisation.

The project will consist of an agroforestation scheme on 900 ha, through 1) planting purely forest trees for reforestation and greater carbon sequestration; and 2) agroforestry farms for livelihoods and lesser carbon sequestration. Total sequestration has been estimated at 89 776 t CO_2e over 20 years. The project implementers are the local indigenous people, represented by the KEF.

The prerequisite for any project activity is identification of the area. However, as of 2010, KEF had been able to delineate only 17 parcels of land with aggregate area of 112.27 ha, which is intended for forest tree establishment. The parcels for agroforestry farms had not yet been identified.

Further, KEF had yet to create a comprehensive project plan and prepare a project design document (PDD) following the standard templates required for the carbon markets. KEF needs strategic partners to help them do this, along with the required documents for environmental services registration and crediting. A one-year agreement with Mitsubishi UFJ Securities Co. Ltd. to provide consultancy services to help KEF with such activities had already expired.

We found that aside from the technical limitations of undertaking the planning process, the process of identifying the project area still remained a challenge for the KEF.

Generally, progress has only stemmed from the assistance provided by the World Agroforestry Centre Philippines through its Rewarding Upland Poor for Environmental Services (RUPES) project.

Keywords: Ikalahan Ancestral Domain, forest carbon, RUPES project, agroforestation, CDM, voluntary carbon market, REDD+ mechanism

Acknowledgements

The authors would like to thank the World Agroforestry Centre 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 and Robert Finlayson for editing and Tikah Atikah for design, both of the World Agroforestry Centre Southeast Asia Program.

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Acronyms

A/R	Afforestation and Reforestation
CADT	Certificate of Ancestral Domain Title
CDM	Clean Development Mechanism
CERs	Certified Emission Reductions
ERs	Emission Reductions
FALLOW	Forest, Agroforest, Low-value Landscape or Wasteland? model
IUCN	International Union for Conservation of Nature
KEF	Kalahan Educational Foundation
MUS	Mitsubishi UFJ Securities Co. Ltd
PAFID	Philippines Association for Intercultural Development
PDD	Project Design Document
RaCSA	Rapid Carbon Stock Appraisal
RABA	Rapid Agro-Biodiversity Appraisal
REDD	Reducing Emissions from Deforestation and Degradation
RUPES	Rewarding Upland Poor for Environmental Services
SWOC	Strengths, Weaknesses, Opportunities, Constraints
TULSEA	Trees in multi-Use Landscapes in Southeast Asia
UNFCCC	United Nations Framework Convention for Climate Change

1. Introduction

Rationale of the study

Rehabilitating denuded forests and degraded land is likely to have positive environmental impacts. Developing forest carbon through agroforestation[1] is seen as one of the ways by which this can be achieved. Aside from carbon sequestration in the atmosphere, these developments target other environmental benefits such as habitat restoration and biodiversity conservation, watershed rehabilitation and protection, land-soil improvement and enhancement of landscape aesthetics.

Schemes that make payments for providing environmental services are potential sources of income for smallholder farmers while also contributing to climate-change mitigation through forest-carbon development. For these farmers, the so-called 'carbon payment' from emission reduction credits could be an additional source of income that could help them adopt sustainable land-management practices. Such practices could further help them to adapt to climate variability while securing food supplies. However, the question remains whether smallholders can institutionalise a forest-carbon development project, participate in, and benefit from, environmental services payments through the United Nations' Framework Convention on Climate Change's Clean Development Mechanism (CDM), the Reducing Emissions from Deforestation and Degradation plus conservation (REDD+) scheme and other similar mechanisms.

This case study was conducted to identify appropriate institutional approaches, technological innovations and policy reforms necessary for Philippines' carbon-forestry projects to participate in carbon markets and engage in environmental services payments schemes. Specifically, we wanted to find ways to reduce the barriers associated with small-scale projects and smallholders' participation. In this paper we examine the proposed forest-carbon development project within the Ikalahan Ancestral Domain.

Objectives of the study

This case study aims to examine the potential of, and challenges for, the proposed project. There were several objectives.

1. To identify the strengths and limitations of the proposed forest-carbon development project to enter the carbon markets and other payments for environmental services mechanisms.
2. To identify the key issues associated with forest-carbon development planning and field implementation.
3. To determine the actions needed in management and policy to institutionalise the project.
4. To identify research needed.

[1] 'Agroforestation' in this context means land rehabilitation through the establishment of a tree-based system and intensification of land management through the establishment of small-scale agroforestry systems.

Background of the study

1973 Ikalahan tribal elders established the KEF to negotiate for indigenous people's rights. Through a Memorandum of Agreement (MOA No. 1) signed between the KEF and the Philippines Government through the then Bureau of Forestry, nearly 15 000 ha were designated as Kalahan Reserve within the ancestral domain claim. (Villamor and Lasco 2006).

1994 KEF established carbon-stock measurement and promoted forest improvement technology to expedite the growth rate of indigenous trees within the forest to improve carbon sequestration.

1997 The Indigenous People's Rights Act of 1997 (R.A. 8371) strengthened the right of Ikalahans to their ancestral domain (Villamor and Lasco 2006).

1994–1998 The Forest Farms Development Project, supported by the Biodiversity Conservation Network, was initiated 'to establish an effective resource management framework to ensure a stable and diverse forest ecosystem within the Kalahan Reserve'. The project aimed to develop income-generating opportunities based on forest products that would satisfy the needs of the community and, in turn, encourage the Ikalahans to conserve the biodiversity of the reserve. The project assisted in strengthening KEF Mountain Fresh jam and jelly production and assisted in research activities in support of conservation efforts within the Kalahan Reserve. The main product of KEF is the Mountain Fresh line of jams and jellies. The enterprise has been supplying major supermarkets in Manila since the late 1980s (Encarnacion 1999).

1999 The ancestral domain claim of 58 000 ha was approved and a Certificate of Ancestral Domain Claim (CADC) was issued (Rice and Pindog 2005, Dolom and Serrano 2005).

2003 Ikalahan Ancestral Domain was selected as the World Agroforestry Centre's RUPES[2] pilot site.

2004 The forest-carbon development project was initiated (Villamor and Lasco 2006).

2005 Focusing on carbon sequestration as an environmental service, the Kalahan was evaluated as qualified for entry into a payment for environmental services mechanism (Villamor and Lasco 2006).

2006 With technical assistance from the RUPES project, a project idea note was created (Villamor and Lasco 2006).

The Certificate of Ancestral Domain Title over a total of 30 758 ha was issued in April 2006.

2007 The project idea note was finalised for 900 ha of marginal and abandoned agricultural land and grassland within the Domain. This was to be submitted under the CDM

[2] RUPES, a project funded by the International Fund for Agricultural Development, is an Asian network for facilitating environmental service agreements between the upland poor and downstream beneficiaries. One focus is on carbon storage as a key environmental service. In the Kalahan, RUPES is helping local communities build capacity for entering the international carbon market.

afforestation/reforestation mechanism and also to potential buyers (RUPES undated, Villamor and Lasco 2006).

2008 KEF signed (9 June 2008) a one-year agreement for consulting services with Mitsubishi UFJ Securities Co. Ltd (MUS). The agreement stipulated that 'KEF is developing in at least 900 hectare of the Ikalahan Ancestral Domain located in Nueva Vizcaya and Nueva Ecija provinces and wishes to acquire Certified Emission Reductions (CERs) and other Emission Reductions (ERs) arising from the project. MUS will provide consultancy services on issues relating to the creation and acquisition of CERs and other matters related to the CDM as well as on the generation of ERs'.

2009 The RUPES project provided an amount to KEF to gather data needed for the project design document (PDD)[3]. The activities supposedly included mapping the 900 ha, a boundary survey and delineation of parcels, and formulating the project plan and specific land-management activities.

2010 With funding from BMZ, Germany, the World Agroforestry Centre Philippines carried out activities in Kalahan as part of its Trees in Multi-use Landscapes in Southeast Asia project. Specifically, a Rapid Agro-Biodiversity Appraisal[4] and Rapid Carbon Stock Appraisal[5] were conducted to provide essential baseline information. This also provided a basis for the negotiation of carbon credits as well as for assessing the feasibility of mechanisms other than carbon markets.

[3] A project design document is required to register the project with the United Nations Framework Convention on Climate Change.

[4] Biodiversity can be an environmental service for which local people can be rewarded. The RABA can provide essential data to determine a landscape's biodiversity value, integrating research results into community-based biodiversity conservation planning and implementation. The RABA study in Kalahan was expected to provide a documented report on the area's biodiversity and agro-biodiversity conservation values; identify hotspots and other important land uses for agro-biodiversity; gather the perspectives of stakeholders (carbon sellers and buyers) on biodiversity conservation and mechanisms to sustain rewards for environmental services; and assess the opportunity to develop an environmental services rewards mechanism for sustainable agro-biodiversity conservation.

[5] The results of the RaCSA provide essential baseline information for the negotiation of carbon credits with buyers. RaCSA also provides experience and insights in how to reduce transaction costs. The objectives of RaCSA in Kalahan were to identify the different land-use practices and key drivers of change; estimate the carbon stocks of the main land uses at plot and landscape level; assess the opportunity to use or adjust the policy framework to enhance or maintain carbon stocks and complete the modeling of land use and carbon dynamics using the FALLOW model.

2. Methodology

Sources of data and method of data collection

Primary and secondary data were used in this case study. The assessment started in 2009, initially by conducting literature reviews from reports and research publications.

Since the project team is still formulating their development plan for the proposed project, the primary sources we drew on were the submitted reports. These included the project idea note, the RUPES activity reports and the draft plan for the project. We also conducted field observations and unstructured, informal interviews with some KEF members, household and individual participants and other stakeholders. We also interviewed RUPES researchers and key KEF personnel involved in the documentation.

Method of analysis

With reference to the overall framework (Appendix 1) developed for this 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.

- Effectiveness of institutionalising the proposed project.
- Efficiency of resource use and mobilisation.
- Impact.

We based our assessment on the project development plan, focusing on site development, resource use and mobilisation, socio-economic and environmental services management.

The key issues of the project were identified in the strengths, weaknesses, opportunities and constraints (SWOC) analysis as specifically related to 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).

Our recommendations emphasise the management approach, what policies are needed and proposed research focus.

3. Results and discussion

Description of the proposed project

Site description

The Ikalahan Ancestral Domain, otherwise known as Kalahan, is located approximately at 11° N and 122° E, with elevation from 600 to 1717 masl, average rainfall recorded at over 4000 mm per year and temperatures between 8° to 24° (Villamor and Lasco 2006). The claim by the Ikalahan domain covers 58 000 ha of mountainous areas in the provinces of Pangasinan (10 000 ha), Nueva Ecija (10 000 ha) and Nueva Vizcaya (38 000 ha), in Northern Luzon, Philippines. Of the 58 000 ha originally claimed as ancestral domain, 18% (10 440 ha) was classified as protected forest, 70% (40 600 ha) as production forest and 12% (6960 ha) used for farming (Decena 2009).

There are three important river systems within the domain: Talavera in Nueva Ecija; Magat in Nueva Vizcaya; and Pampang, which runs into Pangasinan. These river systems are important for the downstream communities (Villamor and Lasco 2006). The ridge known as Bantay Lakay divides the watershed between two peaks and determines water flow (RUPES undated).

There about 20 000 people living within the domain, 90% of whom belong to the Ikalahan tribe and 5% to other tribes such as Ifugao, Ibaloy and Kankanai (RUPES undated). The Ikalahan, which literally means ‘people of the mossy, upland, broadleaf forests’ (Rice and Pindog 2005, Villamor and Lasco 2006), have lived in the area for centuries, hunting, gathering forest products, conducting swidden farming and planting agricultural crops. In the past, each family was allowed to make *kaingin* or swidden anywhere. Forests were targeted for this activity since the soil was still very fertile. This resulted in widespread burning and conversion of the forests to farm land. As the Ikalahan population increased, the traditional farming system required more land, resulting in even further reduction of the forests (Dolom and Serrano 2005). Through time, the Ikalahan learned to observe fallow periods to regain soil fertility, however, the time needed for successful rotation was 15-to-18 years or even longer. The majority of the Ikalahan still practise swidden cultivation but integrate tree such as alnus in their farms (Lasco et al. 2010).

Within the Kalahan Forest Reserve there are five major land-use and land-cover types: agriculture, agroforest, grassland, reforestation and secondary forest (Table 1). Agroforestry, reforestation and secondary forests have high, relative diversity value and evenness. A total of 286 species of vascular plants were recorded belonging to 75 families. Eight species are listed as critically endangered in the IUCN Red Book, along with bird and other wildlife species. Between 1981 and 2001, there was an increase in reforestation (for example, mahogany) and old pines, but there was also a decrease of forests and agricultural areas. From this land-cover change, it is estimated that 1400 tonne of carbon was emitted per year and carbon was sequestered at an average of 500 tonne during the period 1989 to 2001 (Lasco et al. 2010).

Table 1. Major land use types identified in the Kalahan Forest Reserve

IDENTIFIED LAND USES	SUBSETS	BARANGAY
Secondary forest	Pine dominated	Sta Rosa
	Dipterocarp dominated	Baracbac
	Myrtaceous oak dominated	Malico
Agroforest	Tree/fruit crop	Sta Rosa
		Baracbac
		Bacneng
Agriculture	Garden/vegetable	Bacneng
	Swidden/fallow	Tactac
		Atbu
Grassland	Abandoned	Atbu
	Pasture	Sta. Rosa
	Pure grassland	Malico
Reforestation	Old rehabilitated	Bacneng
	Pines and Alnus dominated	Imugan

Source: Villamor et al. 2010

Of the five land uses sampled in the Reserve, grassland and agriculture have the lowest aboveground carbon stock (4.1 t/ha) while reforested areas (55.4 t/ha) have the highest followed by agroforestry (34.2 t/ha) and secondary forests (28.9 t/ha) (Table 2).

Table 2: Mean aboveground carbon stocks of land uses sampled in the Kalahan Forest Reserve, 2009

	Tree	Intermediate	Understorey	Total
Land use	**t/ha**	**t/ha**	**t/ha**	**t/ha**
Agriculture	3.599	0.482	0.025	4.106
Agroforest	17.098	17.098	0.034	34.230
Grassland	3.522	0.578	0.050	4.151
Reforestation	55.220	0.197	0.041	55.458
Secondary forest	28.749	0.157	0.039	28.945

Source: Lasco et al. 2010

Project objectives

The project's aim is to improve environmental and natural resource management of Kalahan watersheds and to help reduce greenhouse gas emissions.

There are three specific objectives.

1. Convert 900 ha of marginal and abandoned agricultural land to more productive tree-based systems.
2. Improve the livelihoods of the communities in the area through agroforestry.
3. Protect the watershed, enhance biodiversity and improve the aesthetic value of the landscape for potential tourism.

Area

The area initially proposed for the project was 900 ha located within the barangays of Buyasyas, Balete Sta Fe, Balete Artitao, Canabuan, Yaway, Sinapaoan, Taktak, Sta. Rosa, Kapinyahan, Anayo and Atbu Other reports indicated parcels in barangays within two municipalities (Table 3).

Table 3: Locations (barangays and parcel area) of the proposed 900 ha forest-carbon development within the Ikalahan Ancestral Domain

Municipality	**Barangays**	*** Parcel area (ha)**	**Municipality**	**Barangays**	**** Parcel area (ha)**
Sta. Fe	Buyasyas	300	Sta. Fe	Buyasyas	300
	Balete	100		Balete	100
	Canabuan	200		Canabuan	200
	Tactac	25		Tactac	25
Aritao	Balete	100	Aritao	Anayo	10
	Kapinyahan	80		Balete	100
	Yaway	60		Kapinyahan	80
	Villaflores	25		Yaway	60
				Villaflores	50
Total		865			915

*This list is taken from the sampling plots used for measuring the carbon baseline and estimating the carbon sequestration potential of the 900 ha

**The areas of these parcels were estimates given by the barangay captains and other leaders when they were asked how much grassland or open areas could be available for the project

Source: World Agroforestry Centre 2007

Technical operations

Implementation strategy

Only native species—and introduced species that have been in the Philippines for at least 10 years—will be planted in the purely tree, mixed species plantations. Priority will be given to species that are already growing in and around the project site. The trees to be planted are mostly indigenous Dipterocarp species, such as *tuai (Bischofia javanica), alnus (Alnus nepalensis*) and *tanguile* (*Shorea polysperma*), and other species like rain tree (*Albizia saman)* that have been observed to be favourable to wildlife in the area. Fast-growing species will be included so as to rapidly establish vegetative cover, especially in highly degraded areas. The indigenous species will be planted in more favourable areas and underneath fast-growing 'nurse' trees. Agroforestry farm development will involve planting of fruit trees in existing upland farms (typically planted with annual crops such as corn and rice) (Villamor and Lasco 2005, Rice and Pindog 2005).

The field activities are presented in Box 1.

Field activity operation for IAD proposed forest-carbon development

Nursery operation

KEF has established two (2) nurseries producing a total of 89,702 assorted tree species seedlings.Planting materials are both raised or collected as wildlings (e.g. indigenous spp)

Forest tress species available in the KEF nurseries for forest carbon development include the following:

- Alnus (*Alnus nepalensis*) – is intended as nurse crop and pioneer species for biodiversity
- Tuai *(Bischofia javanica)*– as climax species for habitat, biodiversity and watershed
- Acasia (*Albizia saman*) – as climax species for watershed
- Santol Bakes and Tanguile (*Shorea polysperma*) – as climax species for biodiversity and lumber

Field/land preparation

Field preparations conducted on parcels that are already planted were done by strip brushing.

Forest Carbon Planting

Two different systems of spacing will be tested in planting to determine which is the most effective and efficient, i.e.:

Simultaneous but alternating with Tuai *(Bischofia javanica)* and Alnus (*Alnus nepalensis*). This is planting starting from the top slope, the first strip along the contour will be planted with purely Alnus (*Alnus nepalensis*) at 3 meter (m) spacing. The second strip will be planted with Tuai *(Bischofia javanica)* and other identified climax species. The third strip along the contour will be planted again with Alnus (*Alnus nepalensis*) together with climax species and continue alternating the species down. The climax species to be planted shall be determined depending on the altitudinal preference and compatibility. Some fruit trees may also be interspersed in the area, if farmer/owner desire and planting materials are available.

Sequential – Alnus (*Alnus nepalensis*) will be planted at 5m spacing over the entire area. After two years, when it has provided the necessary microclimate in the area, the climax species will be planted in between.

The schedule of planting is dependent on the weather conditions (rainfall occurrence) to ensure high rate of survival.

Forest Carbon Maintenance

Re-brushing of strips, ring weeding on planted seedlings, and other necessary care and maintenance of the planted seedlings will be made at least every six months for a period of three years.

To maximize the rate of carbon sequestration, silvicultural practices such as thinning and pruning shall be conducted to improve the micro environment and enhance growth of potential trees. Culling of defective trees and over mature trees will be conducted using the guidelines of the Forest Improvement Technology (FIT). Culled trees and pruned parts intended to provide the lumber and fuel needs of the community trees (Villamor and Lasco, 2005).

Silvicultural activities are to be employed to control competing forest vegetation - reduce competition for space, light, moisture, and nutrients.

Monitoring and Protection

Fire lines shall be established in critical and certain locations, whenever necessary.

Box 1. Field activities of the proposed project

Project development approach

The project will use a community-based approach. The main proponent of the project is the KEF and the direct implementers will be the participating landholders within the domain.

Technical arrangements

During the consultation meetings conducted by the KEF with barangay officials, domain cluster officers, landholders and claimants and other interested community members, it was unanimously agreed that the KEF would provide planting materials from their nursery for establishment of the forest tree areas. The landholders would plant the seedlings, with their labour costs included as in-kind support. Those wanting to plant fruit trees would have to produce their own seedlings. A project monitoring team would be created to quantify carbon sequestration and assess the impact of the project.

Socio-economic arrangements

The produce of crops planted alongside the forest trees will be the property of the landholders who planted the crops.

Other benefits (for example, carbon and other environmental services payments) that can be derived from the project will be divided amongst the participants.

> 20% to KEF (main proponent of the project responsible for overall management and supervision)
>
> 10% to the barangay (barangay-level management and coordination)
>
> 10% to the cluster (field management and supervision)
>
> 60% to landholders and claimants (main implementers in the field)

Each landholder and claimant's share will be proportional to the size of their landholding and the number of trees planted on it.

This agreement would be included in the legally binding memorandum of agreement between all participants.

Rice (2009) indicated that any carbon payments would go directly into the general fund of the KEF and be distributed through social services and not as cash, such as providing subsidised medical care and secondary education.

Management operation

Administrative support

The management of the ancestral domain has been divided into five 'clusters': finance, livelihoods development, natural resources development, education and special services (Appendix 2). Each cluster is managed by its own board of directors. The seven barangays covering the domain are each represented by their tribal leaders on the board of trustees. The board is responsible for formulating policies and serves as the final arbiter in any conflict.

The day-to-day operations of the KEF are carried out by the management staff, who are organised into teams according to their functions. These teams are coordinated by an administrative team composed of all the team leaders and some administrative personnel.

The project does not yet appear in the KEF organisational structure and schedule of activities, however, it may fall under natural resource development, which includes: 1) plant and nursery maintenance; 2) forest protection and maintenance; 3) wildlife sanctuary protection; and 4) forest guards and land management.

Implementation of the project will be jointly monitored by the barangay officials, KEF cluster officers, foresters and other staff. They will collaborate, coordinate and help each other to mobilise people.

Technical support

From the project's inception in 2003, the World Agroforestry Centre Philippines has been providing technical assistance to KEF through the RUPES project.

Preparation of the project idea note and data gathering are still needed for the PDD. This includes contracting the services of the personnel who will conduct the carbon measurement of grassland areas in the domain in order to establish a baseline and estimate the potential carbon sequestration of the 900 ha.

The Centre used tools that had been developed as part of the TULSEA[6] project.

- The 'Forest, Agroforest. Low-value Landscape or Wasteland' (FALLOW)[7] model was implemented to better understand the environmental services maintained by the Ikalahan and to equip them for negotiations and development of an agreement.
- The 'Rapid Agro-Biodiversity and Rapid Carbon Stock' appraisals (RABA and RaCSA) were conducted to provide essential baseline information as a basis for negotiations over carbon credits as well as for assessing the feasibility of other environmental services payments mechanisms. The communities, through the KEF, were trained in conducting the appraisals so they can serve as trainers to other communities who might be interested in entering carbon markets.

MUS has offered to provide consultancy services to KEF to assist with acquiring CERs and other ERs. These services include an initial project assessment, assistance with management of the project for CDM financing, development of the PDD and assistance in obtaining necessary approvals. MUS will bear the costs of validation, verification, certification and registration of the project to the United Nations Framework Convention on Climate Change's (UNFCCC) CDM executive board. However, this is on condition that KEF makes the necessary information and documents available. As the fee for the services rendered by MUS under this agreement, KEF will give MUS an option, that is, the right but not the obligation to purchase the CERs or other ERs.

The Philippines Association for Intercultural Development assisted the KEF in ground surveys and delineating the parcels for the project.

KEF plans to involve other institutions, which in one way or another have provided assistance to the KEF's overall activities: Upland NGO Assistance Committee, Upland Marketing Foundation Inc, a group of indigenous people working to protect the environment in the province of Nueva Ecija, Non-Timber Forest Products Task Force, Philippines Business for Social Progress, Professional Association of Agroforesters, Philippines Sociological Society, local NGOs and the Department of Environment and Natural Resources.

Policy support

The Ikalahan, through the KEF, signed a memorandum of agreement (MOA no. 1) in 1973 with the Philippines Government. Through the MOA, nearly 15 000 ha within the domain were designated as the Kalahan Forest Reserve. The MOA recognised that right of the Ikalahan to manage their ancestral land and to 'utilise the resources with the exclusion of all other parties not "subsisting" within the area at the time of signing' (Rice and Pindog 2005, Dolom and Serrano 2005).

The Republic Act (R.A. 8371. 1997), otherwise known as the Indigenous People's Rights Act, strengthens the rights of the Ikalahan to their ancestral land. In 1999, the ancestral domain claim of the Ikalahan for a total area of 58 000 ha was approved. In 2006, a Certificate of Ancestral Domain Title (CADT) for 30 758.58 ha was issued (NCIP 2006).

The tenurial rights granted by the Philippines Government mandated the Ikalahan to institute ecologically sustainable practices and to be responsible for forest protection, which was also explicitly stated in the MOA. In compliance, they established rules concerning the use of, and access to, forest resources, most especially with regards to swidden farming.

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[6] The Centre's TULSEA project has developed a 'negotiation support 'approach with a number of instruments (for example, computer models and field methods) to reduce conflict in multi-use landscapes.

[7] The FALLOW model was developed by the Centre as a prediction tool for estimating the impact of local land-use changes on environmental services.

To undertake natural resources development and an agroforestry program, KEF established rules and regulations (Rice 2009).

- All barangays covered by the Reserve are encouraged to initiate and actively participate in the regular tree planting activities.
- Cutting and gathering of endangered plant or animal species inside the Reserve are prohibited.
- All agricultural cultivation must be organic to prevent pollution of the rivers and damage to health of the population.
- Landholders must obtain a permit before slashing and burning a new field for planting.
- No trees may be cut without a permit and the principle of Forest Improvement Technology (FIT) must be followed. FIT is a system of thinning the forest occasionally to remove trees that are either crowded, defective or overly-mature. A check list is used by the local forester to guide farmers as to why a tree should be removed.
- No land title of any sort may be transferred in any way to any person who is not a member of the Ikalahan community.

Financial support and investment costs

KEF received funding support through the RUPES and TULSEA projects to conduct the project's initial activities.

Others funding came from KEF's own funds and the Philippines Association for Intercultural Development (PAFID).

Actual costs incurred in the pre-project work (parcel delineation, community consultation, project planning, preparation of the project idea note, baseline measurements and carbon estimation, conducting the two appraisals and documentation) were Php 1 510 476 (USD 37 761) (Table 4).

Table 4: Actual cost incurred

Activity	Budget (Php)	Funding source	Remarks
Site identification			
• Ground survey of project site	70 000	RUPES	To produce a map of the proposed 900 ha
• Delineation of parcels	44 000 650 000	KEF PAFID	Actual ground delineation of individual landholdings included in the project
Subtotal	*764 000*		
Community awareness and project planning			
Consultation	60 000	RUPES	Facilitate farmers' agreement to join the project
Project planning	9415	RUPES	Facilitate project planning and design
Subtotal	*69 415*		
Project documentation and assessment			
• project idea note	117 745	RUPES	Carbon baseline measurement and sequestration potential estimation
• documentation	69 816	Others (not specified)	Facilitation and administration
• RABA and RaCSA	489 500	TULSEA	Conduct Rapid Agro-Biodiversity and Rapid Carbon Stock appraisals
Subtotal	*677 061*		
Total	**Php 1 510 476 (USD 37 762 @ Php 40 to USD 1)**		

Field implementation is estimated to cost Php 19 900 per hectare (USD 497.50) (Table 5). Using this estimate, for the 52 ha planted the total amount incurred was Php 1 034 800 (USD 25 870). For the 112 ha plantation, the needed amount is Php 2 228 800 (USD 55 720).

Table 5: Estimated cost for field implementation

Activities	Cost estimate (Php)
Tree species establishment	
Nursery operation (seedlings raised and wildlings collected)	7200
Land preparation for plantation establishment	7000
Planting and maintenance	5700
• 1st strip brushing/ring weeding (once)	700
• 2nd replenishment planting strip brushing/ring weeding (twice)	1500
• 3rd strip brushing/ring weeding/firebreak establishment (twice)	1500
• 4th strip brushing/ring weeding/forest guarding (twice)	1000
• 5th strip brushing/ring weeding/forest guarding (twice)	1000
Total	**19 900**

Potential and challenges of the proposed project

There are several conditions to be fulfilled in order to participate in carbon markets and environmental services payments mechanisms, especially if registering the project under the CDM A/R criteria. The project proponent (intermediary of the smallholders or the smallholders themselves) should bear in mind the conditions at the planning stage. A project development plan is vital.

The potential and challenges of the proposed forest-carbon development at Kalahan are presented in Table 6.

Table 6. Potential and challenges of the proposed project

INDICATORS	POTENTIAL	CHALLENGES
(1) Effectiveness of institutionalising the project		
Site suitability	The delineated 17 parcels are deforested portions within the domain and already characterised as grasslands	Absence of baseline map (e.g. 1990 land-cover and land-use) showing the entire Ikalahan Ancestral Domain
Development	KEF prepared a project idea note for the 900 ha	Only 112 ha delineated so far and no project development plan yet
Environmental services marketing	The World Agroforestry Centre Philippines through the RUPES project provided both financial and technical support	No identified potential buyer
(2) Efficiency of resource use/mobilisation		
Technical	The agroforestation scheme	Feasibility of the project development approach
Social	Has the participation of the Ikalahan	Building KEF's capacity for the project and taking a strategic role in management
Financial	For the initial activities, KEF generated a total equivalent amount of Php 1 510 476 (USD 37 761) as of 2009	Planting activity was stopped due to insufficient funds
(3) Impact		
Social acceptance	Engaged the direct participation of 17 landholders	Involving the other landholders for the targeted 900 ha
Political/public response	KEF has established regulations and policies for protecting their forests, especially within the Reserve	Enjoining other agencies and institutions' support and fostering official collaboration
Economic consideration	The project provides opportunities to landholders to develop their idle landholdings or enhance productivity of their marginal cultivation areas	Low fertility level of grasslands Ensuring the economic viability of agroforestation scheme
Ecological services	900 ha will be able to sequester 89 776 t CO_2e for 20 years Rehabilitation of denuded forests and degraded lands can support habitat restoration, watershed functions, improved land-soil quality and enhance scenic beauty of the ancestral domain	Potential carbon sequestration is not based on the actual area delineated

Effectiveness of institutionalising the project

Site suitability

> *Passed the eligibility criteria and fulfilled 'additionality' condition under the CDM A/R criteria, but not complying with the standards of the voluntary market. The standards of CDM A/R follow the EB 35 report Annex 18: 'Procedures to define the eligibility of lands for afforestation and reforestation project activities'.*

Survey and delineation of other parcels to make up the 900 ha is still continuing. Actual parcels delineated on the ground and mapped as of 2010 were an aggregate area of 112.27 ha, consisting of 17 parcels of individually and communally claimed landholdings located in six barangays (Appendix 3). Twelve parcels (67.96 ha) are within the Reserve while five parcels (44.31 ha) are outside it. The 15 parcels are within the area issued with a CADT. Two parcels are already outside the CADT area (Appendix 4).

The suitability of these parcels could be tested with a land-use change assessment using the TULSEA tools (for example, FALLOW and RaCSA) to confirm that within the Reserve, land-use change between 1989 and 2001 led to a decrease in forest, pine regrowth, agriculture and fallow areas and an increase in grassland (Ekadinata and Nugrohu 2006, Lasco et al. 2010). However, if ever the project team wanted to register for carbon ER crediting under the CDM A/R criteria, fullfilling the 'additionality'[8] condition could be a challenge. The Reserve is supposedly under protection management by the KEF since 1973. To satisfy CDM standards, KEF has to provide proof that the parcels were long degraded and could not regenerate without the project's intervention, explaining why seeds dispersed from adjacent forest remnants into the grassland portions of the Reserve were not able to cause revegetation. Thus, land-cover and soil characterisations are needed to justify why the grasslands did not revert to forest.

Available maps and images are from 1989 and 2001 and only within the Reserve area. There are no available baseline land-cover maps showing the land-use and land-cover changes (for example, 1990, 2000 and 2010), particularly in relation to deforestation and forest degradation in the entire domain.

Development operation

> *Institutionalise[9] the project so as to participate in the carbon market. Obtain endorsement of voluntary participation. This includes project evaluation by the Department of Environment and Natural Resources (Philippines designated national authority) and third-party validation by a designated operational entity.*

The project idea note for the proposed 900 ha was prepared in 2007. The carbon measurement of the grasslands to serve as a baseline has been conducted and the carbon sequestration potential has been estimated.

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[8] 'Additionality' refers to whether the project occur anyway without the funds raised by selling carbon offset credits.

[9] To prepare the project application document for evaluation by the designated national authority, KEF has to describe how the project will contribute to the Philippines' sustainable development agenda. As prescribed by the Technical Evaluation Committee for A/R projects, the proposal should indicate the 1) economic dimension: economic opportunities, proper safety nets and compensatory measures for affected stakeholders, technically sound and environmentally friendly technology, financial resources; 2) environmental dimension: comply with the environmental policies and standards set by the Philippines Government, improve the quality of the environment, promote sustainable use of natural resources; and 3) social dimension: build the capacities of local stakeholders, provide local resources and services to vulnerable groups, encourage local participation. To prepare a full PDD, KEF have to compile information and support documents required by the standard template (be it under the CDM A/R or the voluntary carbon market).

In 2008, KEF signed a one-year agreement with MUS for consulting services in PDD preparation and for facilitating its registration to the UNFCCC. The actual field survey and parcel delineation has been underway since 2009. Biodiversity and carbon sequestration assessments using the TULSEA tools were conducted. Likewise, communities were trained to conduct the RABA and RACSA themselves so they also provide training to other communities who might be interested in entering the carbon market.

Up to the end of 2010, there is still no project development plan or project design document and more data are needed. Primarily, KEF has yet to finalise the ground survey with parcel boundaries delineated and map prepared.

The main challenge in preparing the PDD is to secure all the documents needed (for example, aerial photographs or satellite imagery complemented by ground reference data; land-use and land-cover information from maps or digital spatial datasets; or ground-based surveys. These are needed as proof of the land-use changes over time demonstrating the non-changing 'degraded' status, along with a land-soil quality assessment, baseline carbon measurements and potential carbon estimation and economic feasibility assessment. To undertake these activities requires both technical skills and funding.

Environmental services marketing

> *The KEF is able to negotiate agreements with potential carbon or environmental services buyers either under the CDM or voluntary carbon markets and/or find financial and technical support for the project, including field implementation, through innovative mechanisms.*

The RUPES project extended significant technical assistance and financial support.

The agreement of KEF with MUS was only for PDD preparation and to facilitate registration under the CDM A/R. However, the fee for the services rendered by MUS is an option to have the right, but not the obligation, to purchase the CERs or other ERs. In practice, KEF has no buyer yet and until now nobody has signified interest in financially supporting the project. Although, MUS is open for re-negotiation when the information needed for the PDD preparation is provided by KEF.

Project registration[10] depends on the completion of the PDD following the standard template, including all required support documents, and achieving endorsement from the designated national authority and operational entity. This relies on the capability of KEF to optimise funding support provided by the World Agroforestry Centre Philippines through its RUPES project.

Whether targeting carbon buyers under the CDM A/R, through the voluntary carbon markets and/or participating in a REDD+ mechanism, marketing and/or project registration for the environmental services and carbon markets still depends the approval and endorsement of the designated national authority and validation and endorsement of the designated operational entity.

[10] Registration is the formal acceptance, by the executive board, of a validated project as a CDM A/R project. Registration is the prerequisite for verification, certification and issue of CERs.

Efficiency of resource use and mobilisation

Technical

> *Conducted A/R activity on deforested land (at least 50 years or before 1990). '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 either of closed forest formations with trees of various storeys and undergrowth cover over a high proportion of the ground, or open formation with continuous vegetation cover in which tree crown cover exceeds 10%.*

As of 2010, KEF was able to delineate only 112.27 ha and planted an area of 52 ha for the reforestation component (Appendix 5). Planting was temporarily stopped owing to unavailability of seedling materials. Seedlings currently available at their nurseries are already two-to-three years old. These were the seedlings taken from commercial or government nurseries and delivered in bulk with roots covered only with very moist medium or slurry. Also, the area intended for the agroforestry system has not been identified.

The prerequisite of any A/R activity should be the identification (locating and delineating on the ground) of the area. KEF has to specify the location of the parcels, landholders involved, and the size (area in hectare). Aside from clarifying the 900 ha, KEF has to ensure that the project will lead to real, measurable and long-term climate benefits in the form of emission reductions or removals that are additional to any that would have occurred without the project. As for the agroforestry component, the question remains whether it can be considered as 'permanent' and reach a 'forest' status since it is not yet clear what tree species and land design are to be undertaken.

Social

> *The project must have local people's involvement, particularly the main stakeholders (people dependent on the land) and address the issue that there should be no people displaced (in case the land is currently occupied).*
>
> *Establish the technical and socio-economic arrangements as well as the administrative structure for operations and field implementation.*
>
> *Local community participation through adopting community-based forest management, which is the national strategy in the Philippines for managing the country's forest resources by virtue of E.O. No. 263, 1995.*

KEF is a community-based and community-led organization, with all its initial resources coming from the community. KEF represents the Ikalahan people in their Community-Based Forest Management Agreement with the Philippines Government
It is still a challenge for KEF to ensure the participation of all landholders and claimants within the domain whose landholdings are marginally productive, needing rehabilitation and are potentially eligible for the project. Except for KEF as communal owner of three parcels, there are only 18 landholders and claimants who have shown interest in the project. Aside from planting materials, currently it is not yet clear what other direct incentives landholders and claimants could receive for including their landholdings in the reforestation activities. The benefit-sharing arrangement agreed in the meeting is not legally binding.

KEF is considered a functional people's organization, especially in their forest management. However, building the capacity of the local community and KEF's field personnel in taking a strategic role in the project's management still remains a challenge. Many of the KEF's innovative programs in the domain can be attributed to Pastor Delbert Rice, who is the KEF

Research Director and also the contact person for the forest-carbon project. He commands authority and respect from the community. He has personal networks with academics, advocates, and government officials locally, nationally and internationally (Albano 2006).

Financial

> *Generated funding support for the project's development and field implementation and/or negotiated with a potential buyer for upfront funding support.*

While there is no upfront funding available from a buyer, KEF generated a total cash equivalent of Php 1 510 476 (USD 37 761.90) as of 2009.

Specific costs were for various activities.

- Site identification and parcel delineation (Php 764 000) from RUPES, KEF and PAFID
- Community consultation (Php 69 475) from RUPES
- Project planning and documentation, preparation of the project idea note, including baseline measurement and carbon potential estimation
- Conducting the RABA and RaCSA and documentation (Php 677 061)

The cost estimate for field implementation was Php 19 900 per hectare (USD 497.50). Thus, development of 900 ha would cost Php 17 910 000 (USD 447 750).

KEF was only able to provide planting materials for an area of 52 ha within the delineated parcels with purely forest tree species but planting activity was stopped owing to insufficient funds. Thus, without assured funding it would be difficult to sustain the project. Also, capacity building requires financial and logistical investment.

Impact

Social acceptance

> *For a holistic approach to rehabilitation, conservation and sustainable development, engaged the participation of the whole community.*

The proposed project is in line with KEF's function of conserving and managing the forest as reflected in their organizational structure and activities: forest and natural resources, health and sanitation, education and enterprise development.

The local community's response for the proposed project initiative is manifested with the involvement of the KEF as the main proponent and communal landholder of three parcels as well as the participation of 18 individual landholders and claimants. However, to obtain full acceptance from the local community, especially the landholders of potentially suitable parcels within the entire domain, still remains a challenge for KEF. Landholders are hesitant to include their landholdings because economic benefits are still unclear to them.

Political/public response

> *Enjoined cooperation from all sectors to provide technical and logistic support, including policy measures.*

The local governing body of the Reserve is KEF. Through KEF the Ikalahan people have been managing the Reserve since the 1970s and have formulated and implemented its policies about forestry and agricultural practices (Rice 2009). Effective implementation of KEF's

regulations and policies for the project, and for the entire ancestral domain, needs the support and collaboration of other agencies and institutions. This has yet to be clarified in their project development plan.

Economic considerations

> *Provided potential source of income aside from the carbon payment or environmental services incentives.*

The proposed project will provide an opportunity for landholders to develop their idle landholdings or enhance productivity of marginal cultivation areas if support could be provided. Improved land management practices can help landholders buffer themselves or adapt to climate variability while at the same time contributing to mitigation.

The question remains whether participating landholders could receive sustainable income without other support (subsidies, incentives and/or rewards). Although land is left idle, not cultivated or under marginal cultivation (because considered degraded land), will landholders undertaking reforestation (forest tree establishment) consider the carbon payments a sustainable source of income and will they consider an agroforestry farm is economically viable.

Areas eligible for carbon-forestry projects are those considered marginal or degraded. Given the low soil fertility level, species (purely trees or trees in combination with food crops) that can be planted will be limited, thus, potentially will have low productivity.

Ecological services provision

> *Carbon sequestration and storage potential (actual net greenhouse gas removal by sinks), and other ecological benefits.*

Although grasslands (4.1 t/ ha) store some carbon, the potential of the area to store and sequester carbon can be realised if these areas are reforested (55.4 t/ha) or converted into tree plantations or agroforestry farms (34.2 t/ha) (Lasco et al. 2010).

Considering that the proposed 900 ha is as yet non-existent, the challenge of the KEF is to identify and clarify the project area and design the land management system.

Strengths and limitations of the proposed project

We assumed that the project's technical and administrative management plan reflected the institutional capacity of the developer to undertake the project and ensure sustainability.

The SWOC analysis is based on the draft plan and other report documents and the experience of the ad hoc team in creating the plan. Our assessment focused on site development, resource use and mobilisation, socio-economic management and environmental services management.

The strengths and limitations (Table 7) of the operational aspects are extracted from the SWOC analysis.

Table 7. Strengths and limitations of the Ikalahan Ancestral Domain proposed forest-carbon development

INDICATORS	STRENGTHS	LIMITATIONS
A. Site development		
1. Area identification	17 parcels of land have been delineated	Only 112.27 ha out of 900 ha.
2. Implementation strategy	Agroforestation scheme	Viability of agroforestation scheme. Ensuring high survival rate and realisation of the potential economic benefits
3. Project development approach	Community-based project	KEF's capacity to formulate the project plan and/or prepare the PDD following the standard template required by the carbon or environmental services buyer
B. Resource use and mobilisation		
1. Administrative support	KEF as project proponent	No management unit specified responsible for the project Field personnel still lack knowledge of the project development process: planning, management and documentation
2. Technical support, public and private	The World Agroforestry Centre's TULSEA project has deployed tools to help the project	Valuation of potential carbon and other environmental services based on actual area is yet to be conducted The team has yet to foster collaboration with strategic partners and sign a formal, binding agreement of support
3. Political support	The barangay captains and tribal leaders are involved	The team has yet to sign a formal, binding agreement with major stakeholders
4. Financial support	Through the World Agroforestry Centre's RUPES project, financial assistance was provided to KEF to gather necessary information for the project plan and PDD.	Insufficient funding for the field activity implementation. The World Agroforestry Centre through its RUPES project can only provide limited financial assistance There is no potential buyer
C. Socio-economic		
	Benefit-sharing arrangement among stakeholders has been agreed	No formal binding agreement yet Feasibility of the technical and socio-economic arrangements has yet to be determined and formally agreed upon by the participating landholders
D. Environmental services management		
	Project is designed to rehabilitate open and deforested areas within the domain that have been covered with grasses for many decades The 900 ha project area is expected to sequester 89 776 t CO_2e over 20 years	Actual carbon baseline measurement and environmental services estimation is yet to be conducted

Site development

This pertains to area coverage (land cover status of identified project site, delineated area), the strategy of implementation (specific land management scheme) and the project development approach (how the project development operation and specific field activities are to be carried out).

Strengths

1) The 17 delineated parcels (112.27 ha) are characterised as left fallow and grasslands dominated with pervasive grass species.

   Grasslands, cultivation areas left fallow and marginal cultivation areas are potentially suitable and targets for the forest-carbon development.

2) The project will be undertaken by deploying an agroforestation scheme: planting mixed native, forest trees and establishing agroforestry farms.

   As of 2010, about 52 ha were already planted with forest tree species. Endemic forest-tree species planted included *tuai (Bischofia javanica*), *alnus* (*Alnus nepalensis*) and rain tree (*Samanea saman*), *Pterocarpus indicus*, *Dracontomelon edule,* benguet pine and *santol bakes*.

3) The project will be undertaken as a community-based project through the KEF as the main project proponent and Ikalahan landholders as the direct field implementers

   Within the CADT area, KEF is providing each household 6–10 ha of land for forest protection and maintenance. They are expected to have a utilisation plan, wherein some portions should be devoted to crop production and some for reforestation. KEF has regular tree planting schedules wherein each family is required to plant 100 seedlings annually.

Limitations

1) The project will be established on 900 ha of grasslands (Lasco and Villamor 2005). Target grassland areas are supposedly those outside the Kalahan Forest Reserve. However, the 900 ha was an estimate made by barangay captains and community leaders when the project idea note was formulated in 2006.

   Of the 900 ha initially proposed, only 112.27 ha consisting of 17 parcels were delineated as of 2010. Only five parcels (44.31 ha) are outside the Reserve. Of the five parcels, two are already outside the CADT area, though this has yet to be verified on the ground.

2) The 17 parcels (112. 7 ha) delineated so far are only intended for planting forest tree species as the reforestation component. The agroforestry component may not be actualised because the decision to adopt it depends on the landholders' preferences and ability to provide their own planting materials. Since planting materials are provided by KEF, specific tree species to be planted depends on the availability of the planting materials in the KEF nursery.

   As of the end of 2010, there was no comprehensive project plan or proposal document.

3) Resources (both technical and financial) are needed to build the capacity of the local community in planning and PDD preparation, which depend largely on the support provided by the World Agroforestry Centre Philippines through its RUPES project.

   Gathering information needed for planning and PDD preparation is ongoing. The information from the TULSEA reports (FALLOW, RABA and RaCSA) is essential

for the project plan and for PDD preparation, however, as of the end of 2010 these were still being finalised.

Resource use and mobilisation

This pertains to the administrative support (administrative set-up of the project, including the roles of each stakeholder), technical support (who will obtain and provide the technical support), public and private support, financial support (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

1) As project proponent, KEF has been registered since 1973 with the Securities and Exchange Commission as a people's organization established by and for the Ikalahan people.

   For management purposes, the ancestral domain has been divided into five clusters. Each cluster is managed by its own board of directors. The KEF serves as an advisor for clusters 2 to 5. Each cluster has identified wildlife sanctuaries and together these form a corridor for the protection and multiplication of the endemic and migratory wildlife.

   The seven barangays covering the domain are each represented by their tribal leaders on the board of trustees. The board is responsible for formulating policies and serves as the final arbiter in conflicts. The day-to-day operations of the KEF are carried out by staff, who are organized into teams according to their functions. These teams are coordinated by an administrative team composed of all the team leaders and some administrative personnel.

   The KEF organizational structure follows the social structure of the Ikalahan community and is considered effective, especially in policy enforcement and conflict resolution.

   The legitimacy of the KEF as a governing body of the Kalahan Forest Reserve under a community-based forest management has gained broader support. KEF was adopted as a model for the Department of Environment and Natural Resources banner program on community-based forest management.

2) The World Agroforestry Centre Philippines and PAFID have been assisting KEF with the project.

   The Centre has been providing technical assistance to KEF since 2003. This included the project idea note preparation, gathering information such as climatic conditions (that is, annual precipitation and mean temperature) from the Philippines Atmospheric, Geophysical and Astronomical Services Administration and soil types from the Bureau of Soils and Water Management and conducting pre-implementation activities (that is, mapping the project area, project planning, facilitating landholder consultations). The Centre's TULSEA project tools (FALLOW, RABA and RaCSA) were also deployed.

   PAFID assisted KEF with the ground survey and delineating the land parcels.

3) The barangay captains and KEF leaders were involved and consulted. The chairman of the seven barangays covered by the Kalahan Reserve automatically becomes a member of the board of trustees. This bolsters the legitimacy of KEF's decisions and its broader support. The board drafts policies, sends them to the barangay council for review and approval, then the boards adopts the approved policies.

KEF works with all barangays to develop uniform policies on resource management for the ancestral domain.

To avoid 'leakage'[11], KEF has established regulations and policies for protecting their forests and watersheds. This includes a monitoring system to quantify carbon sequestered by the growth of production forests on 10 000 ha within the Kalahan Forest Reserve and the impact on the water supply to the Magat Dam, in anticipation of receiving payments for the service.

Two wildlife sanctuaries, covering approximately 3500 ha of forest, have been declared for watershed protection purposes. In these areas there is a 'no entry' policy except for research purposes and hunting during the two-month open season (the open season is prescribed by KEF).

For conducting forest patrol and protection activities, six forest guards from the KEF complement the Department of Environment and Natural Resources' guards.

4) Financial assistance was provided to KEF through the World Agroforestry Centre's RUPES project. A total Php 256 000 (USD 6400) was disbursed to KEF for identifying, delineating and mapping the proposed 900 ha, for conducting the consultation and planning and for assessing the profitability of the proposed small-scale CDM A/R project. About USD 12 000 was spent conducting the RABA and RaCSA.

Limitations

1) KEF had difficulty conducting the pre-implementation activities, especially gathering information and documents needed for planning and preparing the PDD following the standard template required for registration in the carbon market. Activities were generally initiated by the World Agroforestry Centre Philippines through its RUPES research project. KEF needs strategic partners whose activities are not only limited to research.

   Aside from PAFID, institutions have yet to be identified.

   Private and public sector willingness to support the project depends on clarifying what benefits the project could provide.

2) To gain political support, KEF has yet to present the project plan to the relevant authorities.

3) There is no ready funding for the field activities. The World Agroforestry Centre through its RUPES project can only provide limited financial assistance. KEF has no budget allocated for the project and no interested buyer as yet.

Socio-economic management

This pertains to the field-level technical arrangements and socio-economic provisions (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).

[11] 'Leakage' refers to whether implementing the project causes higher emissions outside the project boundary.

Strengths

The technical and socio-economic arrangements, including benefit sharing, were initially agreed during the consultation meetings conducted by KEF with the barangay officials, the domain's cluster officers, landholders and claimants and other interested community members.

KEF will provide the planting materials that are available in their nursery. KEF also mobilises its members to contribute their labour.

The benefit-sharing arrangement favours the landholders and claimants who are the project implementers.

Limitations

Logistic support and funding are needed to fulfil the technical and socio-economic arrangements.

KEF lacks resources to provide enough planting materials for distribution to participating landholders. There is no assured financial support for the nursery operations. Thus, provision of the incentives (cash or in-kind) will be based on what is available.

Labour is not paid but considered as in-kind support by the landholders and claimants.

As yet there is no legally binding agreement for the technical, socio-economic arrangements (including benefit sharing).

Environmental services management

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

Strengths

The project is designed to rehabilitate open and deforested areas within the domain that have been covered with grasses for many decades. Aside from carbon sequestration, the project is targeted to support other ecological functions such as habitat restoration to support biodiversity, watershed restoration, enhance soil quality to improve productivity of cultivated land and over all improve the landscape of the Ikalahan Ancestral Domain.

Limitations

To estimate or measure environmental services that can be provided is currently beyond the capacity of the project proponent.

The initial project activity is focused on the establishment of indigenous tree species for the reforestation component. Thus, economic considerations are being traded in favour of ecological considerations. The agroforestry component, which addresses the economic needs of the landholders, is yet to be designed. An assessment of the economic viability of the project has also yet to be conducted.

4. Conclusion

The proposed forest-carbon development project in the Ikalahan Ancestral Domain has more challenges than potential.

- Up to the time of writing, delineating the 900 ha project area remains a challenge.
- Fullfilling the 'additionality' criterion is an issue without land-cover and land-use maps of the entire Ikalahan Ancestral Domain that can provide proof of suitability.
- Carbon baseline measurement was conducted in 2006. Estimation of carbon sequestration potential is based on the proposed 900 ha, but that area has not yet been physically delineated. Baseline carbon data of grasslands not within the 112.27 ha has not been included in the estimation.

Aside from the technical limitations to undertake the project, just undertaking the pre-project activities is already a strain on KEF's capacity. Since the domain's selection as a RUPES pilot site in 2003, KEF has had no comprehensive project plan.

Funding is crucial but KEF has no budget allocation for the project. The World Agroforestry Centre Philippines through its RUPES project has been able to provide limited financial assistance restricted to research–related activities. KEF has no prospective buyer who is willing to provide the initial investment for pre-project implementation. MUS only agreed to provide consultancy services to help with CDM-related activities, such as PDD preparation, UNFCCC registration and external validation. The one-year agreement has already expired. Although MUS is still open for renegotiation, KEF has to conduct the pre-implementation activities to collect the information and documents required for the PDD.

Generally, project activities have been limited to what assistance has been provided by the World Agroforestry Centre Philippines through its RUPES project.

5. Recommendations

Management

Administrative concerns

1) KEF should identify in their organizational structure the specific unit and people who will be directly responsible for the project (such as identification of suitable parcels, mapping and parcel delineation, activity planning and implementation, monitoring and evaluation).
2) Within the entire ancestral domain, identify and clarify boundaries of areas needing rehabilitation. Identify parcels for tree establishment intended for permanent protection and as production areas under agroforestry.
3) Explore the potential of an agroforestry system of timber and fruit trees and agricultural crop combination. Particularly, examine fruit trees as sources for the Mountain Fresh line of jams and jellies.
4) Build the capacity of personnel for taking a strategic role in the implementation and management of the project.

Technical concerns

1) Find an interested buyer and/or strategic partners willing to pay the costs of operation as an initial investment in the project's implementation. This includes community preparation, ensuring approval and landholders' formal agreement; capacity building; planting materials and establishment, and gathering information and documentation for the PDD.
2) A land-use and land-cover assessment of the entire domain is vital to identify and justify the suitability of the delineated area.
3) Meanwhile, the FALLOW and RaCSA reports should be used to
    a. locate deforested land turned into grasslands that needs rehabilitation and is potentially suitable for the project;
    b. serve as a reference for developing a land management system suitable for the entire domain;
    c. as reference for estimating the carbon potential of the project once the actual area is defined.
4) Also, the carbon baseline measurement on the grasslands of the ancestral domain should be revisited. The grasslands measured need to be re-identified.

Policy concerns

Before any investments are made (that is, carbon baseline measurement, estimating carbon sequestration potential and storage), ensure that the following activities are already undertaken. This has to be in consultation and with the agreement of the direct implementers (the landholders or claimants) and other main stakeholders.

1) Identify/survey, delineate the parcels to be included, and map the project area. Formulate the strategy of implementation. If employing an agroforestation scheme, it should be clear whether this is purely reforestation (planting of forest tree species), purely agroforestry farm development or a combination of both.

2) Design a land management strategy that is economically profitable for the direct stakeholders (the landholders and claimants).

3) The technical and socio-economic arrangements (including benefit sharing) should be formalised with a legally binding agreement.

4) Create a plan that is not dependent on carbon payments but finds innovative funding sources through other means, for example, from the local governments, government agencies and private sector or other stakeholders directly concerned or who will benefit from the services.

5) The potential risks and benefits should be understood by target stakeholders. Adequate information should be well disseminated.

6) Compensate economic opportunities lost for those landholders whose parcels are included in the reforestation component and intended for permanent protection.

7) Specify an agency or institution to spearhead the identification of areas needing rehabilitation. It has not been specified officially what role the Department of Environment and Natural Resources has been assigned. It should be noted that the involvement of other government agencies (such as the National Commission on Indigenous Peoples, Department of Agriculture and Department of Agrarian Reform) is crucial in identifying suitable areas for carbon-forestry projects.

Research direction

1) If agroforestation schemes are to be adopted as a climate-change adaptation and mitigation strategy, and for tapping the market for environmental services payments mechanisms, the bio-physical characteristics should be assessed of the landscape where the scheme is to be implemented.

2) The carbon sequestration potential of an area planted with a purely tree-based system differs from an agroforestry system. The distance between trees and types of tree species planted should be factors in carbon potential estimation.

3) A test site should be established to assess the viability of various agroforestation schemes before expansion of any scheme.

4) Research should be conducted into the potential income that can be derived from implementing the carbon project as well as other economic opportunities and whether they will generate sustainable income for the local community.

5) It is envisioned that the direct implementers, the local communities, especially the indigenous people, will benefit from the project. The reforestation component (forest tree plantation establishment) is intended to provide substantial employment opportunities while the agroforestry component will potentially provide long-term sources of income. An assessment of the economic profitability of the carbon project is essential not only for its own viability but to provide 'hard' evidence for the potential of carbon-forestry projects in the entire country, at least in the context of the current level of financial support to these projects. This is based on the premise that the private sector, which includes the farmers, will not invest in an enterprise that is not profitable.

6) Identify critical environmental issues in the domain that will be addressed with the implementation of the project.

7) Investigate whether the risk of fires, disease and invasive species will be mitigated. Also, whether the choice of land management strategy—appropriate technology, choice of species and silvicultural management—are contributory factors that minimise the use of pesticides and chemical fertilisers.

6. Lessons learned

1) To institutionalise the project and be able to participate in relevant mechanisms such as carbon markets, it is crucial to create a project development plan and, most particularly, a PDD following the relevant standard template.
2) The planning process is crucial. This requires the involvement of the main stakeholders, particularly the implementers.
3) The primary requisite is identification, delineation and mapping of eligible areas. This is to determine the eligibility of the proposed project area for ER crediting.
4) Specifying the project area and the implementation strategy should be carried out before any baseline measurements and carbon potential estimation are made. This is to avoid having to repeat the activity, which has cost and time implications.
5) The involvement of KEF members as the main implementers (providing labour) potentially helps lessen the cost of implementation.
6) To stimulate interest of the other landholders whose lands are potentially suitable, it is important to clarify the technical and socio-economic arrangements.
7) Technical assistance and financial support at the start of the project from the relevant government agencies, research institutions and potential buyer or other sources is vital.
8) The willingness of carbon and environmental services buyers—both the private and public sectors—to support the project depends of what benefits will be provided that will serve their interests. Thus, the project has to create a viable development plan. Measurements or valuations of benefits and services that could be provided are important. However, the project should be implemented without dependence on carbon payments. The project should be designed to address the economic needs of the communities as well as address the provision of environmental services. Carbon sequestration is already an added environmental service, which has an income opportunity.

References

Albano A. 2006. Forest enterprises and sustainable livelihoods: A case study of Kalahan Educational Foundation. MSc Thesis. Canberra: Australian National University.

Decena F. 2009. *Nueva Vizcaya: Dipterocarp forest carbon measurement*. Web page. Available from http://www.ironwulf.net/2009/08/17/nueva-vizcaya-dipterocarp-forest-carbon-measurement. Accessed 21October 2010.

Dolom BL, Serrano RC. 2005. The Ikalahan: traditions bearing fruit. In: Durst PB, Brown C, Tacio HD, Ishikawa M, eds. *In search of excellence: exemplary forest management in Asia and the Pacific*. Available from http://www.fao.org/docrep/007/ae542e/ae542e00.htm.

Ekadinata A, Nugroho DK. 2006. Geospatial data processing in Kalahan Forest Reserve, Philippines. Spatial Analysis Unit Working Notes. Bogor, Indonesia: World Agroforestry Centre (ICRAF) Southeast Asia Program.

Encarnacion CS. 1999. Community-based enterprises and conservation: the Kalahan Forest Farms Development Project. *Unasylva* 199. Available from www.fao.org/docrep/x3030e/x3030e06.htm.

Lasco RD, Abasolo E, Villamor G. 2010. Payments for carbon sequestration in the Philippines: lessons learned and implications. *Mountain Forum Bulletin* XI: 55–58.

Rice, D. 2009. The Kalahan forests and carbon: a Philippine case study. *Journal of Indigenous Affairs* 8: 60–67.

Rice D, Pindog MO. 2005. The Ikalahan in Northern Luzon. In: van der Ploeg J, Masipiqueña AB eds. *The future of the Sierra Madre: responding to social and ecological changes*. Proceedings of the Fifth International Conference on Environment and Development. Cabagan, Philippines: Cagayan Valley Programme on Environment and Development. p. 333–337.

[RUPES] Rewarding Upland Poor for Environmental Services. undated. *Background report: RUPES action research site, Kalahan, Northern Luzon, Philippines*. Bogor, Indonesia: World Agroforestry Centre (ICRAF) Southeast Asia Program. Available at http://www.worldagroforestrycentre.org/Sea/networks/RUPES/download/SiteProfiles/RUPES-Kalahan_FINAL.pdf

Villamor GB, Lasco RD. 2006. Case Study 7: The Ikalahan Ancestral Domain, the Philippines. In: Murdiyarso D, Skutsch M. *Community forest management as a carbon mitigation option: case studies*. Bogor, Indonesia: Center for International Forestry Research. p. 43–50.

World Agroforestry Centre. 2007. *Project Idea Note: Carbon sequestration project in the Ancestral Domain of Ikalahan*. RUPES project reports. Los Baños, Philippines: World Agroforestry Centre (ICRAF) Philippines.

Further reading

Aukland L, Moura Costa P, Bass S, Huq S, Landell-Mills N, Tipper R, Carr R. 2002. *Laying the foundations for clean development: preparing the land use sector. a quick guide to the Clean Development Mechanism*. London: International Institute for Environment and Development.

De Vera, DE. 2007. *Indigenous peoples in the Philippines: a country case study*. Presented at the RNIP Regional Assembly Hanoi, Vietnam, 20–26 August 2007. Cabagan, Philippines: Regional Network for Indigenous People. Available from www.iapad.org/publications/ppgis/devera_ip_phl.pdf . Accessed June 2009.

Institute for Global Environmental Strategies. 2009. *CDM in Charts*. Version 7. Hayama, Japan: Institute for Global Environmental Strategies.

Lasco RD, Guillermo IQ, Cruz RVO, Bantayan NC, Pulhin FB. 2004. Carbon stocks assessment of a tropical secondary forest in Mt Makiling, Philippines. *Journal of Tropical Forest Science* 16: 35–45.

Pulhin FB. 2006. Carbon storage of grassland areas in Ikalahan Ancestral Domain. Los Baños, Philippines: World Agroforestry Centre (ICRAF) Philippines.

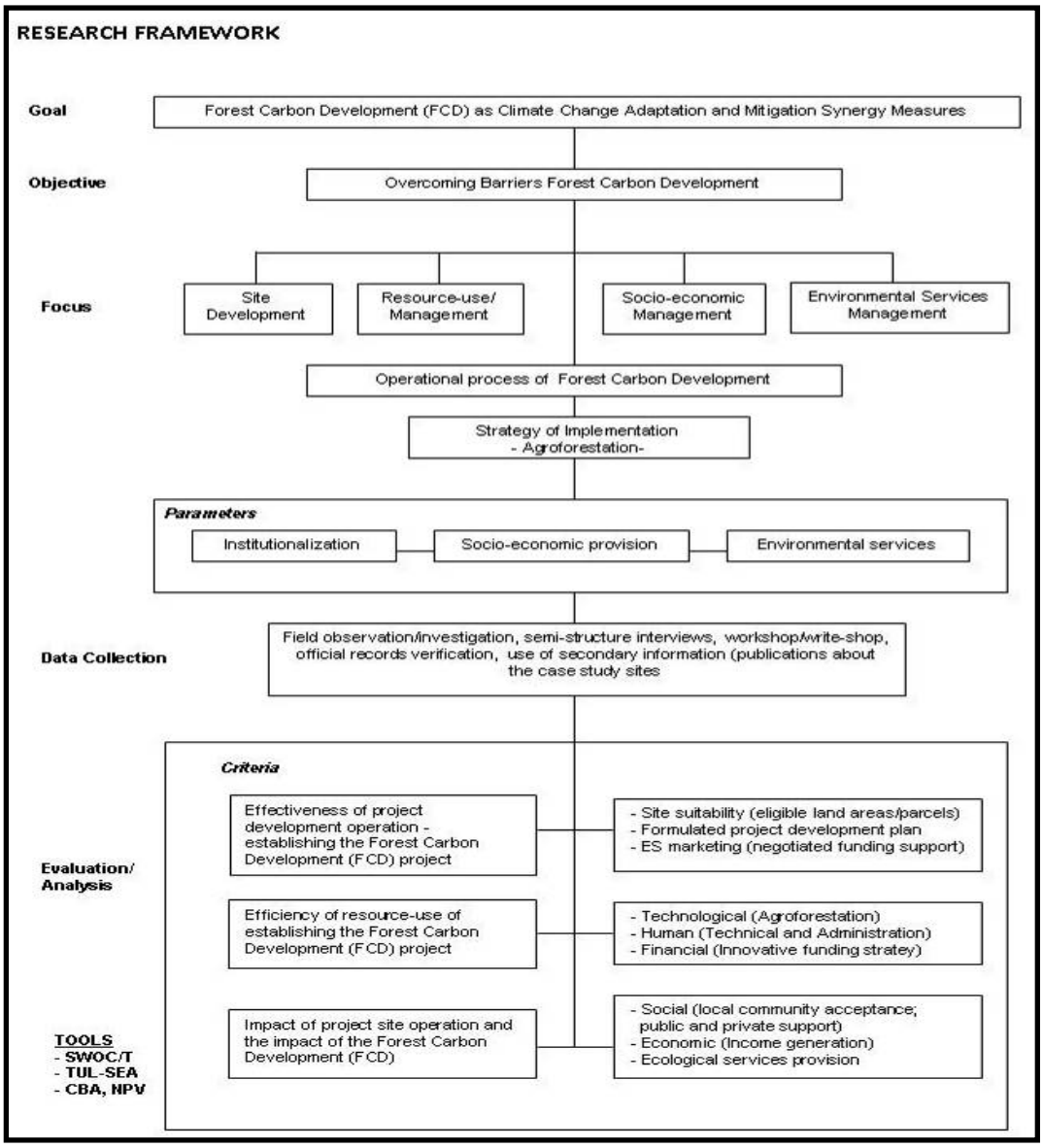
Roshetko J, Lasco RD, Angeles M. 2005. Smallholder agroforestry systems for carbon storage. *Mitigation and adaptation strategies for global change* 12(2): 219–242.

Villamor GB, Lasco RD. 2009. Negotiating Carbon Payment for Kalahan: Prospects of CDM in the Philippines. Los Baños, Philippines: World Agroforestry Centre (ICRAF) Philippines.

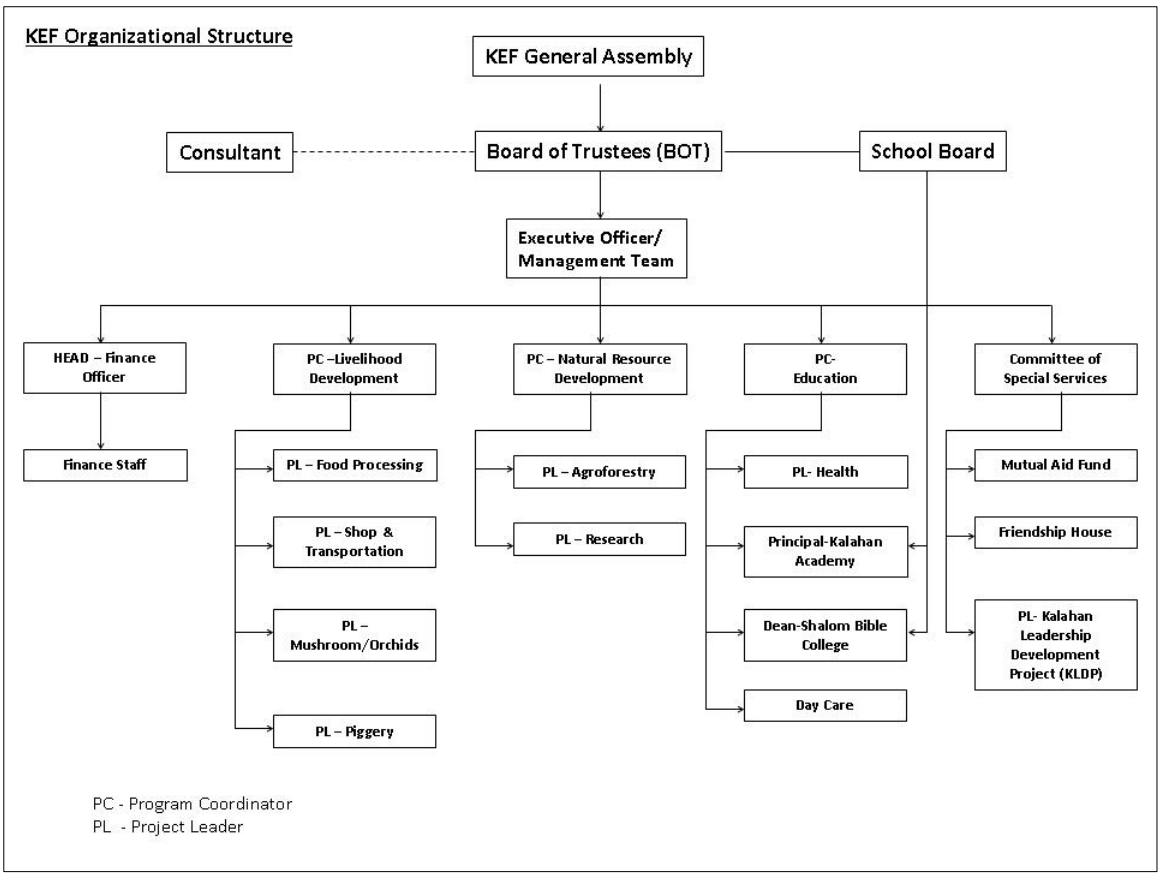
Villamor GB, Lasco RD. 2009. Rewarding upland people for forest conservation: experience and lessons learned from case studies in the Philippines. *Journal of Sustainable Forestry* 3: 304–321. Available from www.informaworld.com/smpp/title~db=all~content=t792306917~tab=issueslist~branches=28 - v28.

Appendices

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



Appendix 2.KEF organizational structure

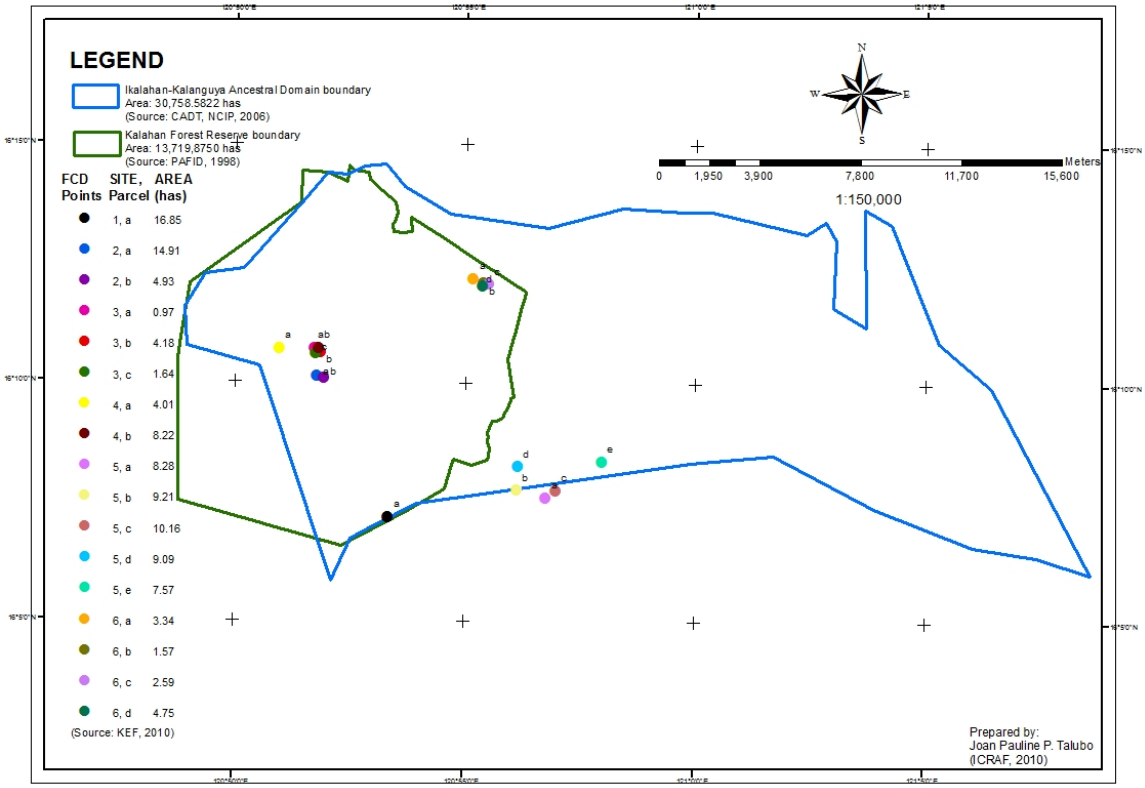


Appendix 3.List of landholders and claimants

Site	Barangay	Parcel	Area (ha)	Landholders and claimants	Remarks
1	Sitio Bawang	a	16.85	Tomas Cay-os Ruben Liwag Tayan Balao Benny Capsula Tamano Bugtong	Communally claimed: individual parcel delineation has yet to be conducted
2	Belonglong, Malico	a	14.91	Fernando Zamora and others	Communally claimed: individual parcel delineation has yet to be conducted
		b	4.93	KEF	Assigned to KEF
3	Talal, Malico	a	0.97	Juy Aspera	Individual claim
		b	4.18	Taynan Omanllio	Individual claim
		c	1.64	Hilarion Kipot	Individual claim
4	Pisos, Santa Rosa	a	4.01	KEF	Assigned to KEF
		b	8.22	KEF	Assigned to KEF
5	Atbu	a	8.28	Primo Higid	Individual claim
		b	9.21	Rogelio Laga	Individual claim
		c	10.16	Herminio Tepal	Individual claim
		d	9.09	Gomer Pacos	Individual claim
		e	7.57	Eduardo Agamas	Individual claim
6	Patoctoc, Bacneng	a	3.34	Gilberto Mariano	Individual claim
		b	1.57	Merson Mariano	Individual claim
		c	2.59	Lino Patnao	Individual claim
		d	4.75	Leo Mariano	Individual claim
		Total	112.27		

Source: KEF, 2009

Appendix 4. Location of the 17 parcels



Appendix 5. Location and coverage of the project

Location				Parcel	Area (ha)	Land cover	Land-soil status	Project scheme
GPS Lat. and Long.	Elevation (masl)	Site	Sitio/ Barangay					
N 16° 07' E 120° 53'		1	Sitio Bawang. Imugan	a	16.85	Grassland	Clay loam	Reforestation
N 16° 10' E 120° 51'	1282–1427	2	Belonglong, Malico	a	14.91	Grassland	Clay loam	Reforestation
N 16° 10' E 120° 51'	1399–1468			b	4.93	Grassland	Clay loam	Reforestation
N 16° 10' E 120° 51'	1315–1363	3	Talal, Malico	a	0.97	Grassland	Clay loam	Reforestation
N 16° 10' E 120° 51'	1260–1368			b	4.18	Grassland	Clay loam	Reforestation
N 16° 10' E 120° 51'	1281–1368			c	1.64	Grassland	Clay loam	Reforestation
N 16° 10' E 120° 51'	1014–1166	4	Pisos, Santa Rosa	a	4.01	Grassland	Clay loam	Reforestation
N 16° 10' E 120° 51'	1014–1220			b	8.22	Grassland with a few stands of secondary pine regrowth	Clay loam	Reforestation
N 16° 07' E 120° 56'	1109–1196	5	Atbu	a	8.28	Grassland	Clay loam	Reforestation
N 16° 07' E 120° 56'	957–1196			b	9.21	Grassland	Clay loam	Reforestation
N 16° 07' E 120° 56'	892–1075			c	10.16	Grassland	Clay loam	Reforestation
N 16° 07' E 120° 57'	856–1016			d	9.09	Grassland	Clay loam	Reforestation
N 16° 08' E 120° 57'	756–935			e	7.57	Grassland	Clay loam	Reforestation
N 16° 2' E 120° 55'	1240–1340	6	Patoctoc, Bacneng	a	3.34	Grassland	Clay loam	Reforestation
N 16° 12' E 120° 55'	1218–1254			b	1.57	Grassland	Clay loam	Reforestation
N 16° 12' E 120° 55'	1173–1231			c	2.59	Grassland	Clay loam	Reforestation
N 16° 12' E 120° 55'	1138–1209			d	4.75	Grassland	Clay loam	Reforestation
				Total = 112.27				

Parcels listed were actually surveyed by KEF through the technical assistance of the World Agroforestry Centre Philippines' RUPES project

Appendix 6. Field planting activity as of 2009

Site	Barangay	Parcel	Area (ha)	Spacing	Seedlings needed/ area	Remarks	Area planted (ha)
1	Sitio Bawang	a	16.85	3m x 3m	18 722	Already planted	16.85
2	Belonglong, Malico	a	14.91	3m x 2.5m	19 880	Already planted	14.91
		b	4.93	3m x2.5m	6573	Not planted yet	
3	Talal, Malico	a	0.97	3m x 3m	1078	Not planted yet	
		b	4.18	3m x 3m	4644	Not planted yet	
		c	1.64	3m x 3m	1822	Not planted yet	
4	Pisos, Santa Rosa	a	4.01	3m x 2.5m	5347	Already planted	4.01
		b	8.22	3m x 2.5m	10 960	Already planted	8.22
5	Atbu	a	8.28	3m x 3m	9200	Planting is on-going	0.7
		b	9.21	3m x 3m	10 233	Planting is on - going	1.0
		c	10.16	3m x 3m	11 289	Planting is on - going	3.3
		d	9.09	3m x 3m	10 100	Planting is on - going	2.1
		e	7.57	3m x 3m	8411	Planting is on - going	0.9
6	Patoctoc, Bacneng	a	3.34	3m x 3m	3711	Not planted yet	
		b	1.57	3m x 3m	1744	Not planted yet	
		c	2.59	3m x 3m	2878	Not planted yet	
		d	4.75	3m x 3m	5278	Not planted yet	
		Total=	**112.27**		**131 871**		**51.99**

Source: KEF, 2009

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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
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132. Carbon-forestry projects in the Philippines: potential and challenges. The Quirino forest-carbon development project in Sierra Madre Biodiversity Corridor

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.

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