

SETTING UP A RES MECHANISM ON THE GROUND: THE KALAHAN EXPERIENCE IN NUEVA VIZCAYA

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INTRODUCTION

Climate change is one of the most pressing and serious threats with potentially detrimental social, environmental and economic impacts facing humanity today. It began to ignite real interests and concerns as early as the 1970s when substantial debates occurred in the international arena which led to the creation of the Intergovernmental Panel on Climate Change (IPCC) by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) in 1988 (Lopes, 2009).

The IPCC has since been in the forefront of advocating the mitigation of adverse impacts of climate change through various carbon offset mechanisms. It is scientifically known that healthy and well-functioning ecosystems play a vital role in combating climate change by sequestering carbon from the atmosphere and acting as carbon sinks. They also provide other essential environmental benefits now popularly known as environmental services the most prominent of which are regulating water flow, conserving biodiversity, providing landscape beauty, and controlling soil erosion (MEA, 2005). It is believed that the continued enhancement of these environmental services through carbon sequestration can be encouraged using merit compensations, rewards or incentives at the local and international markets, which are better known as Payments for Environmental Services (PES; Wunder, 2005) or Rewards for Environmental Services (RES; van Noordwijk, 2005).

The IPCC-proposed series of carbon trading or offsetting mechanisms all engage industrialized countries to comply with their emission limits by buying carbon credits from developing countries that sequester carbon. According to Kollmus et al. (2008), these encompass projects aiming to reduce Green House Gas (GHG) emissions from land-use practices that are collectively called Land-use, Land-use Change and Forestry (LULUCF) projects. Moreover, three types under this project group category exist: (1) those that avoid emissions by conserving existing carbon stocks, i.e., Reduced Emissions from Degradation and Deforestation (REDD); (2) those that increase carbon storage by sequestration, i.e., afforestation – planting a forest for the first time and reforestation – replanting a forest that has been cut down (A/R); and (3) those that increase carbon storage by soil management techniques, e.g., no-till agriculture.

Carbon Offset Markets, Projects and Standards

The two types of carbon offset markets today are the compliance and voluntary markets (Ibid.). Mandatory national, regional or international carbon reduction regimes such as the Kyoto Protocol and European Union Emissions Trading Scheme have created and regulated the compliance markets. The Kyoto Protocol was reportedly the first environmentally-focused, global and legally-binding agreement signed in 1997 that specified targets for member countries to cut off their emissions. The voluntary markets, on the other hand, function outside and beyond the compliance markets thus enabling businesses, companies and individuals to purchase carbon offsets on a voluntary basis. It is believed that carbon offset markets, which are already becoming a substantial economic force, bring hope and promise especially to the developing countries who will host the projects.

One of the flexibility mechanisms under the compliance schemes of the Kyoto Protocol is the Clean Development Mechanism (CDM; Ibid.). It has been used as a benchmark recognized and accepted by other voluntary schemes since February 16, 2005. CDM allows the trade of carbon credits for industrialized countries to meet their Kyoto targets by paying the developing countries for their certified emission reductions (CER) as incentive for the sustainable development of existing carbon stocks.

Thus far there are only four approved CDM A/R projects in the world: Guangxi Watershed Project in China, Haryana Cooperative Afforestation Project in India, Cao Phong Reforestation Project in Vietnam, and the Moldova Soil Conservation Project in Moldova (Thomas et al., 2010). As revealed in an analysis of these projects, there are six characteristics common to successful CDM A/R projects: (1) access to start-up funding and the likelihood of on-going financial viability, (2) guidance in project design and implementation from large organizations with technical expertise, (3) community involvement and integrated participation, (4) clear, controllable and manageable land tenure/property rights, (5) carbon credit revenues mostly directed at local communities, and (6) positive environmental and carbon sequestration outcomes (Ibid.). Projects that do not involve local communities are most likely to fail (Boyd et al., 2007) hence community and stakeholder involvement throughout the whole duration of the project, from conceptualization to implementation, gains utmost importance.

Under the voluntary types, the currently most popular and most robust standard in the carbon market is the Voluntary Carbon Standards (VCS; Lopes, 2009; Kollmus et al., 2008). It focuses only on GHG reduction without other environmental or social benefits. The Climate Group, the International Emission Trading Association and the World Economic Forum Global Greenhouse Register initiated it in 2005 and the World Business Council for Sustainable Development subsequently became a founding partner. In 2007, VCS developed the Agriculture, Forestry and other Land-use (AFOLU) program where the carbon credits are known as Voluntary Carbon Units (VCU). AFOLU includes A/R

and revegetation, agricultural land management, improved forest management and REDD. VCS accepts CDM standards.

The first approved VCS project is the Kasigau Corridor REDD project in Africa (Warner and Peters-Stanley, 2011). Wildlife works Carbon, a US-based conservation consultancy, helped in the development of their project design. This project also has an approved Gold-label validation under the Climate, Community and Biodiversity Standards (CCBS) standard and which was validated and verified against VCS' recently approved REDD methodology. Twenty percent of the VCU were set aside in a "buffer pool" to account for forest risk, and the rest were registered in Markit Environmental Registry. Their financial support came from South Africa's Nedbank Bank which envisions itself to be Africa's first carbon neutral bank.

As a project design standard, CCBS offers rules and guidance on project design and development to ensure robustness and local community and biodiversity benefits but does not verify carbon emission reductions (Kollmus et al., 2008; Lopes, 2009). It was developed by the Climate, Community and Biodiversity Alliance (CCBA), which is a partnership among non-government organizations, corporations and research institutes. The first edition of CCBS was released in 2005; it is widely used in conjunction with VCS and includes A/R as well as REDD projects.

CCBS has already approved two projects in the Philippines under Conservation International (CI): the Peñablanca Reforestation Project and the Forest Carbon Project in Quirino Province, Sierra Madre Biodiversity Corridor, which is also a recently VCS-approved project (CI, 2011). The CI-Quirino Project used the two methodologies within the CDM for small scale A/R to measure current carbon stocks, whereas the CI-Penablanca Project used stratification by land-use or vegetation type and calculated carbon from the IPCC's 2006 Guidelines for AFOLU. Both projects involve Indigenous Peoples as local communities.

Another set of standards known as CarbonFix Standards (CFS) was founded in 1999; it aims to provide high quality carbon credits that also help local communities (Lopes, 2009). CFS is being operated by a non-profit non-government organization based in Germany and accredited by the United Nations Framework on Climate Change Convention. It accepts A/R but not REDD projects. CFS does not accept CDM methodology but considers dual certification with CCBS.

Measurement and Documentation of Carbon Credits

The key elements for any carbon offset project are that the carbon credits must be measurable, verifiable, additional, real, permanent, and unique (Ibid.; Kollmus et al., 2008). For any emissions trading program to be credible, it is important to establish the carbon baseline: what, when, where and how to measure the changes in the carbon. Baseline measurements are used not only for quantifying but also for monitoring and verifying the carbon credits. Above-ground carbon measurement techniques are of three

types: on-site measurements, indirect measurement with off-site tools and using process models or inferences.

On-site measurements are the most accurate way of measuring carbon and land-owners can do the measurement themselves, thus reducing the cost (Gorte and Johnson, 2009). These methods, however, are time-consuming, costly, require continuous sampling and replication and cannot cover large areas. Establishment of permanent sample plots is among the methods. It is reportedly the most statistically superior means of calculating carbon changes because it (a) allows efficient assessment of changes in carbon over time, (b) permits inventory to continue reliably over more than one rotation, and (c) enables efficient verification at relatively low cost.

Indirect measurements involve the use of remote sensing which can provide highly accurate information especially deforestation and live above-ground biomass measurements (Ibid.). Using these measurements, it is possible to assess a wide area quickly and have experts perform the analysis. However, remote sensing images require very costly satellite images; regular measurements can be interrupted by cloud cover and become problematic for activities with less visible impacts or less readily measurable carbon pools.

Process models in turn utilize computer models which are relatively simple, low-cost and provide consistent estimates (Ibid.). These methods however are said to be low in precision, have high verification costs, may not reflect actual differences within and across the activities, and needs occasional site-specific sampling and adjustment of estimates based on samples. Moreover, different models used may yield different estimates of the same site.

CARBON DOCUMENTATION STUDY OF THE KALAHAN EDUCATIONAL FOUNDATION

Although the measurement of carbon credits is an essential requisite for developing country participants of carbon offset markets, this activity and most especially its accompanying challenges have hardly been documented if at all in the literature. Thus valuable lessons that could be drawn from the carbon project experiences are not available for the guidance of indigenous forest communities undergoing or planning to embark on similar efforts.

In the Philippines, the Kalahan Educational Foundation (KEF) is the first holder of the Certificate of Ancestral Domain Title (CADT) and Peoples Organization (PO) to embark on a carbon sequestration program and to attempt to learn from their experiences in standardizing the necessary processes involved. For this reason, KEF sought funding assistance from the RUPES Program¹ of the World Agroforestry Centre/ICRAF to

¹ RUPES is an Asian network for facilitating environmental service agreements between the upland poor and downstream beneficiaries. One of its foci is carbon storage as a key environmental service. In Kalahan, RUPES-Philippines has been helping

document and to review its pioneering experiences in measuring existing carbon stocks in the Kalahan Forest Reserve as a prerequisite for participating in the appropriate carbon markets. Their attempts toward setting up a RES mechanism on the ground had largely been guided by self-help and self-learning principles over the past two decades, with minimal external assistance.

Objectives of the Study

The major objectives of the documentation study were as follows:

1. To describe the background, rationale, processes and preparatory activities of KEF for the carbon market.
2. To document the current process, activities and experiences in the establishment of sample plots in the Kalahan ancestral domain as a basis for making reliable estimates of carbon stocks.
3. To extricate the challenges and lessons learned to date from KEF experiences in order to share them with other indigenous groups interested in the carbon market as a RES mechanism.

Methodology

The study utilized five data gathering methods namely: review of related literature, plot establishment, direct observation, videography, and focus group discussion.

- Literature review – Available published and/or gray literature on the carbon market as a RES mechanism and on Kalahan, including KEF records and reports, were reviewed to explain the historical development and activities in line with the organization’s efforts to prepare for participation in the carbon market.
- Plot establishment – Prior to the study, approximately 150 sample plots had been established in most of the 80 blocks in the Kalahan Forest Reserve that is intended for the voluntary carbon market. In the course of this study, an additional 16 - 20 sample plots were established in selected blocks to provide a means for documenting the process on a firsthand basis and understanding the challenges being hurdled.
- Direct observation – The process, activities, and challenges encountered in the establishment of one (1) sample plot were observed and recorded. The results of the observation were compared to data elicited from the videography.

local communities build capacity for entering the international carbon market since 2004 . RUPES-Philippines provided technical expertise in preparing the Project Idea Note (PIN) in 2006, which was instrumental in estimating how much carbon can be sequestered within their forest reserve in 20 years. RUPES also linked Kalahan to a possible carbon buyer, the Mitsubishi UFJ Securities, which had agreed to assist Kalahan in preparing their project design document needed for the CDM project. Moreover, it helped Kalahan in the generation of essential baseline information on their carbon stocks per land-use and the corresponding values of their biodiversity in terms of the thriving flora and fauna.

- Videography - The establishment of this same sample plot was further documented by video. Findings from the video and the observations were validated in the focus group discussions.
- Focus group discussions (FGD) – Two (2) FGDs were conducted to discuss the challenges culled from the preceding methods and to elicit the lessons learned since the beginning of KEF’s efforts to harness the carbon market as a RES mechanism.

Data gathering was conducted mainly during April to May 2011; collection of some additional data and report verification occurred in subsequent months. The salient findings of the study are presented and discussed in the following sections of this paper.

KEF’S CARBON STOCK DOCUMENTATION IN THE PHILIPPINES

The emergence of the RES concept in recent years has motivated the KEF to explore the possibility of participating in the carbon markets to realize their socioeconomic and environmental goals as well as to address national and international concerns for rehabilitating and expanding forest cover for the purposes of enhancing biodiversity, improving water quality and quantity, and sequestering carbon stocks. With assistance particularly from the World Agroforestry Centre/ICRAF, several projects were undertaken with KEF to research on the Kalahan Ancestral Domain and to prepare both the site, starting with Cluster I, and the people for their participation in the carbon market as a RES mechanism.

KEF’s pioneering efforts to set up a RES mechanism on the ground began around 20 years ago and antedated the awarding of their ancestral domain (described below). A chronology of the major events and activities related to the foundation’s carbon documentation in the past two decades is presented and described in Table 2.

Table 2. Chronology of KEF’s carbon documentation events and activities (1992-2011)

Year	Event/Activity
1992-1993	<ul style="list-style-type: none"> - KEF leaders became aware of climate change from media sources and were interested in carbon sequestration as a forest protection and income generation measure. They wanted to evaluate the carbon stocks in KFR and set up a system for this purpose. - Through participation in a Biodiversity Conservation Network (BCN) project, KEF obtained funds to start their carbon documentation activities. BCN was a consortium of international non-governmental organizations which obtained funding from USAID, World Wildlife Fund and others. While KEF was

	concerned about protecting and improving their forests as well as enhancing incomes, BCN was interested in documentation.
1994	<ul style="list-style-type: none"> - KEF was introduced to the use of satellite imaging data for blocking purposes by Scandinavian university partner. - 62 blocks were initially delineated using the satellite data and KEF located the boundaries on the ground. - Approximately 200 sampling plots were established in these blocks. - KEF computed the carbon baseline data based on perceived indicators and formula.
1997	<ul style="list-style-type: none"> - Baseline computations were revised by KEF based on Dr. Rodel Lasco's formula.² - First monitoring of growth in carbon stocks was undertaken. - The amount of carbon sequestered in the KFR was estimated at 9,500 tons per year from 1994-1997.
2000	<ul style="list-style-type: none"> - The second monitoring of growth in carbon sequestration was done by KEF. - The estimated carbon sequestered for the 3-year period (1997-2000) was 9,700 tons of carbon per year.
2003	<ul style="list-style-type: none"> - The third monitoring of carbon stocks was undertaken and the annual carbon estimate was 8,700 tons per year for 2000-2003. - The decrease in carbon sequestered was due to climate variations particularly the occurrence of reduced rainfall (El Nino).
2006	<ul style="list-style-type: none"> - KEF conducted a fourth monitoring of growth in carbon sequestration. However, the computation of annual growth in carbon was postponed in order to address the need for reblocking some blocks that were found to be not properly homogeneous. - The GPS was adopted as a means to accurately map the location of the sample plots in the blocks. - Funding problems delayed the completion of reblocking.
2009	<ul style="list-style-type: none"> - Fifth monitoring of carbon growth was begun but only 34 sample plots were inventoried. Reblocking was also started.
2011	<ul style="list-style-type: none"> - In February 2011, the map showing reblocking and sample plots within the blocks was produced resulting in an increase of blocks from from 62 to 80. - In the first quarter of 2011, KEF obtained assistance from the World Agroforestry Centre/ICRAF to document KEF's carbon measurement activities. In the process, it was decided that the 2009 data on the 34 sample plots would be disregarded and a new total inventory be started. The monitoring interval would then be changed to 5 years instead of the previous 3 years. - Through the ICRAF project, carbon growth data from 22 sample plots in 9 block sites were inventoried from March 28 to April 21, 2011. The processes and methodologies involved together with the challenges and lessons learned from KEF's carbon documentation experiences were documented.

² Dr Lasco is a member of the Intergovernmental Panel on Climate Change, which was the 2007 co-winner of the Nobel Peace Prize. He began assessing the carbon stocks of different land uses such as forests, plantations, brushlands, agroforestry systems, secondary forests, among others, in 1998 with study sites all over the Philippines. 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.

THE KALAHAN FOREST RESERVE

In 1973, the KEF was founded as an indigenous people’s organization by Ikalahan tribal leaders in order to negotiate for ancestral domain rights. Since time immemorial, the Ikalahan have occupied their ancestral domain located in the Cordillera and Caraballo Mountains in Nueva Vizcaya Province in Northern Luzon. The ancestral domain, totaling approximately 30,000 hectares, is characterized by tropical rainforests and adjacent buffer zones with elevations from 550 to 1717 meters above sea level, relatively good biodiversity, but some agricultural conversion on the lower eastern slopes. In 1999, the KEF obtained recognition of their ancestral right to the entire domain which has since then been divided into four (4) clusters.

The first of these clusters (Cluster I), with a size of 14,730 hectares, has been formally in the care of KEF since 1974 when the organization was granted exclusive rights through a 25-year communal stewardship agreement (renewable for another 25 years) issued by the Philippine government. This was a significant breakthrough for the protection of indigenous rights in the Philippines and a pioneering development in resolving threats to ancestral lands and indigenous culture. As the representative of village elders and barangay officials, KEF established a forest management regime to address both conservation and livelihood concerns, and built community capacity to limit livelihood activities within designated zones in order to spare the primary forests from degradation.

Biophysical Characteristics of the Reserve

More popularly known as the Kalahan Forest Reserve (KFR), Cluster I is found inside the municipality of Santa Fe, Nueva Vizcaya and located in the western portion west of the Magat River. Since taking control of the reserve, the Ikalahan/Kalanguya people have rehabilitated the forest area and effectively managed it under the communal forestry protection concept pioneered and modeled by KEF. To date, the Kalahan Reserve contains pine, mossy oak, and dipterocarp forests, more than 150 bird species (35 of which remain on the UN endangered list) and 1,600 large plants of various species. Protection systems are in place in about 3,000 hectares of old growth and secondary forests as sanctuaries for both flora and fauna. Table 1 specifies the land uses and their corresponding areas within the reserve.

Table 1. Land uses and their sizes in the Kalahan Forest Reserve/KEF Ancestral Domain

Land Use Type	Area (ha.)
Sanctuary	2,203.5
Forests (by classification)	10,290.1
• Primary Dipterocarp	132.0
• Secondary Dipterocarp Few	1,461.0
• Secondary Dipterocarp Medium	1,827.8
• Secondary Dipterocarp Thick	613.8

• Mossy	177.7
• Mossy Scattered	477.9
• Primary Pine	634.1
• Secondary Pine Few	1,758.2
• Secondary Pine Medium	1,319.7
• Secondary Pine Thick	739.5
• Mixed Dipterocarp and Pine Medium	554.3
• Swidden Farms with Scattered Dipterocarp	594.1
Pasture Land	790.9
Titled Land	363.8
TOTAL	13,648.3

Source: Map of Areas of Sampling Blocks, KEF, 25 Jan 2011.

Coverage: 6 Barangays (Imugan, Malico, Baracbac, Bacneng, Sta. Rosa & Unib),
 1 Municipality (Sta. Fe),
 1 Province (Nueva Vizcaya)

Plans are also underway to improve the forest biodiversity in Clusters II, III and IV in the eastern portion east of the Magat River which was logged over some 40 years earlier. These include the construction of a wildlife corridor through the entire domain under the supervision of all four clusters. But because livelihood plays an important role in forest protection and development, economic niches are also planned to be established to reduce demands on the forests and allow for sustainable forest management.

Blocks and Sampling Plots

As indicated in the above-mentioned chronology, blocking in the reserve started in 1994 with the use of satellite imaging data. This initial effort resulted in the delineation of 62 blocks and approximately 200 sample sites. On the basis of this delineation, KEF obtained baseline carbon data by measuring the trees in the sample plots and computing their respective carbon stocks before drawing up a total estimate for the entire reserve. Following the baseline were four monitoring periods that were undertaken 3 years apart in 1997, 2000, 2003 and 2006. KEF's adoption of the Global Positioning System (GPS) as a tool for accurately locating the sample plots within the blocks started a reblocking effort to address the observed lack of homogeneity in tree species within the blocks. Reblocking spanned a few years and was completed in early 2011; this yielded 80 blocks in all. In the interest of observing homogeneity in the sample plots, KEF also reviewed the earlier samples and made certain sampling corrections or modifications where needed.

Table 3 presents selected data on the new total of 80 blocks, including the number of sample plots per block and their respective area and forest classification.

Table 3. Selected data on the blocks and sample plots in Kalahan Forest Reserve

Block	No. of Sample Plots	Area (ha.)	Forest Classification
1	4	132.03	Primary Dipterocarp
2	2	157.78	Secondary Dipterocarp Thick
3	2	64.32	Secondary Dipterocarp Few
4	3	232.49	Swidden w/ scattered Diptero
5	1	84.96	Secondary Dipterocarp Thick
6	4	118.25	Swidden w/ scattered Diptero
7	1	14.56	Secondary Dipterocarp Few
8	3	105.48	Secondary Dipterocarp Few
9	2	26.19	Secondary Diptero Medium
10	1	73.98	Secondary Dipterocarp Thick
11	3	193.51	Secondary Dipterocarp Thick
12	2	127.76	Secondary Diptero Medium
13	3	69.33	Secondary Dipterocarp Few
14	3	87.30	Secondary Dipterocarp Few
15	4	113.14	Secondary Dipterocarp Few
16	3	207.42	Secondary Dipterocarp Medium
17	0	85.55	Secondary Dipterocarp Thick
18	1	121.28	Mixed Diptero & Pine Medium
19	2	59.86	Mossy
20	0	96.57	Secondary Dipterocarp Medium
21	1	65.39	Secondary Dipterocarp Few
22	2	111.47	Secondary Dipterocarp Medium
23	2	87.45	Secondary Dipterocarp Few
24	3	129.51	Secondary Dipterocarp Medium
25	2	114.88	Mossy Scattered
26	2	243.32	Swidden w/ Scattered Diptero
27	4	154.51	Mixed Diptero & Pine Medium
28	3	338.09	Secondary Dipterocarp Medium
29	3	198.18	Secondary Pine Few
30	4	170.29	Secondary Pine Medium
31	3	290.90	Secondary Pine Few
32	2	245.49	Secondary Pine Few
33	2	116.59	Secondary Pine Few
34	4	243.43	Secondary Pine Medium
35	4	640.03	Secondary Pine Few
36	2	102.85	Primary Pine Forest
37	3	104.48	Secondary Pine Thick
38	2	63.31	Secondary Pine Thick
39	2	62.04	Secondary Pine Thick
40	4	239.19	Secondary Pine Medium
41	3	184.09	Secondary Pine Few
42	2	107.03	Secondary Pine Medium
43	2	82.86	Secondary Pine Few
44	3	258.27	Secondary Pine Thick
45	2	20.07	Secondary Pine Medium
46	1	10.25	Secondary Pine Medium
47	2	303.57	Primary Pine Forest

48	1	23.72	Secondary Dipterocarp Few
49	2	145.91	Secondary Pine Thick
50	2	158.53	Mossy Forest Scattered
51	2	114.70	Secondary Dipterocarp Medium
52	2	114.11	Secondary Dipterocarp Medium
53	4	467.25	Secondary Dipterocarp Medium
54	4	180.71	Secondary Dipterocarp Few
55	1	74.59	Mossy forest
56	3	97.89	Mossy Forest
57	1	14.65	Secondary Dipterocarp forest
58	3	9.00	Secondary Dipterocarp Few
59	4	171.12	Mixed Diptero Pine Medium
60	2	206.22	Secondary Pine Medium
61	2	20.09	Mixed Diptero Pine Medium
62	1	17.97	Secondary Dipterocarp Thick
63	1	18.52	Mixed Diptero & Pine Medium
64	1	54.25	Secondary Dipterocarp Medium
65	2	33.78	Secondary Dipterocarp Few
66	0	122.54	Secondary dipterocarp Medium
67	2	100.36	Secondary Pine Few
68	1	6.61	Secondary Pine Few
69	0	165.62	Secondary Pine Medium
70	1	139.94	Secondary Pine Thick
71	2	105.13	Secondary Pine Medium
72	1	121.98	Secondary Pine Medium
73	1	40.51	Secondary Dipterocarp Medium
74	2	43.30	Secondary Dipterocarp Few
75	1	106.61	Secondary Dipterocarp Few
76	1	153.02	Mossy Forest Scattered
77	1	241.27	Mossy Forest
78	0	6.81	Secondary Dipterocarp Forest
79	0	5.13	Secondary Dipterocarp Few
80	0	4.19	Secondary Dipterocarp Thick
TOTAL	164	10,145.63 ^a	

^aDifference of 144.47 has. from total obtained in land uses table. Possibly not reported are the areas of other swidden farms which are adjacent to dipterocarp trees.

As revealed in the foregoing table, to date that there are 164 sample plots in all. These sample plots are distributed by forest type as follows:

<u>Forest Type</u>	<u>No. of Sample Plots</u>
Primary Dipterocarp	4
Secondary Dipterocarp (unclassified)	1
Secondary Dipterocarp Few	32
Secondary Dipterocarp Medium	25
Secondary Dipterocarp Thick	8
Mossy	7
Mossy Scattered	5
Primary Pine	4

Secondary Pine Few	22
Secondary Pine Medium	22
Secondary Pine Thick	13
Mixed Dipterocarp and Pine Medium	12
Swidden Farms with Scattered Dipterocarp	<u>9</u>
TOTAL	164

MAJOR ISSUES, CHALLENGES AND LESSONS LEARNED

The major issues concerning carbon stock measurement and documentation from which challenges and lessons or recommendations were derived are as follows.

1. Duration of and Steps in Carbon Stock Documentation

The study has revealed that KEF faced a very challenging work of continuously monitoring carbon stocks during the past 18 years owing to difficulties stemming from the absence of definite standards for them to follow for most of the duration, their non-awareness of available formula for estimating tree biomass, and technical problems experienced in estimating biomass. These difficulties caused not only many delays but also brought confusion. Moreover, KEF was handicapped by the lack of funds to support carbon growth monitoring activities.

The monitoring activities were conducted four times at 3-year intervals. The ongoing (2011) fifth monitoring task is following a 5-year interval. KEF leaders have recognized that their monitoring activities are necessary although these have become many, costly and sometimes demoralizing because it is still a long way to trading the carbon stocks. Nevertheless, to other indigenous peoples groups wishing to join the carbon trade markets they recommend a shorter set of steps consisting of:

- a. First, get the baseline data to prove that they have got the carbon. This is done by establishing homogeneous blocks in the forest, delineating sample plots within each block, measuring every tree in the sample plot to compute for total biomass in the plot, encoding data in spreadsheets and estimating total carbon based on the existing formula developed by Dr. Rodel Lasco of WAC/ICRAF.
- b. Then sell the carbon stocks to a buyer based on a percentage (e.g. 80%) of the estimated growth per year.
- c. Finally, measure the growth of carbon sequestration 5 years after getting the baseline data. If the computed average annual carbon growth varies from the estimate, corrected payments can be negotiated by the parties involved.

2. Team Composition and Necessary Tools

The KEF team is composed of a total of 9 members: 2 foresters, 2 measurers, 2 carvers, 1 recorder, and 2 brushers. One of the foresters serves as the lead man; the other acts as a recorder. During baseline, the forester also identifies the corners of blocks and sample plots, coordinates the jobs of sub-teams, and prepares the maps using the collected data. The brushers clear the way and are especially needed during baseline establishment when the underbrush is still thick and relatively undisturbed. Two sub-teams of measurer and carver move from tree to tree in partnership with a recorder. The measurer takes the tree measurement, the carver ensures that the tree number is etched on the tree and painted for clarity, while the recorder takes down the measurement made. In KEF's experience, the measurer has to have a good eye, must know how to read the tape measure and add the numbers whenever necessary. The recorder, in turn, has to be alert, attentive and should possess good hearing.

Monitoring is currently being done by two teams of 4 members each comprising of a marker, a measurer, a recorder and a brusher. But it is believed that three and not two teams are actually needed to fulfill the work in KEF's 10-hectare forest. The teams can be supported by a lead forester and cook.

The necessary tools include: (1) a GPS reader for obtaining accurate boundary locations, (2) tape measures for taking the circumference of tree trunks, (c) hammer and home-made carving tool, (d) paint and home-made paint brush, and (e) rubber boots.

During the documentation study, KEF fielded an average of eight team members. Working on an 8-hour work day, it took the team 18 days to take carbon growth measurements in a total of 22 sample plots. The team averaged 3 hours of work per plot.

3. Blocking Technique and Criteria

The blocking technique said to be recommended in textbooks is the so-called chessboard technique which is dividing the area into squares like on a chessboard. This is allegedly alright to use for flatter lands but rather difficult to implement where the slopes are high. Instead of following this technique, KEF decided to do homogeneous blocking based on species and comparative density (i.e., thickness of stand or cover). While satellite imaging data facilitated the initial blocking, this later proved inadequate for ensuring homogeneity *in situ*.

KEF has learned that homogeneous blocking should be kept as a method for subdividing and classifying the forest because high accuracy can be obtained with a lower sampling rate. To avoid the problem of reblocking, it is best to immediately employ the GPS receiver for plotting the exact location of the boundaries of the blocks and sample plots.

4. *Number of Sample Plots*

There was no existing standard regarding the number of sample plots for carbon estimation that KEF could adopt. Consequently KEF initially set its own standard of 1% of the total forest area. Eventually, this was increased to 2% in order to improve accuracy in estimation. This was how KEF arrived at the target of 200 sample plots for a 10,000-hectare forest.

5. *Guidelines for Standardizing Measurements in Sample Plots*

Owing to repeated carbon stock measurement activities in the past two decades, KEF has been able to develop important guidelines for standardization of the following main tasks.

- a. Color coding the trees – Use white paint to identify trees that serve as boundary markers and red paint to number all other trees within the plot.
- b. Identifying which trees/trunks to measure – All trees found within the sample plot with a circumference of at least 30 cm should be measured as part of the baseline. Tree less than 30 cm during a previous measurement period must be included in the subsequent documentation once this target circumference is reached. In the past, only the crop trees were targeted for measurement and non-crop trees like *gebgeb* and *lablabang* were bypassed because of the mistaken notion that the former type was preferred for carbon sequestration. Also bypassed were the secondary trunks in trees with multiple trunks, i.e., only one trunk was measured instead of both. Later, KEF discerned that because every tree contains biomass it is then critical to include non-crop trees and secondary trunks in the carbon documentation.
- c. Measuring the tree trunk – Get the tree circumference at breast height during the baseline establishment. Carve a 6-8 inch line (1-2 mm. deep) on the bark to mark this height and apply red paint. Look for this carved line when you return for another round of measurement even if it appears higher or lower due to soil erosion or earth/ground shifting. In the case of trunks that are encased in or obstructed by moss, vines or loose barks, the obstruction should first be removed before measurement.
- d. Numbering the tree – Carve the number (with 1-2 mm. deep) below the breast line and apply red paint. If there are 2 (or more) trunks below the breast line in a single tree, both trunks should carry the same number but will be distinguished by the first letters of the alphabet, e.g., 1A and 1B. The same rule applies in the case of a tree that bore a single trunk during baseline measurement but had grown a second trunk at breast line on the next monitoring visit. In the past, the tree number was simply painted on the bark,

but this mark was easily lost as the bark changed over time. This experience led to carving the number on the trunk prior to painting.

- e. Recording the measurements – Measurements should be noted down in a record book as soon as these are made. In KEF’s experience, one (1) recorder for every 4-member blocking or monitoring team is sufficient. During the documentation study, the number of trees recorded had increased due to the identification of: (1) new trees that had developed 30-cm trunks; (2) non-crop trees that were bypassed in previous monitoring, and (3) secondary trunks that measured 30 cm.

6. *Factors Affecting the Measurement Activities*

Several factors have adversely influenced the field measurement activities of the KEF team, causing delays and inconvenience. These are:

- a. The distance of the blocks and sample plots from the team’s home base (Barangay Imugan in Sta. Fe) that affects travel time and arrangements for food and accommodation;
- b. Inclement weather conditions which disrupt the completion of field activities (hence if it is at all possible, measurement must be scheduled during the dry months of the year);
- c. Presence of “guerilla flora and fauna” such as thorny or itchy vegetation, huge ants and other biting or stinging insects, and snakes; and
- d. Peace-and-order situation.

7. *Encoding the Data*

After the measurements are completed, the recorder submits the data to the encoder (also a forester in the case of KEF). The Encoder transfers the data to the computer, in the process noting if there are discrepant or missed information. The encoder also advises if callbacks are needed and if some team members must return to the forest for necessary corrections in data.

During the documentation study, it took the encoder 3 days to encode the data for a total of 22 sample plots. The problems the encoder encountered were of two types: difficulty in deciphering the handwriting of recorders and presence of missing data.

8. *Computing the Carbon in the Tree Biomass*

In KEF, its former executive director has assumed the task of preparing the spreadsheets for computation of carbon estimates. Data for 200 sample plots are currently

stored in voluminous spreadsheets which had taken him some months to set up. Computing the data based on a pre-defined formula is said to be quick but it is the work of doing the spreadsheets that is quite long, tedious and best undertaken by a trained person. He calculated that if he could only work uninterruptedly on the spreadsheets it would just take him about a month to arrive at estimates of the carbon stocks in 200 sample sites. The fact that only one person is presently doing the spreadsheets is a challenge KEF must hurdle. The foundation once trained another person to assist in this work but the latter has already left. KEF recognizes the need to train another one to help address the backlogs as well as to crosscheck the data entries.

9. *Enabling Resources*

One of the biggest challenges if not the greatest challenge faced by the KEF in its efforts to monitor/measure carbon growth in the Kalahan Forest Reserve is the lack of enabling resources especially funds for completing the tasks entailed. The documentation study has provided some money to conduct measurements in 22 sample plots. It is believed that if not enough funds will be found to complete the majority of plots (estimate of 178) within 6 months, the data initially collected might be rendered useless. Thus far, the foundation's access to financial help has been limited to WAC/ICRAF which has incorporated the costs of monitoring carbon growth measurements in its projects with KEF whenever possible.

CONCLUSION

As the only CADT holder and PO that had embarked on a carbon sequestration program long before any other, KEF holds an additional distinction of making all the pioneering mistakes and learning from their mistakes. This is akin to trailblazing as there was no clear path to follow around 20 years ago and periodically backing off as obstacles were encountered along the way. But the good that can come out of KEF's learning experiences is that other POs following the same path leading to the carbon market as a RES mechanism need not make the same mistakes. Moreover the carbon baseline data generated from statistics on the Kalahan Forest Reserve may be used by other POs as a basis for making carbon estimates on their own forests in the Cordillera Region.

The KEF's own goal of adopting carbon sequestration and engaging in carbon trading as a mechanism to reward the Ikalahan/ Kalanguya people for continuing environmental services by maintaining and enhancing the Kalahan Forest Reserve is certainly attainable though perhaps not that immediately. There is the ongoing carbon growth monitoring work that needs to be completed amidst limited resources. Because the current focus is only on measuring above ground tree biomass, KEF plans to expand the measurement to include carbon stored below ground or soil carbon. Once the latest carbon estimates become available, there is the further challenge of preparing and submitting a project design for carbon trading with guidance from the RUPES Program of WAC/ICRAF. Among other requirements needed, community consultations about carbon ownership or benefit sharing will have to be conducted and documented by KEF and Memoranda of Agreements must be drawn up with individual claimants within the Kalahan Forest Reserve. Notwithstanding these new challenges, KEF has remained steadfast in its resolve to engage in the carbon market for its socioeconomic and environmental benefits to the local communities and environment.

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