Report of Ex-post Evaluation

PD 41/00 Rev.3 (F,M)

Model Development to Establish Commercial Plantation of Dipterocarps (Indonesia)

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TABLE OF CONTENTS

LIST OF ACRONYMS

GOI	Government of Indonesia
FORDA	Indonesian Government's Forest Research and Development Agency
ITTA	International Tropical Timber Agreement
ITTC	International Tropical Timber Council
ITTO	International Tropical Timber Organisation
PET	Project Evaluation Team
PIT	Project Implementation Team
RCBD	Randomized Complete Block Design
SBK	PT Sari Bumi Kusuma
UGM	Gadjah Mada University

PART I: EXECUTIVE SUMMARY

1. Background Information about the project

The Project was part of the Government of Indonesia's (GOI) initiatives to address the depletion of Indonesia's tropical rainforests resulting from previous over harvesting through unsustainable practices, illegal logging and forest fires. The GOI was concerned that if the previous and continuing forest degradation was not addressed successfully, it could result in the potential loss of forest resources, with serious biological, ecological and economic consequences for the country.

Two previous research activities influenced the development and design of the Project. The first was a research partnership on *Shorea macrophylla,* which was executed by SEAMEO BIOTROP in cooperation with the Faculty of Forestry, Gadjah Mada University. The results of this work showed *Shorea macrophylla* was a promising species on some specific sites. However, as forest degradation in Indonesia covered vast areas with varying site conditions, *Shorea macrophylla* cannot be expected to perform well at all these areas.

The second activity involved the development of vegetative propagation technique for meranti based on the fog cooling system, developed by Indonesian Government's Forest Research and Development Agency (FORDA) in cooperation with Komatsu Ltd. This technique was found to be suitable for mass vegetative production of three meranti species, namely *Shorea leprosula, Shorea selanica and Shorea platyclados.* However, there are other many potential Dipterocarpaceae species which may be suitable for developing commercial plantations and needed to be investigated.

The Project's aim was to address the following four key objectives:

- determining the best Dipterocarpaceae species suitable for rehabilitating degraded forests through commercial plantation development;
- extending vegetative propagation of target Dipterocarpaceae species for commercial plantations, which had been developed for a few species and only at experimental stage;
- providing information on the economic efficiency of commercial forest plantations; and
- enhancing the capacity of forest companies to undertake work on forest rehabilitation through training more qualified technicians.

The Project's Specific Objectives were to:

- select target species and develop appropriate techniques for the mass production of those species suitable for the development of commercial plantations through vegetative propagation; and
- develop a cost-effective tree planting model for rehabilitating degraded forests, and evaluate its financial and economic efficiency and competitiveness, compared with the existing silvicultural practices being used under law by the forest companies.

The Project's Development Objective was to develop technology to produce good quality seedlings of Dipterocarps species in large quantities for rehabilitating Indonesia's degraded forests through commercial plantations.

The overall strategy adopted for implementing the Project involved:

- screening potential Dipterocarp species using the Randomized Complete Block Design (RCBD) method, and testing the six best performing species in plantations using Split Plot Design; and
- developing appropriate technique for mass production of seedlings through vegetative propagation of the six target species, so as to address the lack of continuous supply of seeds and seedlings due to irregular flowering, as well as the short fruit viability period of Dipterocarpaceae species.

The Project's expected outputs were:

Output 1: Identification of target species for commercial forest plantations.

Output 2: Generating information on the growth rates of the species tested in trial plantations.

Output.3: Developing and reporting on successful vegetative propagation technique for target species for commercial plantations.

Output 4: Establishing plantation trials or demonstration forest from material developed from vegetative propagation.

Output 5: Securing the plantation trials as demonstration forest.

Output 6: Training field technicians in selecting target species for commercial forest plantation.

Output 7: Training field technicians in mass vegetative propagation.

Output 8: Assessing the financial and economic viability of commercial plantations established using the selected target species.

The main target beneficiaries of the Project were:

- the Faculty of Forestry, Gadjah Mada University (UGM), through enhancing the Faculty's capacity to undertake research in selecting target species for commercial plantations establishment in Indonesia, through vegetative propagation, as well as the on-going training of forest technicians, undergraduate and postgraduate students;
- the Government of Indonesia (Directorate General of Forest Production Development and Forest Management, Directorate General of Nature Conservation, Forestry research and Development Agency [FORDA]), by contributing to the GOI's objective of rehabilitating the country's forests degraded through unsustainable practices, illegal logging and forest fires; and
- private and state sector forest companies, by providing them with better performing target species of Dipterocarpaceae species for commercial plantations, as well as providing them with information on the financial and economic viability of establishing plantations compared with continuing with the existing silvicultural practices.

The Project's total budget was $USD627, 038.00, of which the International Tropical Timber Organisation (ITTO) contributed $USD461, 212.00, and the GOI and the private and state sector forest companies contributed the balance of $USD165, 826.00.

In the Project Evaluation Team 's(PET) view the Project's Development Objective of developing technology to produce good quality dipterocarps species seedlings in large quantities for rehabilitating Indonesia's degraded forests through commercial plantations was fully consistent with the objectives of the International Tropical Timber Agreement (ITTA) 1994. Similarly, the Project's Specific Objectives to select target species and develop appropriate techniques for the mass production of the species suitable for the development of commercial plantations through vegetative propagation; and develop a commercial plantations model for rehabilitating degraded forests, and evaluate its financial and economic efficiency and competitiveness compared with the existing silvicultural practices being used under law by the forest companies, were also fully consistent with the objectives of the ITTA 1994.

Specifically, the Project's Development Objective and Specific Objectives related to the following ITTA 1994 objectives:

(c) To contribute to the process of sustainable development;

(d) To enhance the capacity of members to implement a strategy for achieving exports of tropical timber and timber products from sustainably managed sources by the year 2000; and

(j) To encourage members to support and develop industrial tropical timber reforestation and forest management activities as well as rehabilitation of degraded forest land, with due regard for the interests of local communities dependent on forest resources.

In terms of ITTO's structure, the Project was related to ITTO's Committee on Reforestation and Forest Management whose roles and responsibilities are concerned primarily with the sustainable management of the natural forest resource base for tropical timber.

The Project's objectives also met the goals and objectives of the Reforestation and Forest Management Committee in ITTO's Yokohama Action Plan, 2002 to 2006. The Goals of the Reforestation and Forest Management Committee in this Action Plan were to:

- support activities to secure the tropical timber resource base; and
- promote sustainable management of tropical forest resources.

The Actions in the ITTO's Yokohama Action Plan, 2002 to 2006 which are relevant to the Project's objectives are:

- 4:Promote the conservation, rehabilitation and sustainable management of threatened forest ecosystems, *inter alia* mangroves in collaboration with relevant organizations;
- 7: Encourage members and assist them, where appropriate, to assess the current and potential productivity of major tropical forest types, taking into account the need to promote future growth and effective regeneration, and
- 10: Encourage members and assist them, where appropriate, to improve the productive capacity of natural forests, where appropriate, through intensified silvicultural practices, better utilization of lesser-used species, the promotion of non-timber forest products, guided natural regeneration, enrichment planting and reforestation.

2: The Purpose of the Evaluation

The ITTO commissioned the ex-post evaluation to provide a concise diagnosis of the Project, so as to point out the successful and unsuccessful outcomes, the reasons for successes and failures, and the Project's contribution towards ITTO's Objective 2000, and to draw lessons that can be used to improve similar projects in the future.

The Ex-Post Evaluation's scope of work required the PET to analyse and assess the Project o determine:

- its overall role and contribution in light of sectoral policies, development programmes, priorities and requirements to achieve sustainable management of forest resources in Indonesia;
- the current management status of forest plantations within the project's area of influence, the effectiveness of the project's implementation and its effectiveness in promoting sustainable plantation management as defined in the ITTO Guidelines for the Establishment and Sustainable Management of Planted Tropical Forests and the ITTO Guidelines for the Restoration, Management and Rehabilitation of Degraded and Secondary Tropical Forests;
- the contributions of the specific studies in various disciplines (genetic conservation, cloning, ecology, socio-economy, silviculture, rehabilitation, stands dynamics, plant materials production, etc.) prepared by the project to the development of forestry in the project's area of influence;
- the results and potential impact of the applied research conducted by the project on the application of plantation establishment/management practices and its contribution to the overall forestry-related knowledge in the country;
- the impact of project activities on the livelihoods of target populations;
- the effectiveness of dissemination of project results;
- the overall post-project situation in the project's area of influence;
- the unexpected effects and impacts, either harmful or beneficial, and the reasons for their occurrences;
- the cost efficiency in the implementation of the project, including the technical, financial and managerial aspects;
- follow-up actions in order to enhance uptake of project results;

- the project's relative success or failure, including a summary of the key lessons learnt; and the identification of any issues or problems that should be taken into account in designing and implementing similar projects in the future;
- evaluation of the overall contribution of the four projects to plantation establishment/management in the tropics and to the restoration, management and rehabilitation of degraded and secondary tropical forests;
- evaluation of the overall impact on and relevance of the project for the Executing Agency, the forest industry sector and local communities being served in Indonesia;
- evaluation of the overall attainment of the objectives and to assess the overall effectiveness of the project; and
- evaluation of the overall appropriateness of the costs and cost structure and use of resources within the four projects.

The scope of work also required the PET to make recommendations on:

1. the need for similar projects in the future;
2. innovative approaches/designs for projects aiming at promoting plantation establishment and management in the tropics and at the restoration, management and rehabilitation of degraded and secondary tropical forests;
3. appropriate target groups, e.g. countries, government, organizations, forestry sector, local communities;
4. the organizational arrangements of such projects;
5. follow-up and evaluation practices; and
6. further actions needed to sustain or increase the intended effects on sustainable management of forest resources and Objective 2000 and to draw conclusions which may be of relevance to other ITTO projects.

3: The Scope of the Evaluation

The evaluation methodology used by the PET involved:

- a review of documents the ITTO provided to it prior to travel to the Project site in Indonesia which included:
    - the original Project document the GOI submitted to the ITTO;
    - Project progress reports;
    - technical reports and guidelines;
    - Minutes of the Project Steering and Technical committees;
    - the Project Completion Report; and
    - the Project Final Report
- interviews and discussions with the Project Implementation Team (PIT) including relevant officials and staff at The Faculty of Forestry, Gadjah Mada University ; and
- field visit to Nanga Nuak in Central Kalimantan, to inspect research trials and established demonstration plantations, as well as conduct interviews and discussions with the PIT including representatives of PT Sari Bumi Kusuma (SBK), one of the collaborating private sector forest companies.

The PET comprising of Dr Hosny El-Lakany from Canada and Dr Kwame Asumadu from Australia visited Yogyakarta and Nanga Nuak, Indonesia, from 10th to 16th August 2010 inclusive.

Although the Project activities were undertaken in six locations in Kalimantan, Sumatra and Java, the PET was only able to visit the site at Nanga Nuak in Central Kalimantan because of logistical reasons, and time constraints. The PIT informed the PET that the Nanga Nuak site was an accurate representation of the outputs achieved, as it had examples of the full suite of activities undertaken under the Project.

The PET notes that it was not possible, for logistical reasons, to meet and have discussions with the GOI agencies (Directorate General of Forest Production Development and Forest Management, Directorate General of Nature Conservation, Forestry research and Development Agency [FORDA]), which were also part of the PIT.

The results of the PET's evaluation of this Project are therefore based on the inputs from PIT members from The Faculty of Forestry, Gadjah Mada University and the staff at PT Sari Bumi Kusuma (SBK) at Nanga Nuak.

4: Conclusions of the Evaluation

Based on the review of the Project's Completion Report, the various Progress Reports, field visit and discussions with individuals involved with the Project's implementation, the PET concluded that, overall, the Project was executed efficiently, particularly the research and field demonstration components, and that allocated resources were used as per the Project's budget and the scheduled activities. In the PET's view, given the total budget and the activities undertaken, this has been a very cost-effective and value for money Project for the ITTO and the collaborating partners.

The ITTO approved a12 month extension to the original Project duration period of 3 years without additional cost to the budget, to enable the PIT implement transitional arrangements for the GOI and the six participating industry partners to take over and continue the Project through on-going research and plantation establishment.

After reviewing all Project documents, visiting the Project site at Nanga Nuak and discussions with the relevant PIT members, the PET concluded that the Project's Developmental Objective and the two Specific Objectives were largely achieved. All Project outputs were achieved satisfactorily, although with varying degrees of success.

In summary, the PET considers that the Project has achieved its Specific and Developmental Objectives through:

- selecting the 3 best performing Shorea species as the basis for producing planting materials for large scale commercial plantings in Indonesia;
- testing and selecting superior mother trees within species for on-going improvement of planting stock;
- establishing 3 nurseries for the on-going production of planting materials and also research (i.e. for rooting of cutting trials);
- developing an innovative silvicultural system and planting model, which is being used by the private and public sector companies for large scale planting in its logged over forest areas; and
- producing a financial and economic analysis of the new forest rehabilitation model to guide future investment in plantations establishment, as well as the development and refining of government policy for the sector.

The Project produced over 30 publications, and the PET found that the PIT had disseminated the Project results effectively through:

- several high quality scientific and technical research papers and documents;
- presentations at regional scientific and policy conferences; and
- technology transfer seminars and workshops.

The trial plots and nurseries also continue to be used for demonstrating the Project's outcomes.

In the view of the PET, the Project has been sustainable for the following reasons:

- although the ITTO funded Project concluded in 2006, the partners: private and state sector forest companies, the Gadjah Mada University and the GOI have maintained the partnership to continue the work;

- all the mother trees selected for the species, plantation and progeny trials have been mapped, to enable easy identification;
- the trials established for basic species selection, species and progeny trials are still functional and well maintained, and are still being used for on-going research, learning and teaching;
- the nurseries (at least the ones the PET visited at PT SBK's concessions at Nanga Nuak in Central Kalimantan) are also functional and well maintained by the company staff, and being used for on-going research by the UGM, as well produce planting materials for the company;
- company staff and students from UGM have been trained, and the facilities at PT SBK's concessions at Nanga Nuak in Central Kalimantan are still being used for on-going training of postgraduate and undergraduate students and forest technicians;
- the PET found evidence of clear commitment by the private and state sector forest companies to on-going adoption of the outcomes of the Project, including continuing its collaboration with the GOI and UGM , as demonstrated by the work being done currently at Nanga Nuak by PT SBK in Central Kalimantan; and
- the GOI and the private and state sector forest companies have committed funds for continuing the Project, particularly operational planting and research, especially into vegetative propagation.

Discussions with the PIT and also company staff at PT SBK's concessions in Nanga Nuak confirmed that the Project has had a number of positive impacts, and these impacts are likely to continue into the future. The Project impacts include the following:

- the private and state sector partner companies have adopted the innovative silvicultural system for rehabilitating logged over forests, and are planting the selected 3 best species;
- the innovative planting and silvicultural system for rehabilitating logged over and degraded forest developed under the Project has significantly improved forest productivity;
- while the main objective of the Project was the continual production of high quality planting materials for the rehabilitation of logged over and other degraded forests, one of the important impacts for the forest-dependent communities has been the possibility of further developing *Shorea macrophylla* for the production of timber and non-wood forest product such as oil for a range of domestic and commercial applications;
- the Project has provided the opportunity for further capacity building in the selection and production of improved material for commercial plantings to rehabilitate logged over and other degraded forests, as well as human resource development (forest technicians, undergraduate and postgraduate students);
- the Project has contributed to the enhancement of private-public partnership between the private and public sector forest industry collaborators, UGM and the GOI;
- provision by the private and public sector companies of venues, facilities, infrastructure and logistical support for UGM to continue its research in further developing and refining the innovative silvicultural system and planting model for rehabilitating logged over and other degraded forests;
- the Project has demonstrated through financial and economic analysis that the new silvicultural system and planting model is cost-effective, compared with the existing silvicultural systems and models;
- the results of the Project (particularly the financial and economic analysis study) are informing the development and refining of public policy in the forestry sector in Indonesia; and
- the project has developed an innovative silvicultural system and planting model which may be applicable to other ITTO member countries with similar edaphic (soil and climatic) and economic conditions.

The evaluation indicated that the key lessons learned from the Project's execution are:

- the success of a project like this one is dependent on it being underpinned by good science, as well as the keenness of the scientists to pursue it;
- the minimum duration of projects like this one, which incorporate aspects of pure and applied research, should be five years. One of the important features of this Project was the practical inter-relationship between the research (the species, plantation and progeny trials) and the direct or immediate application of the results on the concessions of the potential users (the private and state forest companies) i.e. the applied component;
- working closely with the potential users of the research outputs had the benefit of minimising any mismatch between research and operational activity;
- commitment by all partners, especially the end-users, to adopt and implement the results is very critical; and
- clear demonstration of financial and economic benefit to the potential end-users of the project output (s) is very important.

Based on the review of project documents, field visits and discussions with relevant stakeholders, the PET concluded that the:

- the Project was executed efficiently, and indeed given the total budget and the overall activities undertaken, as well as the outputs achieved and their present and future impacts and effects, it has been a very cost-effective and value for money project;
- the Project's Development and Specific Objectives were largely achieved;
- sustainability or continuation of the Project is very good now and promising for the future;
- the Project provides a good example of public-private partnership model, which should be promoted to other ITTO member countries; and
- the Project provides a good demonstration model of the rehabilitation of logged over forest areas and other degraded forest areas through reforestation.

5: Recommendations

5.1: For the ITTO

Based on the findings of the evaluation, the PET makes the following recommendations for consideration by the ITTO:

- The Project is a very good example of a public-private partnership model where a forestry project intended to provide financial and economic benefit to the Project Submitting Country and the collaborating private and public sector forestry companies, is underpinned by a combination of good pure and applied research, and the ITTO may wish to share widely the results of this Project with other ITTO member countries.
- As part of publicising this Project to other ITTO members, the ITTO may wish to consider organising an international conference on site, to showcase the public-private partnership model, as well as the new planting model and silvicultural system developed in Indonesia for commercial plantations and the rehabilitation of logged over and other degraded forests.
- The ITTO is encouraged to assist the GOI in identifying suitable donors for the second phase of the Project, which has already been approved by the ITTO's Expert Panel for the Technical Appraisal of Projects and Pre-projects and awaiting funding.

5.2: For the Country

The PET makes the following recommendations for consideration by the GOI:

- In collaboration with the forestry companies, the GOI may wish to consider options for continuing funding for the UGM to continue with the Project so as to support further human resource development for the forestry sector.
- The GOI should consider incentives to encourage other private sector companies not currently involved in the Project, to contribute funding, as well as adopt the outcomes of this Project.

PART II

1. Project Context

The Project originated from two previous initiatives aimed at developing materials for rehabilitating Indonesia's degraded tropical rainforests. These were:

- a research partnership on *Shorea macrophylla.* Executed by SEAMEO BIOTROP in cooperation with the Faculty of Forestry, Gadjah Mada University, the research project was supported by the Government of Indonesia (GOI) and the Office of State Ministry of Research. The results of this research showed *Shorea macrophylla* was a promising species on some specific sites. However, forest degradation in Indonesia covers vast areas with varying site conditions, and *Shorea macrophylla* cannot be expected to perform well at all these areas; and
- development of vegetative propagation technique for meranti based on the fog cooling system, developed by Indonesian Government's Forest Research and Development Agency (FORDA) in cooperation with Komatsu Ltd. This technique was found to be suitable for mass vegetative production of three meranti species, namely *Shorea leprosula, Shorea selanica and Shorea platyclados.* However, there are other many potential Dipterocarpaceae species which may be suitable for developing commercial plantations and needed to be investigated.

These initiatives were part of the GOI's attempt to address the continuing depletion of Indonesia's tropical rainforests, resulting from previous over harvesting through unsustainable practices, illegal logging and forest fires. If left unaddressed, the previous and continuing forest degradation could result in the potential loss of forest resources, with serious biological, ecological and economic consequences for the country.

1.1: Project Objectives

The Project aimed to address the following four key objectives:

- determining the best Dipterocarpaceae species suitable for rehabilitating degraded forests through commercial plantation development;
- extending vegetative propagation of target Dipterocarpaceae species for commercial plantations, which had been developed for a few species and only at experimental stage;
- providing information on the economic efficiency of commercial forest plantations; and
- enhancing the capacity of forest companies to undertake work on forest rehabilitation through training more qualified technicians.

The Project's Specific Objectives were to:

- select target species and develop appropriate techniques for the mass production of those species suitable for the development of commercial plantations through vegetative propagation; and
- develop a cost-effective tree planting model for rehabilitating degraded forests, and evaluate its financial and economic efficiency and competitiveness compared with the existing silvicultural practices being used under law by the forest companies.

The Project's Development Objective was to develop technology to produce good quality seedlings of dipterocarps species in large quantities for rehabilitating Indonesia's degraded forests through commercial plantations.

1.2: Project Strategy

The overall strategy adopted for implementing the Project involved:

- screening potential Dipterocarp species using the Randomized Complete Block Design (RCBD) method and testing the six best performing species in plantations using Split Plot Design; and

- developing appropriate technique for mass production through vegetative propagation of the six target species, so as to address the lack of continuous supply of seeds and seedlings due to irregular flowering, as well as the short fruit viability period of Dipterocarpaceae species.

1.3: Expected outputs

The expected outputs were:

Output 1: Identification of target species for commercial forest plantations.

Output 2: Generating information on the growth rates of the species tested in trial plantations.

Output.3: Developing and reporting on successful vegetative propagation technique for target species for commercial plantations.

Output 4: Establishing plantation trials or demonstration forest from material developed from vegetative propagation.

Output 5: Securing the plantation trials as demonstration forest.

Output 6: Training field technicians in selecting target species for commercial forest plantation.

Output 7: Training field technicians in mass vegetative propagation.

Output 8: Assessing the financial and economic viability of commercial plantations established using the selected target species.

1.4: Target Beneficiaries Involvement

The main target beneficiaries of the Project were:

- The Faculty of Forestry, Gadjah Mada University (UGM). The Project further enhanced the Faculty's capacity to undertake research in selecting target species for commercial plantations establishment in Indonesia through vegetative propagation, as well as the on-going training of forest technicians, undergraduate and postgraduate students.
- The Government of Indonesia (Directorate General of Forest Production Development and Forest Management, Directorate General of Nature Conservation, Forestry research and Development Agency [FORDA]). The Project contributed to the Government of Indonesia's objective of rehabilitating the country's forests degraded through unsustainable practices, illegal logging and forest fires.
- Private and State sector forest companies. Indonesian forest companies benefited from the project through the selection of better performing target species of Dipterocarpaceae species for commercial plantations, as well as providing them with information on the financial and economic viability of establishing plantations compared with continuing with the existing silvicultural practices.

1.5: Project Inputs

The project inputs and sources were as follows

ITEM	AMOUNT$USD
Total ITTO Budget	461,212.00
Government of Indonesia and the Forestry Companies	165,826.00
Total Budget	627,038.00

1.6: The ITTO/ITTA Context

The Project's Development Objective of developing technology to produce good quality dipterocarps species seedlings in large quantities for rehabilitating Indonesia's degraded forests through commercial plantations was fully consistent with the objectives of the International Tropical Timber Agreement (ITTA) 1994. Similarly, the Project's Specific Objectives to select target species and develop appropriate techniques for the mass production of the species suitable for the development of commercial plantations through vegetative propagation; and develop a commercial plantations model for rehabilitating degraded forests, and evaluate its financial and

economic efficiency and competitiveness compared with the existing silvicultural practices being used under law by the forest companies, were also fully consistent with the objectives of the ITTA 1994.

Specifically, the Project's Development and Specific Objectives related to the following ITTA 1994 objectives:

(c) To contribute to the process of sustainable development;

(d) To enhance the capacity of members to implement a strategy for achieving exports of tropical timber and timber products from sustainably managed sources by the year 2000; and

(j) To encourage members to support and develop industrial tropical timber reforestation and forest management activities as well as rehabilitation of degraded forest land, with due regard for the interests of local communities dependent on forest resources.

In terms of ITTO's structure, the project was related to ITTO's Committee on Reforestation and Forest Management whose roles and responsibilities are concerned primarily with the sustainable management of the natural forest resource base for tropical timber.

The Project's objectives also met the goals and objectives of the Reforestation and Forest Management Committee in ITTO's Yokohama Action Plan, 2002 to 2006. The Goals of the Reforestation and Forest Management Committee in this Action Plan were to:

- support activities to secure the tropical timber resource base; and
- promote sustainable management of tropical forest resources.

The Actions in the ITTO's Yokohama Action Plan, 2002 to 2006 which are relevant to the Project's objectives are:

- 4:Promote the conservation, rehabilitation and sustainable management of threatened forest ecosystems, *inter alia* mangroves in collaboration with relevant organizations;
- 7: Encourage members and assist them, where appropriate, to assess the current and potential productivity of major tropical forest types, taking into account the need to promote future growth and effective regeneration, and
- 10: Encourage members and assist them, where appropriate, to improve the productive capacity of natural forests, where appropriate, through intensified silvicultural practices, better utilization of lesser-used species, the promotion of non-timber forest products, guided natural regeneration, enrichment planting and reforestation.

2: Evaluation Scope and Focus

The ITTO commissioned the ex-post evaluation to provide a concise diagnosis of the Project, so as to point out the successful and unsuccessful outcomes, the reasons for successes and failures, and the Project's contribution towards ITTO's Objective 2000, and to draw lessons that can be used to improve similar projects in the future.

The Ex-Post Evaluation's scope of work required the consultants to analyse and assess the Project to determine:

- its overall role and contribution in light of sectoral policies, development programmes, priorities and requirements to achieve sustainable management of forest resources in Indonesia;
- the current management status of forest plantations within the project's area of influence, the effectiveness of the project's implementation and its effectiveness in promoting sustainable plantation management as defined in the ITTO Guidelines for the Establishment and Sustainable Management of Planted Tropical Forests and the ITTO Guidelines for the Restoration, Management and Rehabilitation of Degraded and Secondary Tropical Forests;
- the contributions of the specific studies in various disciplines (genetic conservation, cloning, ecology, socio-economy, silviculture, rehabilitation, stands dynamics, plant materials production, etc.) prepared by the project to the development of forestry in the project's area of influence;

- the results and potential impact of the applied research conducted by the project on the application of plantation establishment/management practices and its contribution to the overall forestry-related knowledge in the country;
- the impact of project activities on the livelihoods of target populations;
- the effectiveness of dissemination of project results;
- the overall post-project situation in the project's area of influence;
- the unexpected effects and impacts, either harmful or beneficial, and the reasons for their occurrences;
- the cost efficiency in the implementation of the project, including the technical, financial and managerial aspects;
- follow-up actions in order to enhance uptake of project results;
- the project's relative success or failure, including a summary of the key lessons learnt; and the identification of any issues or problems that should be taken into account in designing and implementing similar projects in the future;
- evaluation of the overall contribution of the four projects to plantation establishment/management in the tropics and to the restoration, management and rehabilitation of degraded and secondary tropical forests;
- evaluation of the overall impact on and relevance of the project for the Executing Agency, the forest industry sector and local communities being served in Indonesia;
- evaluation of the overall attainment of the objectives and to assess the overall effectiveness of the project; and
- evaluation of the overall appropriateness of the costs and cost structure and use of resources within the four projects.

The scope of work also required the Project Evaluation Team to make recommendations on:

1. the need for similar projects in the future;
2. innovative approaches/designs for projects aiming at promoting plantation establishment and management in the tropics and at the restoration, management and rehabilitation of degraded and secondary tropical forests;
3. appropriate target groups, e.g. countries, government, organizations, forestry sector, local communities;
4. the organizational arrangements of such projects;
5. follow-up and evaluation practices; and
6. further actions needed to sustain or increase the intended effects on sustainable management of forest resources and Objective 2000 and to draw conclusions which may be of relevance to other ITTO projects.

3: Evaluation Methodology

The evaluation methodology employed by the PET involved:

- a review of the:
    - Project document;
    - Project progress reports;
    - technical reports and guidelines;

- Minutes of the Project Steering and Technical committees;
- the Project Completion Report; and
- the Project Final Report

- interviews and discussions with the PIT including relevant officials and staff at The Faculty of Forestry, Gadjah Mada University ; and
- field visit to Nanga Nuak in Central Kalimantan, to inspect research trials and established demonstration plantations, as well as conduct interviews and discussions with the PIT including representatives of PT Sari Bumi Kusuma (SBK), one of the collaborating private sector forest companies.

The PET, comprising of Dr Hosny El-Lakany from Canada and Dr Kwame Asumadu from Australia ,visited Yogyakarta and Nanga Nuak, Indonesia, from 10th to16th August 2010. The actual duration of the evaluation was six days.

Although the Project activities were undertaken in six locations in Kalimantan, Sumatra and Java, the PET was only able to visit the site at Nanga Nuak in Central Kalimantan because of logistical reasons and time constraints. The PIT informed the PET that the Nanga Nuak site was an accurate representation of the outputs achieved, as it had examples of the full suite of activities undertaken under the Project.

The PET notes that it was not possible, for logistical reasons, to meet and have discussions with the Government of Indonesia agencies (Directorate General of Forest Production Development and Forest Management, Directorate General of Nature Conservation, Forestry research and Development Agency [FORDA]), which were also part of the PIT.

The results of the PET's evaluation of this Project are therefore based on the inputs from PIT members from The Faculty of Forestry, Gadjah Mada University and the staff at PT Sari Bumi Kusuma (SBK) at Nanga Nuak.

4: Findings and Lessons Learned

4.1: Efficiency

Efficiency relates to an assessment of:

- how the Project inputs were used and the Project activities in the Work Plan were undertaken in producing the project outputs in a cost-effective manner; and
- the quality of the outputs produced.

Based on the review of the Project's Completion Report, the various Progress Reports, field visit and discussions with individuals involved with the Project's implementation, the PET concluded that, overall, the Project was executed efficiently, particularly the research and field demonstration components, and that allocated resources were used as per the Project's budget and the scheduled activities.

Considering the total budget and the activities undertaken, it is the PET's view that this has been a very cost-effective and value for money project.

The ITTO approved a12 month extension to the original project duration period of 3 years without additional cost to the Project Budget, to enable the PIT implement transitional arrangements for the Government of Indonesia and the six participating industry partners to take over and continue the Project through on-going research and plantation establishment.

4.2: Effectiveness

Effectiveness relates to an assessment of the project's achievements i.e. the outputs, and how the outputs contributed to the Specific and Development Objectives.

After reviewing all Project documents, visiting the Project site at Nanga Nuak and discussions with the relevant Project team members, the PET concluded that the Project's Developmental Objective and the two Specific Objectives were largely achieved. All Project outputs were achieved satisfactorily, although with varying degrees of success.

In summary, the PET considers that the Project has achieved its Specific and Developmental Objectives through:

- selecting the 3 best performing Shorea species as the basis for producing planting materials for large scale commercial plantings in Indonesia;
- testing and selecting superior mother trees within species for on-going improvement of planting stock;
- establishing 3 nurseries for the on-going production of planting materials and also research (i.e. for rooting of cutting trials);
- developing an innovative silvicultural system and planting model, which is being used by the private and public sector companies for large scale planting in its logged over forest areas; and
- producing a financial and economic analysis of the new forest rehabilitation model to guide future investment in plantations establishment, as well as the development and refining of government policy for the sector.

4.3: Effectiveness by Outputs

4.3.1: Details of Outputs Achieved by the Project

Output 1: Identification of target species for commercial forest plantations.

From a total of 64 Dipterocarp species collected and screened, the Project selected 20 for basic species trial in 2003 in a good experimental design. Data collected included diameter, height, survival rates, and economic value of the timber. Based on growth rates, survival and economic value of trees, 6 out of the original 20 species were selected for plantation trials, which also started in 2003. Five selected species were trialled in a completely randomised block design.

The plantation trials indicated that three species: *Shorea leprosula, Shorea parvifolia* and *Shorea johorensis* performed best at all the trial sites in Sumatera, Java and Western, Central and Eastern Kalimantan, whereas *Shorea smithiana, Anisoptera marginata, Shorea platyclados* and *Dryobalanops* performed well only in specific locations.

Based on the plantations trial, the 3 best performing species, *Shorea leprosula, Shorea parvifolia* and *Shorea johorensis,* have been recommended for large scale commercial planting.

The Project also conducted progeny trials using 31 plus trees from two provenances in 2003. Data has been collected since which show significant differences between the plus trees. The stand has been thinned twice, and will eventually be the source of superior seeds for large scale commercial planting. The same stand is being used to collect cuttings from the best families.

The cuttings were planted in the nursery established by PT SBK at Nanga Nuak in Central Kalimantan as a clonal seed orchard and source of vegetative cuttings, because cuttings from mature plus trees proved difficult to root. The clonal seed orchard is used at present as a source of vegetative cuttings after hedging and rejuvenation.

The PIT informed the PET that the work on vegetative propagation is still on-going due to the difficulty of cuttings from mature trees developing roots.

Output 2: Generating information on the growth rates of the species tested in plantations.

The plantation trials of 20 species conducted at PT SBK's site at Nanga Nuak in Central Kalimantan were used to collect information on early growth rates. Trialled species were grouped into three categories: fast, medium and slow. Four of the 20 species were considered to be the fastest growing. These were: *Shorea leprosula, Shorea parvifolia, Shorea johorensis* and *Shorea platyclados.* The Project has recommended these four species as the target species for commercial plantations in Indonesia, especially in Sumatera and Kalimantan. The medium growth species were *Shorea atrinervosa* and *Shorea smithiana. Dipterocarpus caudiferus* and *Vatica oblongifolia* were the slowest growing species.

Output.3: Developing and reporting on successful vegetative propagation technique of target species for commercial plantations.

The Project tested 24 species at FORDA in Bogor and also in the concession areas of PT ITCI Kartika Utama in East Kalimantan and PT Sari Bumi Kusuma in Central Kalimantan. Thirteen species showed rooting percentages of above 70%. These were: *S leprosula, Hopea Odorata, S javanica, S ovalis, S selanica, S Sumatra, A marginata, Dipterocarpus grandiflorus, Hopea gregaria, S johorensis, S macrophyla, S pinanga* and *S seminis.* The rooting rate of the remaining eleven species was below 70%. Work is on-going of developing and further refining the vegetative propagation technique, with the view to using it for the mass production of high quality planting seedlings. This will address the current problem of the irregularity of the flowering of dipterocarp species, as well as the short viability period of their fruits.

Output 4: Establishing plantation trials or demonstration forest from material developed from vegetative propagation.

The PIT informed the PET the Project successfully established a total of 31.6 hectares of plantation trials in 2004 on the concessions of four timber companies in Central Kalimantan (PT SBK), South Sumatera (PT Musi Hutan Persada, East Kalimantan (PT ITCI Kartika Utama) and Java (Perum Perhutani).

Output 5: Securing the plantation trials as demonstration forest.

As indicated in Output 4 above, the PIT informed the PET that the Project established a total of 31.6 hectares of plantation trials on the concessions of four private sector and state-owned companies at four different locations. The PET was only able to visit the trial established in Central Kalimantan on the concession of PT SBK and found it to be performing very well. The PET was convinced that these trials will continue to serve a useful purpose as demonstration plots for on-going teaching, learning and research, as well as demonstrate the economic and financial viability of rehabilitating degraded forests through the use of the best performing species which have been selected based on good quality and rigorous scientific research.

Output 6: Training field technicians in selecting target species for commercial forest plantation.

The PIT reported that it had organised several technology transfer activities involving planning, design, conduct and analysis of mass vegetative propagation through workshops. A total of 43 persons had participated in these technology transfer activities. During the field trip to Central Kalimantan, the PET met several forest technicians and undergraduate students who were using the demonstration plots established under the Project for learning and research.

Output 7: Training field technicians in mass vegetative propagation.

The PET observed that one of the nurseries established on the property of PT SBK at Nanga Nuak in Central Kalimantan was being used by the company's employees for vegetative propagation of the selected target plantation species for the company's forest rehabilitation activities. The nursery was well-equipped and functional, and was also being used by the Gadjah Mada University for on-going teaching, learning and research.

Output 8: Development of a new planting model and silvicultural system for commercial plantations and the rehabilitation of logged over and other degraded forests

The Project has developed an innovative planting model and silvicultural system for commercial plantations and the rehabilitation of logged over and other degraded forests (referred to by the PIT as "close to nature silviculture") involving interspersing line plantings of selected material within the semi-natural forest. Three metre wide strips are cleared in a straight line, which are separated by 17 metre blocks of semi-natural forests. The seedlings from the selected best species are planted in line in the cleared areas at a stocking rate of 200 stems per hectare, which will later be thinned to 160 stems per hectare. The 17 metre wide strips are intended to serve the following purposes:

- as habitat for native flora and fauna, and therefore to maintain biodiversity;
- to maintain the native Meranti (Shorea species) with their natural predators in order to protect the newly planted trees; and

- to maintain the semi-natural nature of the forest for conservation purposes.

The new system is also used to rehabilitate skid trails and other areas such as log yards, cleared during harvesting operations. Strips are cut only on land with slopes of less than 20 degrees, and also exclude riparian areas.

The system is designed for the planted trees to be harvested in 30 years. However, if the silvicultural treatment to be used results in earlier attainment of the minimum commercial diameter in Indonesia, which is currently 40cm, they will be harvested. Should this occur, it will further improve the economics of the new system as it may be possible to have two rotations, instead of one, within the sustainable cutting cycle of 35 years. During the field trip, the PET observed 10 year-old *Shorea johorensis* and *Shorea leprosula* in line plantings which had attained diameters of 27 cm and 25 cm respectively.

An additional benefit of the new system is that it would reduce risk to the companies, should the planted trees be attacked by pest, as the 17-metre conservation blocks will contain sufficient commercial volumes of merchantable trees to minimise financial and economic loss.

Output 9: Assessing the financial and economic viability of commercial plantations established using the selected target species.

The PIT briefed the PET on the financial and economic viability study conducted by the Faculty of Forestry, Gadjah Mada University on the new forest rehabilitation model and silvicultural system. The study compared the new model with two existing silvicultural systems in Indonesia: namely, selective harvesting with planting in cleared areas only such as skid trails and log yards (TPTI) and selective harvesting with line planting (TPTJ).

Based on Net Present Value (NPV) and Benefit Cost Ratio (BCR), the financial and economic analysis showed that the new model was more viable both financially (to the investor) and economically (i.e. society at large).

In the view of the PET, as these conclusions were based on long term projections, they are preliminary and should therefore be interpreted cautiously. Nevertheless, the results are a useful guide for assisting potential investors in making investment decisions, as well as the GOI in refining and formulating sector policies.

4.4: Dissemination of Results

The Project produced over 30 publications, and the PET found that the PIT had disseminated the Project results effectively through:

- several high quality scientific and technical research papers and documents;
- presentations at regional scientific and policy conferences; and
- technology transfer seminars and workshops.

The trial plots and nurseries also continue to be used for demonstrating the Project's outcomes. A novel approach adopted by the PIT has been the establishment of a memorial forest using the seedlings of the selected best performing species. Important local and overseas visitors to the Project site at Nanga Nuak are invited to plant memorial trees for posterity. The PET planted two seedlings of *Shorea macrophylla* in honour of the ITTO.

4.5: Project Sustainability

Project Sustainability assesses the extent to which the Project Submitting Country (PSC) continues to maintain and use the facilities and other infrastructure from an ITTO-funded project in on-going activities, which continue to further the Project's Specific and Development Objectives, and therefore create broader and enduring impacts after the ITTO-funded project has been completed officially, and funding has ceased.

In the view of the PET, the Project has been sustainable for the following reasons:

- although the ITTO funded Project concluded in 2006, the partners: private and state sector forest companies, the Gadjah Mada University and the GOI have maintained the partnership to continue the work. The PIT informed the PET that since 2006, the GOI and private and state sector forest companies have continued to fund the progeny trials, with the GOI paying for the collection of seeds

and the companies providing facilities, infrastructure and logistical support, as well as maintain the seed orchard. A senior employee at PT SBK in Pontianak, Western Kalimantan, informed the PET that the company continues to provide, on average, more than $USD 200.00 a year in cash and in-kind, to support the on-going project activities;

- all the mother trees selected for the species, plantation and progeny trials have been mapped, to enable easy identification. This is useful for on-going research to further improve and refine the quality of the planting materials;
- the trials established for basic species selection, species and progeny trials are still functional and well maintained, and are still being used for on-going research, learning and teaching;
- the nurseries (at least the ones the PET visited at PT SBK's concessions at Nanga Nuak in Central Kalimantan) are also functional and well maintained by the company staff, and being used for on-going research by the UGM, as well produce planting materials for the company;
- company staff and students from UGM have been trained, and the facilities at PT SBK's concessions at Nanga Nuak in Central Kalimantan are still being used for on-going training of postgraduate and undergraduate students and forest technicians;
- the PET found evidence of clear commitment by the private and state sector forest companies to on-going adoption of the outcomes of the Project including continuing its collaboration with the GOI and UGM , as demonstrated by the work being done currently at Nanga Nuak by PT SBK in Central Kalimantan; and
- the GOI and the private and state sector forest companies have committed funds continuing the Project, particularly for operational planting and research especially into vegetative propagation.

4.6: Impact and Effects

Discussions with the PIT and also company staff at PT SBK's concessions in Nanga Nuak confirmed that the Project has had a number of positive impacts, and these impacts are likely to continue into the future. The Project impacts include the following:

- the private and state sector partner companies have adopted the innovative silvicultural system for rehabilitating logged over forests, and are planting the selected 3 best species. The PIT reported that as at the end of 2009, the private and state sector partner companies had planted a total of 45,202 hectares. The current average annual rate of planting is between 3,500 and 5,000 hectares. The PIT informed the PET that, based on the current level of interest and adoption, it was expected that within 15 years, the new planting model and silvicultural system will become the national standard, and be adopted by all private and public sector forest companies in Indonesia ;
- the innovative planting and silvicultural system for rehabilitating logged over and degraded forest developed under the Project has significantly improved forest productivity. The PIT informed the PET that the average annual productivity of Indonesia's natural forests is currently around 30 m^3 per hectare, compared with an average of 280 m^3 per hectare which can be achieved under the new model and silvicultural system. In addition, the new system is cost-effective, with a total per hectare establishment cost of $USD870, which includes a provision of $USD70 per hectare to support on-going research, establish new trials and organize training programs to continually improve and refine the system;
- while the main objective of the Project was the continual production of high quality planting materials for the rehabilitation of logged over and other degraded forests, one of the important impacts for the forest-dependent communities has been the possibility of further developing *Shorea macrophylla* for the production of timber and non-wood forest product such as oil for a range of domestic and commercial applications. Because of the forest-dependent community's interest in the fruits produced by this species, the private and public sector companies have agreed that *Shorea macrophylla* should be developed so that up to 6 metres of stem can be available for timber production, leaving sufficient branches and limbs to produce fruits which the forest-dependent communities can collect and use for food and oil production;

- the Project has provided the opportunity for further capacity building in the selection and production of improved material for commercial plantings to rehabilitate logged over and other degraded forests, as well human resource development (forest technicians, undergraduate and postgraduate students);
- the Project has contributed to the enhancement of private-public partnership between the private and public sector forest industry collaborators, UGM and the GOI;
- provision by the private and public sector companies of venues, facilities, infrastructure and logistical support for UGM to continue its research in further developing and refining the innovative silvicultural system and planting model for rehabilitating logged over and other degraded forests;
- the Project has demonstrated through financial and economic analysis that the new silvicultural system and planting model is cost-effective compared with the existing silvicultural systems and models. This has given the public and private sector companies the confidence to make commercial and economic decisions regarding commercial plantations development investment in the sector;
- the results of the Project (particularly the financial and economic analysis study) are informing the development of public policy in the forestry sector in Indonesia; and
- the project has developed an innovative silvicultural system and planting model which may be applicable to other ITTO member countries with similar edaphic (soil and climatic) and economic conditions.

The considerable interest the Project has generated within the forestry sector in Indonesia has led to the development of Phase II, focusing on clonal development of the selected best species, and further improvements and refinements to the new planting model and silvicultural system. The new project has already been approved by the ITTO's Expert Panel for the Technical Appraisal of Projects and Pre-projects and awaiting donor funding. The aim is to develop what the PIT describe as "The Kalimantan Forest Company Model " or "SILIN", incorporating the use of improved indigenous species for commercial plantations development and the rehabilitation of logged over forests and other degraded forests, integrated pest management (IPM) and organic soil nutrient enhancement techniques.

Based on the discussions with the PIT, the PET was concerned that, despite the demonstrable economic and financial benefit of the Project outcomes to the whole forestry sector in Indonesia, only a few of the 50 or so private and public sector companies in Indonesia were contributing financially to the activities still on-going under the Project. The GOI may wish to consider addressing this "free riding" phenomenon by examining incentives which can be provided to encourage the other non-contributors to provide funding, as well as adopt the outcomes.

The GOI may also consider organising an "open day" activity in collaboration with the private and public sector forestry company partners at PT SBK's concession at Nanga Nuak, and invite the non-contributing companies to visit and verify for themselves, the Project's success including the practical outputs which they can adopt immediately.

5: Lessons Learned

The evaluation indicated that the key lessons learned from the Project's execution are:

- the success of a project like this one is dependent on it being underpinned by good science, as well as the keenness of the scientists to pursue it;
- the minimum duration of projects like this one, which incorporate aspects of pure and applied research, should be five years. One of the important features of this Project was the practical inter-relationship between the research (the species, plantation and progeny trials) and the direct or immediate application of the results on the concessions of the potential users (the private and state forest companies) i.e. the applied component;
- working closely with the potential users of the research outputs had the benefit of minimising any mismatch between research and operational activity;

- commitment by all partners, especially the end-users, to adopt and implement the results is very critical; and
- clear demonstration of financial and economic benefit to the potential end-users of the project output (s) is very important.

6: Recommendations

6.1: For the ITTO

Based on the findings of the evaluation, the PET makes the following recommendations for consideration by the ITTO:

- The Project is a very good example of a public-private partnership model where a forestry project intended to provide financial and economic benefit to the Project Submitting Country and the collaborating private and public sector forestry companies, is underpinned by a combination of good pure and applied research, and the ITTO may wish to share widely the results of this Project with other ITTO member countries.
- As part of publicising this Project to other ITTO members, the ITTO may wish to consider organising an international conference on site, to showcase the public-private partnership model, as well as the new planting model and silvicultural system developed in Indonesia for commercial plantations and the rehabilitation of logged over and other degraded forests.
- The ITTO is encouraged to assist the GOI in identifying suitable donors for the second phase of the Project, which has already been approved by the ITTO's Expert Panel for the Technical Appraisal of Projects and Pre-projects and awaiting funding.

6.2: For the Country

The PET makes the following recommendations for consideration by the GOI:

- In collaboration with the forestry companies, the GOI may wish to consider options for continuing funding for the UGM to continue with the Project so as to support further human resource development for the forestry sector.
- The GOI should consider incentives to encourage other private sector companies not currently involved in the Project, to contribute funding, as well as adopt the outcomes of this Project.

7: Conclusions

Based on the review of project documents, field visits and discussions with relevant stakeholders, the Project Evaluation Team concluded that the:

- the Project was executed efficiently, and indeed given the total budget and the overall activities undertaken as well as the outputs achieved and their present and future impacts and effects, it has been a very cost-effective project;
- the Project's Development and Specific Objectives of the Project were largely achieved;
- sustainability or continuation of the Project is very good now and promising for the future;
- the Project provides a good example of public-private partnership model, which should be promoted to other ITTO member countries; and
- the Project provides a good demonstration model of the rehabilitation of logged over forest areas and other degraded forest areas through reforestation.

Figure 1 Species trials


Figure 2 Species trials

Figure 3 Progeny test


Figure 4 Progeny test thinned down to be used as Seed Orchard

Figure 5 Intensive silviculture system

Figure 6 Areal view of the Intensive silviculture system (Photo curtsy of GMU)

Figure 7 Nursery for mass seedling production

Figure 8 Vegetative propagation facility

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APPENDICES

Appendix 1

ITINERARY FOR THE EX-POST EVALUATION OF PD 41/00 Rev.3 (F, M)
YOGYAKARTA: - 10th TO 16TH AUGUST 2010

CONSULTANTS: PROFESSOR HOSNY EL-LAKANY AND DR KWAME ASUMADU

DATE	TIME	ACTIVITY
Tuesday, 10th August		Travel from Bali to Jakarta and then to Pontianak (GA 502) Overnight at Mercure Hotel in Pontianak
Wednesday, 11th August		Travel by car to SBK
Thursday, 12th August		Field Visit of Project Site
Friday,13th August		Travel by car from SBK to Pontianak (Overnight at Mercure Hotel in Pontianak)
Saturday, 14th August		Fly from Pontianak to Yogyakarta
Sunday, 15th August		Review of information and preparation of initial report by Professor El-Lakany and Dr Asumadu
Monday, 16th August		Wrap-up Meeting Professor El-Lakany and Dr Asumadu leave Indonesia

Appendix 2

MEETING OF THE PROJECT IMPLEMENTATION TEAM, MERCURE HOTEL, PONTIANAK, 10TH AUGUST, 2010

NAME	ORGANISATION
Professor Soekotjo	Faculty of Forestry, GMU
Professor Mohammed Na'iem	Faculty of Forestry, GMU
Ir. Atok Subiakto	Faculty of Forestry, GMU
Pamuji Raharjo	Faculty of Forestry, GMU
Hosny El-Lakany	University of British Columbia, Canada
Kwame Asumadu	Asumadu Pty Ltd, Australia

Appendix 3

MEETING HELD IN NANGA NUAK, 12TH AUGUST 2010

NAME	ORGANISATION
Professor Soekotjo	Faculty of Forestry, GMU
Professor Mohammed Na'iem	Faculty of Forestry, GMU
Ir. Atok Subiakto	Faculty of Forestry, GMU
Pamuji Raharjo	Faculty of Forestry, GMU
Sofyan P. Warsito	Faculty of Forestry, GMU
Dr. Sapto Indrioko	Faculty of Forestry, GMU
Widiyatno	Faculty of Forestry, GMU
Ir. Khusaeri	SBK
Ir. Yudi Hendro	SBK
Ir. Susilo Purnomo	SBK
Ir. Joko	SBK
Tri (SIP)	SBK
Hosny El-Lakany	University of British Columbia, Canada
Kwame Asumadu	Asumadu Pty Ltd, Australia

Appendix 4

WRAP-UP MEETING HELD IN UGM, YOGYAKARTA, 16TH AUGUST, 2010

NAME	ORGANISATION
Professor Soekotjo	Faculty of Forestry, GMU
Professor Mohammed Na'iem	Faculty of Forestry, GMU
Ir. Atok Subiakto	Faculty of Forestry, GMU
Sofyan P. Warsito	Faculty of Forestry, GMU
Pamuji Raharjo	Faculty of Forestry, GMU
Hosny El-Lakany	University of British Columbia, Canada
Kwame Asumadu	Asumadu Pty Ltd, Australia