

**Fiscal Year 2007 CDM/JI Project Research**  
**Philippines Reforestation, Agroforestry and Biomass**  
**‘Triple Benefit’ CDM Project Research**  
**Summary Report**

Mitsubishi Research Institute, Inc.

1. Project Summary

We have conducted a feasibility study and developed a PDD for a project which is a combination of afforestation and biofuel production and utilization in the province of Quirino on Luzon Island of the Republic of the Philippines (the Philippines). This project targets one of highly important biodiversity area in the Philippines called ‘Sierra Madre Biodiversity Corridor,’ designated and under close study since 2002 by Conservation International (CI), an international environmental conservation NGO.

Due to its geographical and climatic characteristics, the Philippines is rich in biodiversity mainly in its tropical rainforests. However, as it happens in other countries in the Southwest Asia, increase in population has significantly reduced the rainforest cover through expansion of human habitat and agricultural lands in the forest, commercial logging. Even after the deforestation was banned, the deterioration continues. A decrease in forest cover not only results in a loss of habitat for animals and plants but also a loss of functions that it provides, such as stable water supplies and soil stability. It is necessary to protect and restore these damaged lands for the regional development and conservation of biodiversity, however, it is also essential to consider the current situation that poor people rely on forests and its natural resources and need to continue their exploitive farming.

In the Sierra Madre Biodiversity Corridor, even though there has been much deforestation, there is still a large area of forest left supporting high biodiversity. The region holds an important role as it still retains the potential to maintain the complex ecosystem with diverse species. In addition, Sierra Madre Mountains serve as a watershed for the region, supplying water for hydroelectric generation and household and agricultural use, and therefore an appropriate watershed management is essential for the livelihood of the local residents.

This project aims for ‘Three Benefits’, namely, to create an alternative source of income for the local community, to protect and improve the habitat for animals and plants, and at the same time to stabilize the ecology in watershed areas to ensure a steady supply of water. The project is composed of forestry activities and biofuel production/utilization (Figure 1). The forestry activities consist of A/R CDM components and non A/R CDM components. Biofuel, which will reduce

greenhouse gas emission by replacing conventional diesel oil, will be produced from *Jatropha culcus* seeds. The local community will get new incomes from non-timber productions and sales of CERs from AR CDM and emission reduction type CDM. By combining with the biofuel component, local communities will have access to a stable market for *Jatropha* seeds produced from *Jatropha* plantation.

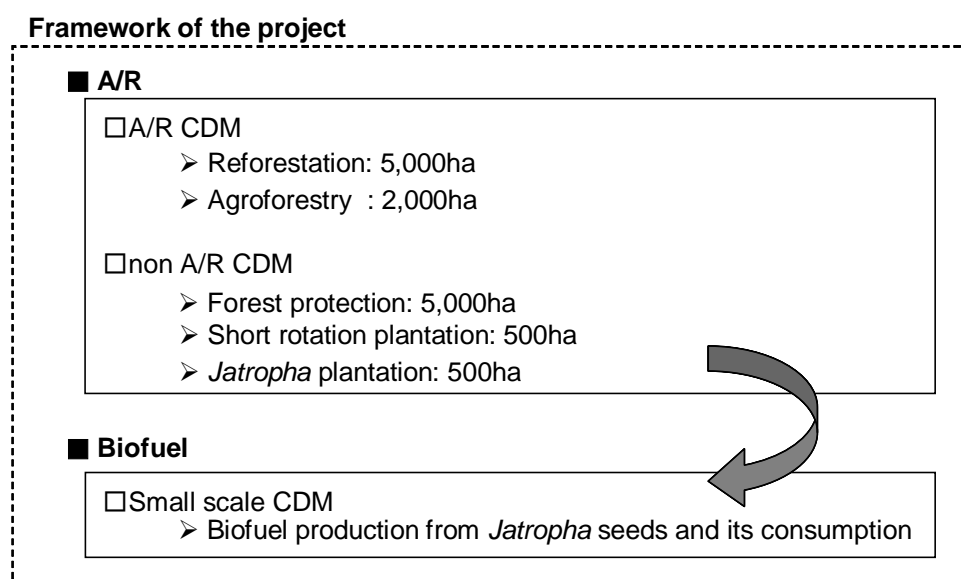


Figure 1 Framework of the proect

## 2. Conditions in the Host Country and the Subject Area

### 2.1 Conditions in the Host Country

Because of its rich but threatened biodiversity, the entire Philippines is designated as a CI hotspot, ‘an area that contains an exceptional level of biodiversity globally but faces destruction’.

The Philippines government raises energy independence as one of their ten policy mission, and in their mid-term development plan (2004-2010), states their plans to actively invest in natural gas and renewable energy developments. Also in the Philippines Energy Plan (2004-2013), they list 4 goals.

- to secure an energy source that is abundant, secure, safe, accessible and reasonably cheap
- to pursue the use of more clean and efficient energy and development of clean energy technology
- to build a concrete partnership and cooperation with key partners and stakeholders
- to empower and balance many energy interests

In the Philippines, the government encourages biofuel consumption as part of their energy independence goal, and this year an action plan, 'Biofuels Act of 2006 (Republic Act No. 9367)' was adopted. Our bioenergy project will contribute to the government's energy policy and its sustainable development.

## 2.2 Host Country's Readiness for Acceptance of CDM

The Philippines is one of the countries that reacted early to the climate change issues by creating Inter-Agency Committee on Climate Change (IACCC) in December of 1990 through the president's directive (No.220). They have also signed the Kyoto Protocol on April 15, 1998 and ratified it on November 20, 2003.

Designated National Authority (DNA) is run by 'CDM Steering Committee' led by the chairman of DENR and made up of members from government agencies and numerous industry leaders. The role of DNA is to support the nationally approved process for CDM and act as the center for information on CDM implementation. Under CDM Steering Committee, there is 'CDM Technical Evaluation Committee (TEC)' to evaluate projects proposed by CDM. Also this committee is comprised of Department of Energy (DOE) that is responsible for energy related projects, Forest Management Bureau (FMB), responsible for A/R CDM and Environmental Management Bureau of DENR, responsible for waste management. The timescale for CDM application process differs on project size and if there is any use of approved and appropriate baseline or monitoring methodology. Usually a normal size project will take about 20-25 working days to obtain approval. For a project to take effect, it takes an additional month, and for UNFCCC public comment period of another month, therefore a total of about 8 weeks before the project is registered.

For the current research, we have explained to the DNA about our project and requested their assistance. DNA has evaluated our project as having high impact on the Philippines' natural resources development, as the CDM projects currently underway for waste and wastewater management. Also, DNA has encouraged us to complete the research and make an application as soon as possible with their assistance.

## 2.3 Conditions in the Subject Area

The subject area, Sierra Madre Biodiversity Corridor is an area of 1.4M ha near Maddela, Quirino province on Luzon Island. In its 'Philippine Biodiversity Conservation Priority-setting Program (PBCPP),' the Philippines has categorized the conservation of the Sierra Madre Mountain

area as ‘very high to most important’ level. The Sierra Madre Biodiversity Corridor contains the largest forest in the country; its size is 1.4M ha, 25% of total national forest area, and of which 40% is a primary forest. Also the region exceeds as high biodiversity area; 45% of all living organisms in Philippines is found here.

The average annual temperature of the province of Quirino is 26.6°C, and the average of highest temperature is 32.6°C, while the lowest average temperature is 22.2°C. Normally, January is the coldest and May is the hottest month of the year. The annual rainfall varies from year to year with below 1500mm and above 2100mm.

The main industry in Quirino is agriculture. Rice and corn are the main crops, and they are supplied to neighboring regions and the greater Manila area. In Maddela, 79% of the households work in agriculture, and the rest in fisheries or other industries, i.e. furniture making, basket weaving, rattan craft, dry flower manufacturing.

The number of households that agreed to participate in the project is 1,989, and with average household size of 5 people, there will be about 10,000 people who will benefit from the project. And from the economic activities generated by the project, there will be more local residents who will indirectly benefit from the project.

### 3. Research Implementation

The contractor for this project, Mitsubishi Research Institute has conducted the research in cooperation with Conservation International Japan. Also, we have worked in cooperation with the Philippine government organizations and private companies. The figure 2 below illustrates the cooperative structure (Figure 2).

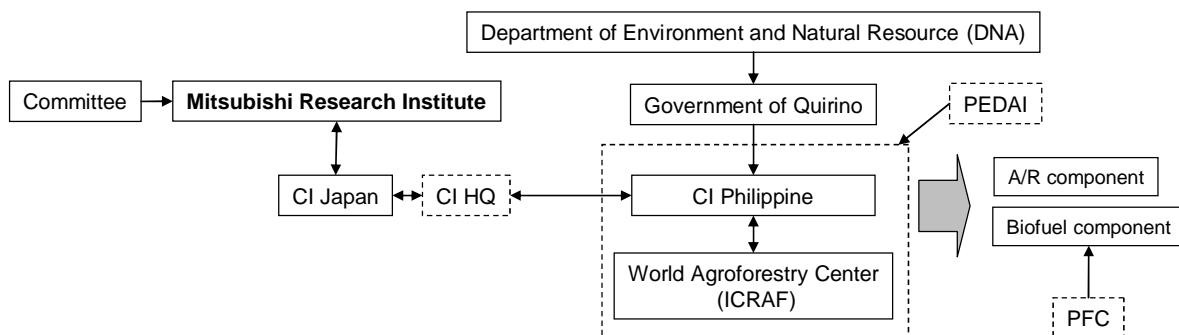


Figure 2 The cooperative structure for the project

## 4. Research on A/R CDM Project

### 4.1 Project Summary

Afforestation and reforestation projects are categorized into A/R CDM or non-A/R CDM. Even though CER is only applicable for A/R CDM component, we are planning to execute as one. The below are components for the afforestation and reforestation.

#### 1) A/R CDM

- Forest Restoration
  - To plant native species seeds in degraded land to create 5,000 ha of reforest area for the purpose of forest ecology restoration
- Agroforestry
  - In order to encourage and secure an increase in income for the local community, plant species appropriate for agroforestry on 2,000 ha of land

#### 2) A/R CDM Non-Approved Forest

- Short-Rotation plantation
  - Provide an alternative wood supply for the local community by planting species appropriate for short-rotation coppicing on 500 ha of land.
- *Jatropha* plantation
  - Plant *Jatropha Curcus* on 500 ha of land for biomass energy source contributing to GHG emission reduction which will also contribute to an increase in the local community's income
- Forest protection
  - Protect 5,000 ha of the existing primary forest and preserve the habitat for wildlife

### 4.2 Land Eligibility of the Subject Area

The A/R CDM subject area of over 7,000 ha has been deforested before 1990, according to the land cover map of 1987 and the forest cover change map of 1990-2000. Also, we have conducted an onsite inspection and verification and confirmed that the area is suitable for our project.

### 4.3 Selection of the Subject area

The subject area has been selected according to the criteria below within the suitable region.

- (1) The area lays in degraded, abandoned, and needs reclamation
- (2) The project initiatives meet the land use plan of the province of Quirino
- (3) The area is inclusive of Cagayan Valley region
- (4) The forest in the area has been destroyed before 1990

The subject area is located in the province of Quirino and includes municipals of Aglipay, Maddela and Nagtipunan. It has been selected after careful discussions with the local government officials, barangay leaders and local farmers. The information map shows the project boundary, covering Maddela (14 barangays), Aglipay (8 barangay) and Nagtipunan (1 barangay). Initially, there were plans to encourage landowners to participate in agroforestry, but after discussions and investigations, it was decided that reforestation and agroforestry developments would take place in the national forest. The landowners interested in participating in the project were given an option of short-term coppicing or *Jatropha* cultivation.

### 4.4 Project Implementation Structure

For this research, we have had continuous discussions on the project structure with relevant central and local government organizations. Figure 3 shows the most updated implementation structure.

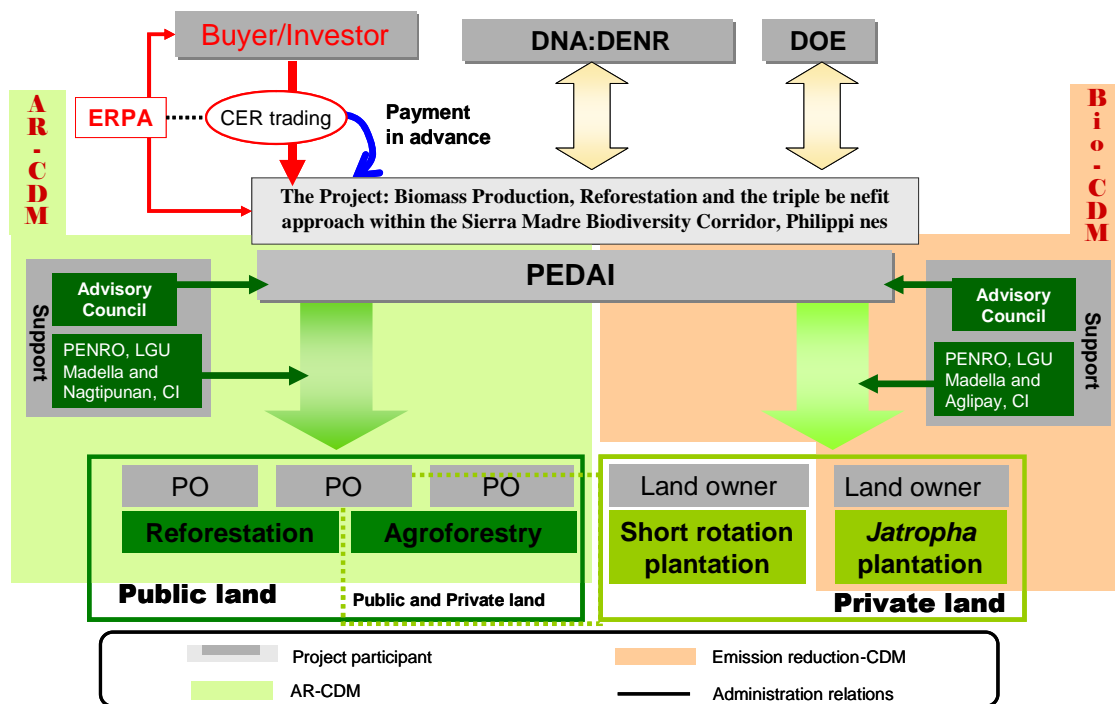


Figure 3 The project implementation structure

#### 4.5 Project's Crediting Period

We estimate the crediting period for the project to be about 30 years, but the activities will continue even after that.

#### 4.6 Baseline Monitoring Methodology

##### (1) Applying Methodology

For this project, we will use the approved A/R methodology, AR-AM0004 ver.2, 'Reforestation or afforestation of land currently under agricultural use.'

##### (2) Determination of Baseline Scenario

The baseline scenario was determined in 3 steps as stated in the applied methodology. For this subject area, the farming area is increasing with the population growth, and unless there are subsidies to encourage land use change, it will not be relinquished. Therefore, land use as farmland or pasture will continue as according to scenario 1 (status quo). Furthermore, the majority of farmlands is used to grow corn for animal feed, and our project will not compete with the food self-sufficiency in the region.

### (3) Hierarchy Process

This project will categorize various project activities in hierarchy according to their types. The below are the hierarchy levels:

- Level 1: Geographical Location (Maddela/ Aglipay/ Nagtipunan)
- Level 2: Project Activity (Reforestation/ Agroforestry)

### (4) Determine the Baseline net GHG removals by sinks

In the subject area, trees will not grow naturally. Therefore, we will assume conservatively that the baseline is zero.

### (5) Estimation of net GHG removals by sinks

The tree species for reforestation was selected according to the local residents' wish and with advice from experts. The increase in CO<sub>2</sub> capture from reforestation is estimated at 3M tons over 30-year period. The loss of existing vegetation is calculated as 420K tons of CO<sub>2</sub>. Within the project boundary, the amount of GHG emission is 4K tons of CO<sub>2</sub> from fertilizers and 180K tons of CO<sub>2</sub> from leakage, therefore net anthropogenic GHG removals is estimated at 2.4M tons for 30 years.

### (6) Demonstrating Additionality

Through the tool for the demonstration and assessment of additionality in A/R CDM project activities, we displayed that this project activity is not the baseline scenario but additional. In Step 2, we have only conducted a barrier analysis.

### (7) Monitoring Methodology and Plan

We will monitor the project according to AR-AM004 ver.2. However, we will not monitor the baseline net GHG removalst.

## 4.7 Evaluation of Environmental and Socio-economic Effects

### (1) Environmental Assessment

We have conducted a desk review on environmental impact assessment of the project based on the Climate, Community and Biodiversity (CCB) Standards, developed by Conservation International. In result, the project met all the criteria and received additional 7 points from



optional 'point scoring' criteria. We expect that the project will be awarded the gold status. There were several pending issues after the feasibility study, but they are currently under discussion with the interested parties, and it was confirmed that the solution measures described would be the basis for the projects precondition.

## (2) Evaluation of Socio-Economic Effects

We have conducted a questionnaire survey in the region on the socio-economic effects of this project. We have received 498 responses from the subject area. The number of responses corresponds to 10% of households in Aglipay, Maddela and Nagtipunan. From the result of the survey, we learned that the local communities believe that the project will improve their living standards.

### 4.8 Stakeholders' Comments

We have held consultation meetings with local governments, DENR (central/ local governments) and the local community led by barangay captain, we have obtained opinions and ideas from the stakeholders in September of 2006, January and November of 2008. Furthermore, between October and November of 2006, the research group from CI Philippines has visited each barangay and conducted socio-economic survey by consultations and questionnaires. At the same time, we have consulted a Japanese expert, Professor Noriyuki Kobayashi of Graduate Law School, Nihon University, who is recognized as an expert on A/R CDM development from while he worked in Sumitomo Forestry Company.

## 5. Research on Biomass Energy CDM Project

### 5.1 Project Summary

This project plans to utilize an oleaginous plant, *Jatropha curcus* as biofuel to reduce GHG emissions. By joint implementation with the A/R CDM project explained previously, we expect maximizing the benefits of both projects and contribute to the sustainable development of the local community.

There has never been any large-scale cultivation of *Jatropha curcus* in the province of Quirino. However, this tree species is familiar to the residents as it is commonly used as hedge around houses and pastures. Also, as stated in above, in the recent years, the Philippine

government has endorsed its cultivation, and the local communities see it as a means for potential increase in their income.

## 5.2 General Condition of the Subject Area

This scheme targets the same regions of Aglipay, Maddela and Nagtipunan in the province of Quirino as the A/R CDM project, with an emphasis on Maddela. Raw material for biofuel, *Jatropha curcus*, is planned to be cultivated outside of the A/R CDM project boundary. The subject area was chosen through several meetings and consultations with the local government leaders, the local community and DENR representative for Quirino. For the A/R CDM project, land designated for reforestation, agroforestry and short rotation coppice needed to be at a certain size, but for this project, cultivation areas were chosen per farm units according to landowners interests in the project. At the moment, about 500ha of land is designated for cultivation of *Jatropha curcus*.

## 5.3 The Use of Biofuel

For this project, we will produce *Jatropha* oil and replacing diesel fuel used for agricultural machinery, such as gain dryers and rice mills. In this case, the part of the project that uses *Jatropha* oil as an alternative for diesel fuel is CDM project. The excess *Jatropha* oil from 500 ha of cultivated forest that is not consumed within the project is planned to be sold to biofuel companies like D1.

## 5.4 Project Implementation Structure

The project will be implemented under the same structure with A/R comport. See 4.4.

## 5.5 Biofuel Production Plan

We have calculated the amount of *Jatropha* oil that can be produced from 500 ha of plantation area with the below assumptions from references and interviews from experts.

- Tree density per ha: 2,500 trees/ ha
- Seed production per tree: first year 2 kg/ tree, second year 4 kg/ tree
- Oil percentage per seed: 30%

- Yield rate after degumming: 74%
- Jatropha Oil specific gravity: 0.92kg/l

With the above assumptions, the amount of *Jatropha* oil produced from 500 ha of cultivated forest is 1,206,522 liters/year.

## 5.6 Project's Credit Period

We estimate 10 years, but the activity will continue after that by PEDAI.

## 5.7 Baseline Monitoring Methodology

### (1) Applying Methodology

This project, which utilizes bioenergy for off-grid electricity generation, is a joint project between Type I.B. and I.C. As methodology, we will use Version 10 of AMS-I.B and Version 13 of AMS-I.C (referred here on as AMS-I.B and AMS-I.C).

### (2) Selection of Baseline Scenario

The baseline for the project will be the fossil fuel consumption in the absence of proposed project, according to Paragraph 7 of AMS-I.B and paragraph 6 of AMS-I.C. The energy baseline will be the fossil fuel consumption results prior to the project as stated in the paragraph 7 (b) of AMS-I.B and paragraph 10 of AMS-I.C.

### (3) Establish Baseline GHG Emissions

The baseline will be the fossil consumption prior to the project. From the data obtained from PEDAI and assumption of 10% mixture, we calculated that there would be a reduction of 8,528 tons in CO<sub>2</sub> emission.

### (4) Leakage

With regard to projects that obtain renewable energy from plantation, it is necessary to consider the displacement of activities or people prior to the project and emissions from biomass energy production as source for leakage. There will be no displacement of households with this project. However, even though the afforestation will be carried out in areas around farmlands, 12% of land used by participant households will move out of the boundary. We estimate 15% baseline

emissions as leakage from displacement of activities prior to the project. Moreover, the use of fertilizers and existing biomass reduction may result in GHG emission, but the refinery process of *Jatropha* seeds will be operated using *Jatropha* oil run electricity generators.

#### (5) Demonstrating Additionality

If from investment and technical barriers there was no CDM project, there would not be any transition from fossil fuel to *Jatropha* oil, and as a consequence, the reliance on high GHG emission fossil fuel for electricity generation and agricultural machinery operation would continue. The Philippines government is encouraging the shift to bioenergy, but their focus is mainly in the vehicle fuels industry, and will not have any incremental effect on this project as it is outside of their scope.

#### (6) Monitoring Method and Plan

The project implementing body will monitor the amount of electricity generated in the project, using one of the two methods below according to the Paragraph 14 of Methodology AMS-I.A.

- (a) Confirm that the subject facility is in operation every year
- (b) Record the amount of electricity generated

For agricultural machineries monitoring, we will refer to Paragraph 9 of Methodology AMS-I.B.

- (a) Register the number of machineries in operation annually
- (b) Estimate the number of operated hours from production

For this project, we will select (a) for both, and the project implementing body will keep the data in digital format.

## 5.8 Environmental Assessment

Philippine Environmental Impact Assessment System classifies projects as within or out of their regulation according to the project's scale, accumulative effects on other projects, use of natural resources, waste generation and risks for environmental hazards or accidents. Our project is small-scale and most likely will not be required to comply with the environmental assessment policy, however, since it is presumed to have both positive and negative effects to the environment, appropriate measures will be necessary after discussions with DENR.

## 5.9 Comments from Stakeholders

As with A/R CDM project, we held discussions with Local governments, DENR (central/local governments) and the local community led by barangay captain and obtained opinions of the project from the stakeholders. From October to November of 2006, we have visited each barangay and conducted socio-economic survey by consultations and questionnaires. We have recorded and saved the survey results in English.

## 6. Benefits and Issues on Combining A/R and Biomass Energy Projects

The characteristic of this project is that the A/R and biomass energy components are closely related together. For this reason, we believe that it is possible to have synergetic effects as listed below:

- By securing a market for *Jatropha* seeds, the farmers in the project area will be able to receive additional income, and especially so for the farmers not participating in the afforestation CDM project. This way, it is possible to fairly and widely distribute the benefits of the project.
- The additional income from afforestation will lessen the reliance on exploitive farming, and it will be possible to contribute to a long lasting conservation and reclamation of the forest.
- Excess *Jatropha* oil will be available to the local communities as cheap and sustainable energy source, and the entire region will benefit from its use.
- PEDAI, which has a track record for local agricultural development and micro-finance, will be the implementing body for the bioenergy project and give technical and financial support to the participants. In the future, PEDAI will be able to flexibly cope with the use of *Jatropha* seeds outside of the project area or use of *Jatropha* oil in other facilities.
- For PEDAI, this project is not only a chance to increase their operation but also to secure a stable energy supplies through *Jatropha* seeds under mutual trust with the local farmers.

On the other hand, there are issues on combining the afforestation CDM and Bioenergy project as below.

- Negative aspects of bioenergy

- ✓ Currently in the Philippines, energy self sufficiency through biofuel is advocated by the president's directive, and the central and local governments and private companies are showing interest in Jatropha oil. Therefore there is a conflict of interests between private companies and publicly run companies.
  - ✓ As sustainable energy, biofuel can contribute to energy shortage and climate change issues. Nevertheless, when biofuel projects are implemented without any consideration for its impact on society or environment/ habitat, it has proven to have negative effects, for example, increase GHG emissions, degrade habitat by one species cultivation or trigger food shortage through competition with farmlands, etc.
  - ✓ It is important to have an accurate land use plan based on environmental conservation and land use policy, as well as the local community's involvement towards poverty alleviation. It is necessary to have a same goal with the local community to achieve environmental conservation and energy production.
- Host Country's Preparation for the Project Implementation Structure and Performance Development
- ✓ The Philippines government is in the process of establishing CDM project supporting structure, with the possibility that the DENR will be a participant in the project (in Philippines, forest area is under jurisdiction of DENR). Within the DENR, there is also DNA, and the government is cautious in deciding if it will be a participant in the project.
  - ✓ There is some hopeful outlook that interest in the CDM project from the Japanese government and companies will expedite the Philippine government's preparation process. However, there is also a possibility that the delay in preparation will discourage investment interests. In order to materialize investment interests from Japan, it is necessary to continue the research to discuss and establish the host country's investment scheme and implementation structure.

In COP12/CMP2, the subject of discussion was the contribution to sustainable development of CDM. If our project is realized, it will be a precedent for future projects in developing countries to follow, as addressing environmental conservation, energy supply and climate change issues all at the same time.