Case Study

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Laguna Lake Basin and Sierra Madre Community Forests, the Philippines

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Introduction

Climate change is one of the primary concerns of humanity today. The third IPCC assessment report concludes that there is strong evidence that human activities have affected the world's climate (IPCC 2001). The rise in global temperatures has been attributed to emission of greenhouse gases, notably CO_2 (Schimell *et al.* 1995). Forest ecosystems can be sources and sinks of carbon (Watson *et al.* 2000). Deforestation and burning of forests releases CO_2 to the atmosphere. Indeed, land-use change and forestry are responsible for about 25% of all greenhouse gas emissions. Forest ecosystems can, however, also help reduce greenhouse gas concentrations by absorbing carbon from the atmosphere through the process of photosynthesis. Of all the world's forests, tropical forests have the greatest potential to sequester carbon primarily through reforestation, agroforestry and conservation of existing forests (Brown *et al.* 1996).

Philippine forest ecosystems have likewise been a source and sink of carbon (Lasco and Pulhin 2000, 2003). Since the 1500s, deforestation of 20.9 million ha of Philippine forests contributed 3.7 billion tons of carbon to the atmosphere, 2.6 billion tons of which were released last century (Lasco and Pulhin 2000). Present land-use cover, however, also absorbs carbon through regenerating forests and planted trees. The vast areas of degraded land in the Philippines in fact offer great potential for carbon sequestration through rehabilitation activities such as reforestation and agroforestry.

In recent years, there has been an increasing interest in forestry projects under the CDM in the Philippines. The objective of this paper is to present two community-

based AR CDM projects being developed in the Philippines. These are the Laguna Lake basin project and the Sierra Madre project. As these projects are still under development at this time, some aspects may change in the future.

The Ilda-Tanay Stream Bank Rehabilitation Project

Background

The Laguna Lake basin is one of the most important and dynamic land and water formations in the Philippines. It straddles Metro Manila and the fast developing region of Calabarzon (composed of the provinces of Cavite, Laguna, Batangas, Rizal and Quezon). It is an important source of agricultural commodities and industrial raw materials. Laguna Lake is considered to be the freshwater 'fish bowl' of Metro Manila and is also important for irrigation, transportation and energy production.

Because of its proximity to urban and industrial centres, the land and water resources of the basin are under severe stress. The total basin area is 382,000 ha, of which 198,640 ha are under some form of agriculture (LLDA 1995). Forest lands occupy 73,000 ha, of which only 19,000 ha are actually covered with forests. The rest are mainly denuded lands with grass and annual crops. The impact of land degradation processes is heavily felt in the lake. Siltation of the lake bed is one of the most serious problems that threaten the capacity of the lake to provide goods and services. The volume of water in the lake is essential for power generation, irrigation and navigation. It is roughly estimated that the rate of sedimentation is in the order of 1.5 million m^3 per year.

The Tanay microwatershed covers the municipality of Tanay. It lies at 14°30′ N and 121°17′ E. The municipality is 56 km east of Manila. It is bounded in the north by the towns of Antipolo, Baras, Teresa and Montalban in the province of Rizal. In the east, it is bounded by Quezon province, on the south by Sta. Maria, province of Laguna, and Pililia, Rizal, and in the west by Laguna de Bay.

The main proponents or sellers of this project are the municipality of Tanay and the Laguna Lake Development Authority (LLDA). The implementers will be farmers in the Tanay watershed, many of whom belong to indigenous groups (Santos-Borja *et al.* 2005). The local governments will, through multistakeholder river councils, identify and implement the subprojects. They will also be responsible for the collection of monitoring data to verify carbon emissions reductions and through participatory, transparent processes, and will allocate the revenues from the subproject emission reductions (ERs) to activities in the microwatershed and participant communities.

The main objective of the project is to reduce greenhouse gases (*i.e.* CO_2) in the atmosphere while helping rehabilitate the Tanay watershed and providing socio-economic benefits to the local people. Specifically, the project aims to

- reforest 70 ha of private lands,
- establish 25 ha of agroforestry farms on public lands and
- sequester 10,000 to 20,000 t of CO_2 from the atmosphere in 20 years.

It is expected that local communities will be the prime beneficiary of the project.

Farmers could benefit in at least two ways. First, by planting fruit trees, they are expected to gain additional income from harvesting them. The income from fruit trees could be significant since the area is in close proximity to Manila, the largest market in the country. In addition, it is expected that farmers will benefit from the proceeds of the sale of carbon credits. The exact mechanism for this is still being discussed.

Project Development Methods

The project is being developed through a World Bank grant to the LLDA, which is already implementing an existing World Bank watershed project, and the local government units in the watershed. The basic idea is to superimpose production of carbon credits on the existing project components. An information campaign was conducted in the various local government units (LGUs) to increase their awareness of the potential to gain carbon credits through their project activities. Initially, the municipality of Tanay was the first LGU to develop AR CDM projects for carbon credits. The project has three components: stream bank rehabilitation, ecological enhancement and agroforestry.

Stream bank rehabilitation: The purpose of this activity is to increase the riparian forest cover of the Tanay river in order to reduce erosion. Under this component, owners of private lands will be encouraged to plant trees along river banks within their property. Seedlings will be given for free after an information and education campaign and a pledge of commitment to the project. Provision of seedlings and support services will be contracted through Katutubo, an upland village consisting of indigenous Dumagat and Remontado groups. A total of 20 ha will be reforested.

Ecological enhancement in upland areas: The purpose of this second subcomponent will be to reforest upland areas near the headwaters of the Tanay river in order to reduce erosion. A total of 50 ha of denuded and grassland areas will be reforested. Provision of seedlings, planting and maintenance will be implemented by the village of Katutubo. The species will be chosen by the community and will provide them timber, fruit and medicinal resources.

Agroforestry orchard: The purpose of this subcomponent is to provide income for Katutubo through agroforestry while reducing erosion in the upland areas. This component will be undertaken in an area of 25 ha of communal land belonging to this indigenous community. It will integrate mango trees at 10 x 10 m spacing with cash crops using an alley cropping design.

Preliminary Results

Expected greenhouse gas benefits: The expected greenhouse gas (GHG) benefits were calculated using a high and low scenario. For the project period (2004–2014), the project will have total net carbon benefits of 3,204 tC (11,759 tCO_2e) and 1,424 tC (5,230 tCO_2e) under the high and low scenarios, respectively (Santos-Borja *et al*. 2005). The anticipated total emission reduction purchase agreement value is US$31,380 for the low scenario and US$70,554 for the high scenario. Total carbon sequestration for the 20-year project duration is shown in **Figure 8.1** under various scenarios.

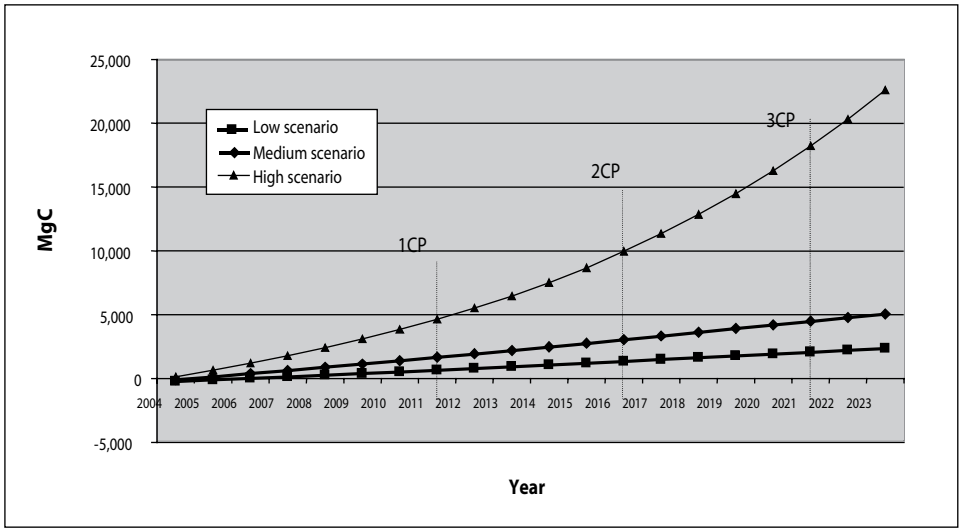

Figure 8.1. Net carbon sequestration under various scenarios of the LLDA project in Tanay, Rizal

Expected buyers of carbon credits: In the Philippines, the World Bank is the only firm buyer thus far of emissions reductions from sinks project through its LISCOP project with the LLDA. The BioCarbon Fund will purchase the emission reduction units. The BioCarbon Fund provides carbon finance for projects that sequester or conserve greenhouse gases in forests, agro- and other ecosystems (www.carbonfinance.org). It is designed to ensure that developing countries, including some of the poorest countries, have an opportunity to benefit from carbon finance in forestry, agriculture and land management. It is expected to help reduce poverty while reducing greenhouse gases in the atmosphere. The BioCarbon Fund is testing how land use, land-use change and forestry activities can generate high-quality ERs with environmental and livelihood benefits that can be measured, monitored and certified, and stand the test of time.

Intermediaries: For the LISCOP project, LLDA will act as the carbon financing intermediary and technical advisor for the proponent local governments in the Laguna de Bay watershed. During preparation, LLDA will act as technical advisor, ensuring the subproject is technically sound, meets environmental and social safeguard policies and undertakes the necessary analysis and administrative requirements for carbon finance. It will monitor the execution of the subprojects from a technical, environmental and social perspective and act as intermediary in monitoring and verifying emissions reductions and channelling revenues from carbon credits back to local governments.

Compensation mechanisms: The BioCarbon Fund is expected to pay US$4 per ton CO_2e, which is on the high side of carbon prices offered by the World Bank's other carbon funds. The details of the compensation mechanism are still being worked out at the time of writing. Key issues are: (a) how will the carbon income be divided

among stakeholders? (b) will farmers receive their share individually or as a group? (c) what types of projects, if any, will the carbon income finance? and (d) what is the role of LLDA in fund administration?

Current Status

At present, other LGUs in the watershed have expressed interest to likewise develop AR projects. These projects will be bundled together to form one small-scale project (with less than 8,000 tons of CO_2e removal per year). The Project Design Document (PDD) of the project is currently being validated.

The Sierra Madre Project

Background

The Sierra Madre Biodiversity Corridor (SMBC), covering approximately 1.7 million ha, is one of the most biologically important areas in the Philippines. It includes 15% of the remaining closed canopy dipterocarp forests in country as well as 47% of the remaining mossy forests. Aside from the diverse habitat types, the corridor is also home to the endangered Philippine eagle. Part of the SMBC is the Northern Sierra Madre Natural Park, the largest protected area under the National Integrated Protected Area System of the country. The park is one of the few areas in Asia that contain a high concentration of threatened species. Seventy globally threatened or near-threatened species of wildlife have been recorded in the park. In addition, it harbours the largest remaining lowland forest in the Philippines.

The proposed carbon sequestration project is part of Conservation International (CI)—the Philippines' concerted efforts to build alliances with local communities, private sector, government agencies and nongovernmental organisations (NGOs) to facilitate the management of the SMBC and strengthen enforcement of environmental laws. It uses a multifaceted approach to alleviate threats and to restore and protect 12,500 ha of land within the corridor.

The ultimate objective of the project is to demonstrate that a properly designed and implemented carbon offset project not only offers an economically attractive, risk-managed portfolio option, but also generates multiple benefits such as biodiversity protection, watershed restoration, soil conservation and local income generation. It will also demonstrate that tradeoffs such as soil erosion, water table decrease and loss of livelihoods can be avoided. Specifically, the project has the following initial objectives:

- To reduce pressure on the natural forest and provide incentives for local communities, the project will work to establish an agroforestry project on 2,000 ha brushland that will supply a more stable income to the population and lessen the reliance on forest projects.
- To facilitate the sequestration of carbon dioxide from the atmosphere and increasing the connectivity of sensitive habitats for the world's most threatened species, the project will restore 5,500 ha of grassland areas to original hardwood forests using a mix of fast-growing species and native species.

The main strategy of the project will be community-based forest management. The key stakeholders of the project will be the local community, local NGOs, LGU, the Department of Environment and Natural Resources (DENR), the project monitoring team, and the funding organisation. The project is located in Quirino province about 400 km north of Manila between 16°15′00″ - 16°27′30″ N and 121°40′00″ - 121°52′30″ E.

The following discussion is based on the preliminary study conducted to explore the feasibility of implementing a CDM project in the area.

Project Development Methods

The site development technologies to be used are common to the Philippines. There has been a long history of reforestation and tree planting in the country, and it was more than 100 years ago that the first reforestation project was implemented.

Reforestation: Reforestation will be done by planting a combination of indigenous and fast-growing species in grassland areas. Ideally, preference should be given to the use of indigenous species as these are better adapted to the site, but the approach of combining fast-growing and indigenous species is deemed to be prudent in this case for two reasons. First, the sites for the project activity are open and marginal grasslands. Fast-growing species have proven ability to compete with Imperata grassland. They could then provide a better microclimate for indigenous species, which could be introduced either naturally or artificially in the understorey once the grass is suppressed. Secondly, there is minimal experience in planting indigenous species in open grasslands. Using a combination of indigenous and fast-growing species thus improves the chance of success and mitigates risk to the project.

Agroforestry farm development: Upland farms are widespread in the project site. They usually involve planting of annual crops such as rice, corn and vegetables for subsistence and/or cash. They have high soil erosion rates and are therefore not sustainable, especially in steep slopes. They will eventually end up as degraded grassland area without any intervention.

The main strategy in stabilizing these farms will be by agroforestry development. Agroforestry involves the planting of woody perennials in conjunction with agricultural crops. Many forms of agroforestry exist in the Philippines, ranging from alley cropping to multistorey systems.

Fruit trees will be introduced in upland farms that are devoted to annual crops. This will help reduce erosion and increase income of farmers. Farmers will be given a choice of species to plant. The following fruit trees have been identified as suitable for the area: avocado, caimito, jackfruit, mango and pummelo. Trees will be planted at a 10 x 10 m spacing to allow for intercropping of annual crops. In this way, the current practices of farmers will not be radically changed.

From the carbon sequestration point of view, the main advantage of fruit trees over forest trees is that only the fruits are harvested so that the bulk of the carbon in the biomass is conserved. In addition, it is in the best interest of the farmers to prevent fire because they want the trees to bear fruit, unlike in a purely reforestation project where the main income is derived from planting trees. There is also little chance of farmers allowing their own farms to be converted to forest tree plantations

because of bureaucratic red tape associated with getting permits for harvesting trees. In contrast, no such regulations govern the harvesting of fruit trees.

Stakeholder participation: Comments from local stakeholders were solicited through a series of two workshops early in the development of the project. During the first workshop, which gathered representatives from government agencies, NGOs and academia, the concept of CDM and eligible projects were discussed. The workshop also provided an opportunity to orient stakeholders on the proposed CDM forestry project. After receiving an overview of the CDM concept and of the proposed forestry project, participants were asked to identify criteria in choosing specific sites. The criteria identified by local stakeholders and that established by the CDM were used to identify specific sites for the project activity.

The second workshop involved the local communities inside the proposed project site. The main objective of the workshop was to increase awareness of the project on the part of local communities and to solicit support and participation from them. Similar to the first workshop, the second workshop began with the presentations of papers to provide the participants with an overview of the concept of CDM, eligible projects under the CDM and the proposed forestry project. After the presentations, a forum was provided to express issues and concerns on establishing the CDM forestry project. Towards the end of the workshop, a resolution was drafted, discussed and finalized. The resolution signed by the local communities is an indication of their support of the implementation of the carbon sequestration project.

Preliminary results

After 30 years, it is expected that a total of 512,000 tC will be sequestered by the project, most of which will come from the reforestation component (**Figure 8.2**).

The project's long-term social development outcomes are related to the watershed-wide benefits of reduced sedimentation in the rivers, reduced flooding (*e.g.* less damage to assets and less time lost) and reduced topsoil erosion (*e.g.*, improved

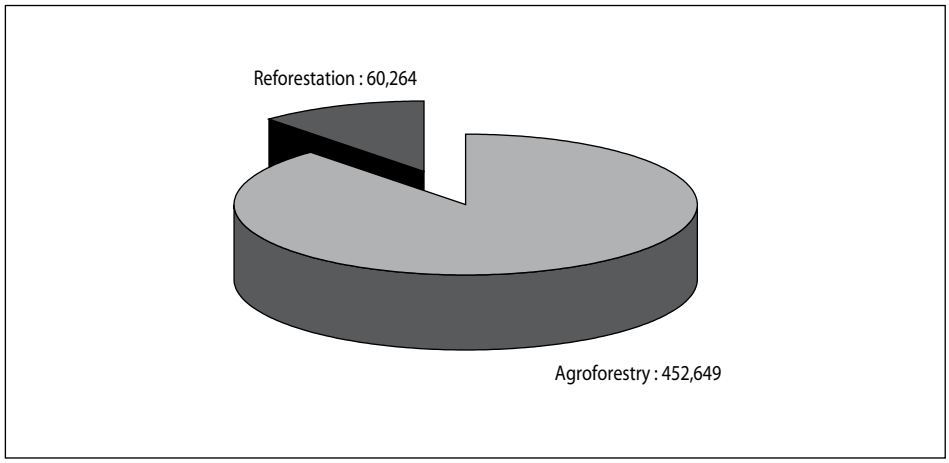

Figure 8.2. Total net carbon benefits (in tC) of the reforestation and the agroforestry components of the project

agricultural production in the long term). In the short term the project will result in livelihood improvement (through agroforestry), aesthetic improvements and reduction of localized erosion problems.

Local communities will benefit from the project. Reforestation components offer substantial employment opportunities for residents in the area. In addition, the agroforestry component has the potential to provide a long-term source of income.

Current Status

After two initial studies since 2001, the PDD is now being prepared. There were initial consultations with the Designated National Authority (DNA) and it is expected that the PDD will be completed in early 2008.

Opportunities and Challenges

There is great potential for carbon sequestration projects in the Philippines owing to its biophysical condition and the presence of land areas that could and should be reforested (Lasco *et al.* 2001). There are literally millions of hectares in the uplands that pose ecological and economic threat if forest cover is not restored. There are, however, challenges that need to be overcome in order for the full potential of the carbon market to come to fruition.

To date, the DNA has not endorsed a single AR CDM project to the United Nations Framework Convention on Climate Change (in contrast more than five energy projects have been endorsed). Recently, there is the positive signal that the government through the DENR is finally moving to pave the way for AR CDM projects in the country. A technical evaluation committee for AR CDM projects is being constituted and capacity building activities are currently underway. It is highly likely that the two projects presented here will be the first ones to seek DNA endorsement.

The key challenge is to streamline the DNA procedures so that potential project developers are not discouraged. Early signs are encouraging. The DNA promises to reach a decision within 21 working days upon submission of a PDD. After more than a century of trying to reforest the Phillipines' denuded areas, the country has little success to show for it. The CDM offers a way of funnelling new resources that could assist in achieving the vision of a green Philippines.

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