

ITTO CITES Phase II

Promoting Conservation of Plant Genetic Resources of *Aquilaria* and *Gyrinops* Species in Indonesia

Completion Report



Ministry of Forestry
Forestry Research and Development
Center for Conservation and Rehabilitation Research and Development
in cooperation with
International Tropical Timber Organization
(ITTO) – CITES Phase II Project

Bogor – Indonesia
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Project number : ITTO Collaborative Program with CITES “Support to ITTO-CITES Implementation for tree species and trade/market transparency (TMT)

Activity: Promoting Conservation of Plant Genetic Resources of *Aquilaria* and *Gyrinops* Species in Indonesia

Starting date of the activity : October 7, 2013

Duration of the activity : 12 months, extended to 15 months

Project costs (US \$) : ITTO: US\$ 96,170 and GOI (in kind): US\$ 21,617

The ordinal number and type of the report : Activity Completion Report

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Executive Summary

1. Activity Context, Origin and problem to be addressed

The genera *Aquilaria* and *Gyrinops* consist of many species. These species are naturally distributed throughout the major islands of the Indonesian archipelago. Due to the increase of population density and the rapid exploitation of natural resources, the extraction of natural agarwood has also increased. However, the population and distribution status of the species remain unknown, and in particular on their conservation status and the effectiveness of the efforts that have been taken to conserve them. Furthermore, the taxonomic interpretation of the species, especially that of *Aquilaria* does vary between species. The increase of the population density has also resulted in various disturbances on the agarwood producing species in nature. If no intervention is taken, the pressure will increase from time to time which in turn will cause the extinction of certain species. In the Activity, it is proposed that several measures be introduced to ensure their conservation and sustainable management, especially through exploratory assessment on the taxonomic, population and conservation status of *Aquilaria* and *Gyrinops* species, and the initial establishment of genepools of selected species in the specific and secure areas.

2. Activity Objective

The objective of the Activity is to explore and obtain information on the current status of *Aquilaria* and *Gyrinops* species, with specific reference to their taxonomic, population, conservation status, and to promote initial establishment of genepools of selected species in specific and secure areas. The data and information will be obtained through literature review, workshop and field exploration in selected representative areas.

3. The most critical differences between planned and realized Activity implementation

Activity Personnel: Personnels who is involved in this activity are slightly different from that mentioned in original documents with similar in qualification. Therefore, the quality of the activity remains similiar.

Time schedule: There is a slight delay in the schedule from the starting date and some extention of implementation. The original schedule was 12 months from October 2013 through September 2014. The extension period is from October through December 2014 without any additional funding. The extension directed to further establishment of conservation garden by additional seed collections of some more species and provenances, maintenance seedling at nursery until they are ready to be planted, to finalize and to make findings and output more useful to the stakeholders.

Budget Amendment: There are some reallocated funds to support and to strengthen some activities during the extension period. The total budget, however, remains the same.

4. The situation prevailing after Activity completion, as compared to the Pre-activity situation including the situation of the target beneficiaries, and indicates the post- Activity sustainability (a brief description)

There were six printed publications disseminated to the related institutions and in broader scale, especially for the books of identification manual of *Aquilaria* and *Gyrinops*, to the farmers, companies, agarwood association in Indonesia. The book on the taxonomical status and population of *Aquilaria* and *Gyrinops* and in-situ and ex-situ conservation of *Aquilaria* and *Gyrinops*: a review, besides providing important information of the two genera, it is also aimed to raise the awareness of the policy makers of local government to the importance and existence of agarwood producing species in the area and eager to conserve them in form of in-situ and ex-situ conservation as well. The conservation gardens, which were established at Dramaga, 10 km from Bogor, were expected to be as potential source of planting materials for the future breeding program.

5. The most relevant outcome of the analysis of the Activity implementation

The established conservation gardens in Dramaga, Bogor comprise of several provenances of *Aquilaria* (*Aquilaria malaccensis*, *Aquilaria beccariana* and *Aquilaria microcarpa* from Bengkulu, Lampung, West Kalimantan, East Kalimantan) and *Gyrinops versteegii* (from West Nusa Tenggara and East Nusa Tenggara). Each provenance was planted in isolated separate distant area with main idea of avoiding cross-pollination among provenances. The conservation garden will be the potential source of genetic materials and considered as crucial initial step of further breeding program.

6. The lessons learned

There are six species of *Aquilaria* and seven species of *Gyrinops* are naturally distributed in Indonesia. Those agarwood producing trees are widely distributed throughout Indonesia. It is therefore, certainly require huge efforts to collect planting materials from all its natural distribution. The activity, which implemented in 15 months, could collect only in some parts of its huge natural distribution. The involvement of local government and other related entities, where the agarwood producing trees are naturally distributed, is unquestionably important. That local government should have a sufficient awareness of conserving the genetic materials from its natural stands. It will not a trouble-free exertions, however, it is not an impossible works as well. A continues effort on awareness raising of the local government from the central authority and related institutions on the importance of conserving the genetic materials of agarwood producing trees, will in some extend has a significant result. In this case, the local governments are encouraged to establish a small area of conservation garden comprising of all available genetic resources of *Aquilaria* and *Gyrinops*.

7. Recommendations

In order to avoid further loss of genetic resources of *Aquilaria* and *Gyrinops* in its natural distribution, there are some recommendations as follows:

- a. *Aquilaria* and *Gyrinops* have been planted tremendously in Indonesia, mostly by private farmers. Many natural agarwood producing trees are conserved in home gardens to produce seeds and seedlings for planting stocks. Meanwhile the technology of inoculation in producing artificial agarwood has been developed. Therefore, the production of artificial agarwood could be projected to increase in the future. This artificial agarwood product, as an incentive to the farmers, is allowed to be exported beyond the allocated quota. This certainly will gradually replace the export of agarwood from nature, which is expected to be decreasing from time to time.
- b. Raise the awareness of local governments, where agarwood producing trees are naturally distributed, in the conservation of genetic resources of *Aquilaria* and *Gyrinops*. The local governments are encouraged to establish small genetic conservation garden of the two genera.
- c. It was hard to obtain information on *Gyrinops* species. Information on ecology, habitat, phenology, propagation, pest and disease of *Gyrinops* was not available. Therefore, further exploration and study on these genera are strongly recommended.

1. Activity Identification

1.1. Context

Gaharu or agarwood is one of the commodities of Non-Timber Forest Products that have been popular in Indonesia for the last several decades due to their high economic value. The agarwoods are resins or derivatives resulted from the infected part of the wood within the species of *Aquilaria* and *Gyrinops*. This aromatic material has been used in, among others, various medicinal and cosmetic products. The high economic value and demand, especially from overseas, have intensified the exploration and exploitation of agarwood, which in turn, cause serious threat to the natural population of *Aquilaria* and *Gyrinops* species that produce the agarwood. Several species of *Aquilaria* have been widely domesticated and planted in Indonesia. However, the plantation is still insufficient to reduce the harvesting of agarwood from the natural population. This is especially the case as the quality of agarwoods from nature is still incomparable and awareness on the importance of natural agarwood conservation is still weak.

In this Activity, the primary issue to be addressed is the conservation both *in situ* and *ex situ* of the agarwood producing species, including exploratory assessment on their natural distribution and plantation. The expected outputs are (i) the taxonomical and population status of *Aquilaria* and *Gyrinops* species; and (ii) the initial establishment of gene pools of selected *Aquilaria* and *Gyrinops* species.

1.1.1. Activity Location

The administrative work of project was managed in Executing Agency office in Bogor, West Java as project secretariat.

The Activity consists of desk study, field explorations for collecting data and information required for collecting genetic materials, ground check the existent of several natural populations and collect herbarium and pictures of the two species, and a selected location for establishment of conservation garden. Desk study activities were carried out at the implementing agency in Bogor, Bogor Agriculture University in Bogor, LIPI (Indonesian Science Institute) in Cibinong, and Ministry of Forestry in Jakarta. Field visit were conducted in several areas i.e. field explorations were carried out in twelve provinces, namely West Kalimantan, East Kalimantan, Lampung, South Sumatra, South Sulawesi, Bengkulu, Bangka Belitung, Riau Archipelago, Jambi, Maluku, East Nusa Tenggara, and West Nusa Tenggara.

The conservation garden was established in Dramaga Research Forest in Bogor, West Java.

1.1.2. Relevant National and regional policy and program

Aquilaria spp. and *Gyrinops* spp. are listed into Appendix II of CITES since 2004. This is to assist in the trade control by both exporting and importing countries. The requirements of these policies include NDF assessment prior to harvest and set yearly quota with subject to be approval from CITES Authorities for agarwood which derived

from nature forest. Currently, the status of the taxonomic, population and conservation of the genera *Aquilaria* and *Gyrinops* remain unmanaged and unmonitored. Various disturbances, especially the harvesting of natural agarwood from the wild has threatened the existence of the genetic resources of the species. The accuracy of determination of the export quota require sufficient data on status of the taxonomic, population and conservation of those two species. This activity also supports national program in the effort to conserve the genetic resources.

1.2. The origin and the main problem to be addressed

The Activity is a further elaboration of the previous ITTO regular project on agarwood in Indonesia (ITTO PD425) which was terminated in 2010. The previous project had focused on the development and dissemination of artificial inoculation of selected *Aquilaria* species, including wide introduction of artificial plantation of *Aquilaria malaccensis*.

The genera *Aquilaria* and *Gyrinops* consist of many species. These species are naturally distributed throughout the major islands of the Indonesian archipelago. Due to the increase of population density and the rapid exploitation of natural resources, the extraction of natural agarwood has also increased. However, the population and distribution status of the species remain unknown, and in particular on their conservation status and the effectiveness of the efforts that have been taken to conserve them. Furthermore, the taxonomic interpretation of the species, especially that of *Aquilaria* does vary between species. The increase of the population density has also resulted in various disturbances on the agarwood producing species in nature. If no intervention is taken, the pressure will increase from time to time which in turn will cause the extinction of certain species. In the activity, it is proposed that several measures be introduced to ensure their conservation and sustainable management, especially through exploratory assessment on the taxonomic, population and conservation status of *Aquilaria* and *Gyrinops* species, and the initial establishment of genepools of selected species in the specific and secure areas.

2. Activity Objectives and Implementation Strategy

2.1. Rationale and Specific Objectives

As described in the activity document, the objective of the activity is to explore and obtain information on the current status of *Aquilaria* and *Gyrinops* species, with specific reference to their taxonomic, population, conservation status, and to promote initial establishment of genepools of selected species in specific and secure areas. The data and information will be obtained through literature review, workshop and field exploration in selected representative areas.

2.2. Adjustments made in the implementation phase

There were some adjustments made in the implementation phase such as personnel for national expert and member of field team, allocated budget component, and period of the activity. As described in the activity document national expert for activity 1.1. was Dr. Kade Sidiyasa, national expert for activity 2.2. and member of field team for activity 1.1. and 2.2. was Ms. Badiyah. Due to time availability, national expert for those activity were replaced by Mr. Adi Susilo and Mr. Lukman Hakim, and a member field team was replaced by Mr. Edy Santoso and Ms. Titi Kalima for activity 1.1. and there was no field activity in the activity 2.2.

Three months extension period was made without additional funding from ITTO, and some budget component were reallocated to support the extension and activities implementation.

The extension directed to further establishment of conservation garden by additional seed collections of some more species, maintenance seedling until they are ready to be planted, and to finalize and to make findings and output more useful to the stakeholders.

2.3. Implementation Strategy

Several strategies had been taken to achieve the Activity objectives through: (1). Identify of qualified and experienced parties and personnels to be involved in the project activities; (2). Collect data and information on taxonomical, population conservation, and genetic material of *Aquilaria* spp. and *Gyrinops* spp. using the existing documents (printed and non printed), internet search or online database and other sources (interview with relevant stakeholder); (3). Carry out several technical meeting discussion and stakeholder consultation to representing workplanto obtain inputs and comments; (4). Carry out technical workshop to presenting the findings and obtain inputs and comments; (5). Dissemination of findings and guideline to several stakeholders; and (6). Internal FORDA evaluation to review and evaluate the progress, the problems and the solutions faced by the activity and to enhance the achievement of Activity outputs in conjunction with other events organized by FORDA.

Involved stakeholders and beneficiaries:

- Ardikusuma Library, Ministry of Forestry
- Indonesian Institute of Science (LIPI)
- DG. Of Planology, Ministry of Forestry
- CITES Management and Scientific Authorities
- Provincial and District Forest Services
- Universities
- Companies
- Gaharu (agarwood) association and;
- Local communities (farmer and trader of agarwood).

2.4. Assumptions and risks

It is unlikely that the Activity will face any serious risks as the major activities are mostly carried out through literature search, and field exploration (survey) in selected areas. However, the unpredictable weather may slightly influence the work schedule, but will not cause a complete failure in the achievement of the overall Activity objective.

3. Activity Performance

3.1. Performance of each Activity

The objective of the Activity is to explore and obtain information on the current status of *Aquilaria* and *Gyrinops* species, with specific reference to their taxonomic, population, conservation status, and to promote initial establishment of genepools of selected species in specific and secure areas.

Outputs and Operational Activities	Schedule (Duration)	Applied inputs	Achievement	Remarks
Output 1. Taxonomical and population status of <i>Aquilaria</i> and <i>Gyrinops</i> species				
Activity 1.1. Exploratory assessment on the taxonomical status and population of <i>Aquilaria</i> and <i>Gyrinops</i> species	October 2013 – March 2014	National Expert and team member	Fully executed but slightly delay	Completed with technical report, Field guidelines and bibliography
Activity 1.2. Technical workshop on the result of activity 1.1.	Februari – Maret 2014	Discussant, Speakers, facilitators and participants	Fully executed but slightly delay	This activity is carried out to obtain inputs and comments to enhance report on activity 1.1.
Output 2. Initial establishment of genepools of selected <i>Aquilaria</i> and <i>Gyrinops</i> species				
Activity 2.1. Review on the in-situ and ex-situ conservation of <i>Aquilaria</i> and <i>Gyrinops</i> species	Desember 2013 – Maret 2014	National Expert and team member	Fully executed	Completed with technical report.
Activity 2.2. Stakeholder consultation on the establishment of conservation gardens of agarwood producing species	Januari – Februari 2014	Speakers, facilitators and participants	Fully executed	This activity is carried out to obtain inputs and comments to the implementation of activity 2.3.
Activity 2.3. Initial establishment of <i>Aquilaria</i> and <i>Gyrinops</i> conservation gardens	November 2013 – Desember 2014	National Expert and team member	Fully executed	Completed with report, manual and conservation garden in Dramaga Forest Research

Activity 1.1. Exploratory assessment on the taxonomical status and population of *Aquilaria* and *Gyrinops* species

The execution of activity 1.1 (*Exploratory Assessment on the Taxonomical status and Population of Aquilaria and Gyrinops Species*) was led by Mr. Adi Susilo, a senior researcher of the Center for Rehabilitation and Conservation Research and Development, as a National Expert and involving other researcher as team member. Data and information on taxonomical, and population status of *Aquilaria* and *Gyrinops* species were collected using all available published and unpublished materials from Ardikusuma Library, IPB, LIPI, and also online data base such as Proquest, Science Direct, Google Scholar and Infotact. To check the existent of several natural populations of *Aquilaria* spp. and *Gyrinops* spp. field visit were conducted into several selected provinces i.e. East Kalimantan Province, West Nusa Tenggara Province, South Sulawesi Province, South Kalimantan and Maluku Province. Data and information also collected from the collection of sample of herbaria and species collection, National Forest Inventory (NFI) and interviewed with several stakeholder.

All findings on this activity were compiled into one technical report on Status Taxonomy and Population of *Aquilaria* and *Gyrinops species in Indonesia*, two field guide to Identification of agarwood producing tree for each species and one book on abstract of agarwood studies were collected during the activity had been published.

Activity 1.2. Technical workshop on the result of activity 1.1.

Technical workshop on Status Taksonomi and Population of *Aquilaria* and *Gyrinops* Species in Indonesia was held in IPB International Convention Center on 26th May 2014 to obtain inputs and comments to enhance report of activity 1.1. The technical workshop was attended by 29 participants from various relevant institutions such as, Ministry of Forestry, LIPI, SEAMEO BIOTROP, and University.

The report of “Status Taksonomi dan Populasi Jenis-Jenis *Aquilaria* dan *Gyrinops* di Indonesia” was presented by Mr. Adi Susilo and Ms. Titi Kalima and in depth discussed by an expert Dr. Tony Suhartono, Prof. Dr. Harry Wiradinata, and Prof. Dr. Tukirin Partomihardjo and participants of the workshop.

Several recommendations were appear during the discussion such as the consistency of the report, additional data on biology population, regeneration, and figure need to be improve. Recommendations had been accommodate in the final report of the activity 1.1..

Activity 2.1. Review on the in-situ and ex-situ of *Aquilaria* and *Gyrinops* Species

The execution of activity 2.1. (*Review on the in-situ and ex-situ of Aquilaria and Gyrinops Species*) is led by Mr. Tajudin Edy Komar, a senior researcher of the Center for Rehabilitation and Conservation Research and Development, as a National Expert and assisted by Mr. Marfuah Wardhani as technical assistant. Data and information on in-situ and ex-situ of *Aquilaria* and *Gyrinops species* were collected using all available published and unpublished materials, field survey in representative areas, interview and discussion with several stakeholders.

Field data collections had been carried out in South Sumatra Province, Bangka Belitung Province, Bengkulu Province, Riau Archipelago Province, Jambi Province, South Kalimantan Province and West Nusa Tenggara Province.

All findings in this activity were compiled into one technical report "In-situ and Ex-situ Conservation of *Aquilaria* and *Gyrinops*: A Review"

Activity 2.2. Stakeholder consultation on the establishment of conservation gardens of agarwood producing species

Stakeholder consultation was carried out in form of Focus Group Discussion (FGD). This FGD was held in IPB International Convention Center on 13th February 2014 to obtain informations on the biophysical suitability, nursery techniques, silvicultural systems and pest management as the basis to determine the site(s) for the development of conservation garden of *Aquilaria* and *Gyrinops* species. The FGD was attended by 28 participants from various relevant institutions such as, Ministry of Forestry, LIPI, Perhutani, University and farmers to share their experiences and knowledges. The FGD was run smoothly through all scheduled agenda which consisted of two sessions. First session was sharing experiences on the technique of development conservation garden, biophysical suitability, silviculture/cultivation, and how to manage pests and diseases from Mr. Atok Subiakto, a senior researcher from CRCRD, Mr. Mahmuddin Sany, Chairman of the North Sumatra Agarwood Forum, and Mr Muhammad Nuh, an extension officer from Sanggau District, West Kalimantan. Second session was focused to discuss on determining the sites of the conservation garden based on the biophysical conditions, accessibility, legal status, and secure from the attack of pests and diseases. Several issues related to the development of conservation garden were appear during the discussion such as planting system, pest management and proposed sites for conservation garden.

Activity 2.3. Initial establishment of *Aquilaria* and *Gyrinops* conservation Garden

The execution of activity 2.3 (*Initial establishment of Aquilaria and Gyrinops conservation Garden*) is led by Mr. Lukman Hakim, a senior staff of the Center for Rehabilitation and Conservation Research and Development, as a National Expert and involved other researcher as team member. Genetic materials were collected from several locations in conjunction with activity 1.1. and 2.1.. Genetic materials had been explored and collected from several areas such as Bengkulu, Lampung, West Kalimantan, East Kalimantan, West Nusa Tenggara, East Nusa Tenggara, Maluku Province, Lingga District, Ketapang District, Kutawaringin District, and Bangka Tengah District. Genetic materials that had been collected are *Aquilaria malaccensis*, *Aquilaria microcarpa*, *Aquilaria beccariana*, *Aquilaria cumingiana*, *Aquilaria hirta* and *Gyrinops versteegii*. After collected, seed and seedling were planted at nursery in Bogor to be cultivated and maintained before it is ready to be planted at the conservation garden.

Six plots of conservation garden had been established in Dramaga Research Forest with total areas is $\pm 1,55$ ha and approximately 2,019 seedlings were planted as shown in the following table. Lemongrass (*Citronella* sp.) was also planted as efforts to prevent agarwood pest.

No.	Block	Total Area (Ha)	Distance (m)	Species/Provenan	Number of Seedlings	Planting Time
1.	179,175	± 0,30	3x3	<i>Aquilaria malaccensis</i> / Lampung Province	202	6 June 2014
2.	73	± 0,25	2x3	<i>Gyrinops versteegii</i> /West Nusa Tenggara Province	360	24 July 2014
3.	182	± 0,25	2x3	<i>Gyrinops versteegii</i> /East Nusa Tenggara Province	321	31 Oct 2014
4.	96	± 0,25	2x3	<i>Aquilaria malaccensis</i> /Bengkulu Province	384	3 Nov 2014
5.	99	± 0,25	2x3	<ul style="list-style-type: none"> <i>Gyrinops versteegii</i>/West Nusa Tenggara Province <i>Gyrinops versteegii</i>/East Nusa Tenggara Province 	320 64	14 Nov 2014
6.	19	± 0,25	2x3	<ul style="list-style-type: none"> <i>Aquilaria malaccensis</i>/ Lampung Province <i>Aquilaria malaccensis</i>/ Bengkulu Province <i>Aquilaria malaccensis</i>/ West Kalimantan Province <i>Aquilaria microcarpa</i>/ East Kalimantan Province <i>Aquilaria microcarpa</i>/ West Kalimantan Province <i>Aquilaria beccariana</i>/ East Kalimantan Province 	96 96 32 82 10 52	15 Nov 2014
Jumlah		± 1,55			2,019	

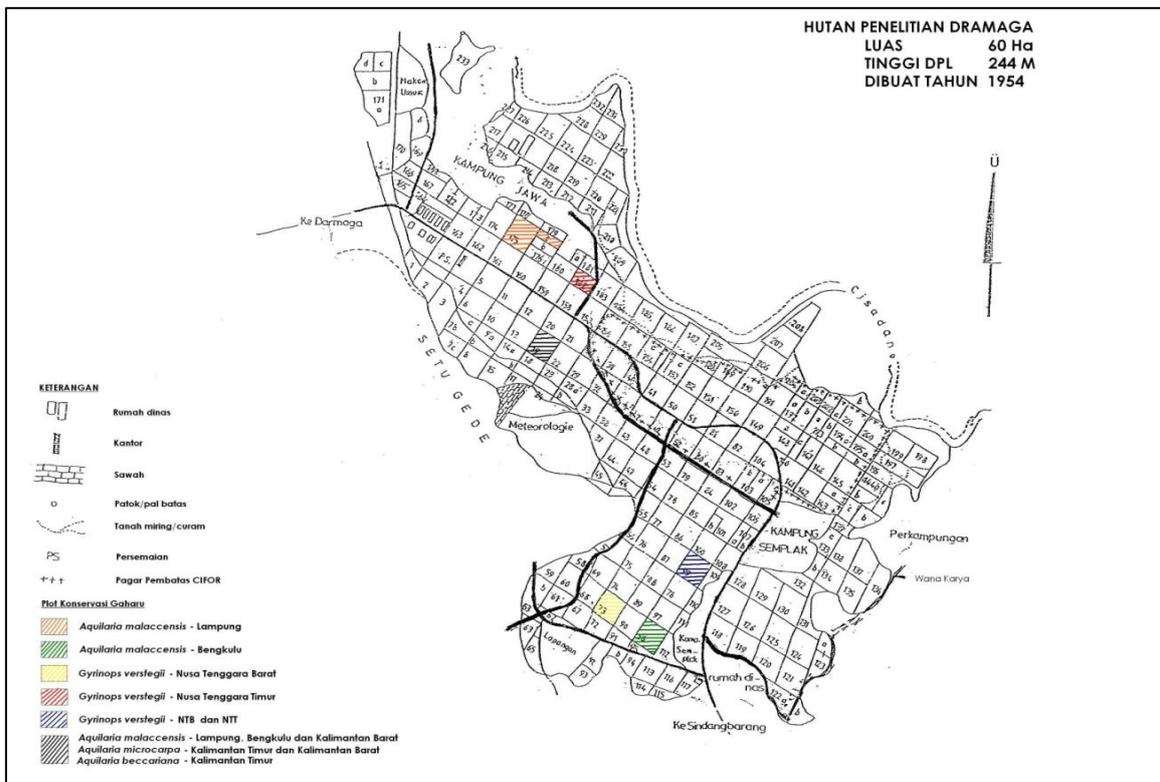


Figure 1. Sketch of Agarwood Conservation Plots in Dramaga Forest Research

3.2. Output achievement

There are two outputs achieved: (1) taxonomical and population status of *Aquilaria* and *Gyrinops* species and (2) initial establishment of genepool of selected *Aquilaria* and *Gyrinops* species.

Output 1. Taxonomical and population status of *Aquilaria* and *Gyrinops* species

Taxonomical and population of *Aquilaria* and *Gyrinops* species in Indonesia had been identified through collection of published and unpublished data and information, herbaria and field survey to selected sites. The status of taxonomical and population of this two genera had also been discussed in technical workshop organized under this Activity.

A technical report (*Status Taksonomi dan Populasi Jenis – jenis Aquilaria dan Gyrinops*) had been printed and to be distributed to the concerned stakeholders. The contents of the report are related to the key of identification, description and distribution of population for each species.

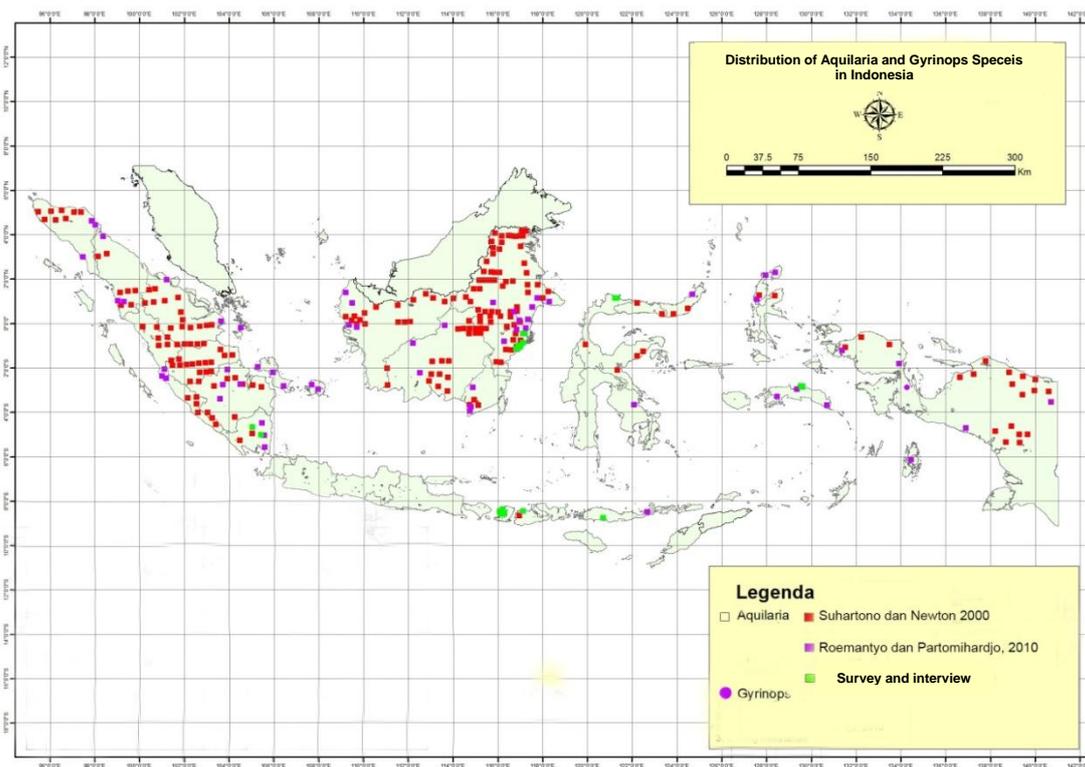


Figure 2. Distribution of Population *Aquilaria* and *Gyrinops* species in Indonesia

In addition, two guidelines and one agarwood bibliography were also developed. One is the “Field Guide to Identification of agarwood producing tree *Aquilaria* spp. in Indonesia”, and one is the “Field Guide to Identification of agarwood producing tree *Gyrinops* spp. in Indonesia” which are contents of description of each species. The targets of these guidelines are the field staffs who work on field inventory, farmer, agarwood association and other related stakeholder. A bibliography, which is contents of compilation abstracts of agarwood studies. The targets of this bibliography are academics, researchers, and other related stakeholder.

These publications will be further disseminated to relevant stakeholders and authorities as part of capacity building.

Output 2. Initial establishment of genepools of selected *Aquilaria* and *Gyrinops* species

The initial of selected *Aquilaria* and *Gyrinops* conservation gardens had been established in Dramaga Research Forest. Total area is \pm 1.55 ha and more than 2,000 seedlings collected from various provenances had been planted separately in 6 blocks in this area. Four blocks were planted with only one species each and two other blocks were planted with mixed species.

In addition, one manual had been prepared. The target of this manual is farmer, companies, agarwood association and other related stakeholder.



Figure 3. Six month planted of *Aquilaria malaccensis* from Lampung at conservation garden in Dramaga Research Forest

Beside that, in-situ and ex-site agarwood conservation had been identified through collection of published and unpublished data and information, and field survey to selected sites. A technical report (*In-situ and Ex-situ Conservation of Aquilaria and Gyrinops: A Review*) had been printed and to be distributed to the concerned stakeholders. The contents of the report are related to the natural distribution, gaps and problems on sustainable harvest and conservation, conservation status and strategic action and recommendation for conservation of *Aquilaria* and *Gyrinops* species

Time Schedule

The activity implementation had been conducted in 15 months, slightly delay from original time schedule. The original schedule was 12 months started from October 7th, 2013 through September 30th, 2014. The extension period is from October 1st, 2014 through December 31st, 2014 without any additional funding. The extension directed to further establishment of conservation garden by additional seed collections of some more species, maintenance seedling, and to finalize and to make findings and output more useful to the stakeholders.

Total Amount of Expenditures and Analysis

ITTO contribution was transferred in two period i.e first installment was USD 50,000 and converted with rate IDR 11,418 and second installment was USD 46,170 converted with rate IDR 11,518.

From the ITTO contribution of 96,170 at total of USD 95,196.33 was spent while leaving balance of USD 1,244.47 (including bank interest rate and all bank administration) as reflected in the 'Activity Cash Flow Statement - ITTO contribution' and the 'Activity Financial Statement -ITTO contribution' in **Appendix 1 and 2**.

The remaining fund will be returned to ITTO account after deducted by closing account fee, transfer fee and correspondence charge, using rate when the fund is return.

In this regard from the in-kind contribution of US\$ 21,617.00 from Indonesia, a total of US\$ 21,617.00 was spent as shown in the 'Activity Cash Flow Statement – Government of Indonesia (Gol) contribution' and the 'Activity Financial Statement -Gol contribution' in **Appendix 3 and 4**.

4. Activity Outcome, Target Beneficiaries Involvement

4.1. The achievement of specific objectives

Outputs

Output of the Activity areas follows:

- a. Technical reports and manuals/guides
 - (i). Exploratory assessment on the taxonomical status and population of *Aquilaria* and *Gyrinops* species
 - (ii). In-situ and ex-situ conservation of *Aquilaria* and *Gyrinops*: A review
 - (iii). Agarwood bibliography; A compilation of Abstracts on Agarwood Studies
 - (iv). Manual on establishment of ex-situ conservation plot of agarwood producing species
 - (v). Field guide to Identification of agarwood producing tree *Gyrinops* spp. in Indonesia
 - (vi) Field guide to identification of agarwood producing tree *Aquilaria* spp. in Indonesia
- b. Conservation garden

Six plots of conservation garden were established at Dramaga, about 10 km from Bogor. The area of the conservation garden is 1.55 ha and more than 2,000 seedlings were planted. The planted seedlings were three species of *Aquilaria* from four provenances and one species of *Gyrinops* from two provenances

The impact/Outcome.

Identifying the right species of agarwood producing tree is important as different species produce different agarwood quality. Distinguishing *Aquilaria* and *Gyrinops*, even between species within genera is not an easy task, especially when the reproductive part is not present. It is not surprising, therefore, that *Aquilaria malaccensis* is frequently misidentified as *Aquilaria microcarpa* vice versa.

The technical reports and manuals/guides as mentioned above were distributed to various addresses from local governments, association of agarwood, and farmers. These reports and manuals/guides are greatly understood to be the important sources of information in establishing the conservation garden and plantation and in assisting to identification of species of *Aquilaria* and *Gyrinops*.

For the local governments, where the natural distribution of *Aquilaria* and *Gyrinops* appear, were intended to raise their awareness on the importance of conserving the genetic resources of the two genera for the future use. The final goal is that those local

governments will willing to established their own conservation garden. The locations could be as Botanical Garden, recreational forests/parks and research/educational forests

4.2. Situation at Project completion

The Activity which implemented within 15 months, beside three technical reports and two guides, is successful to establish six plots of conservation garden of *Aquilaria* and *Gyrinops*. There are remaining seedlings of some provenances that still being raised at nursery. These seedlings will be planted soon after being ready for replanting at existing conservation garden and for being disseminated to farmers and other interest groups

4.3 Participation the target beneficiaries

The related stakeholders consisting of Scientific Authority, Management Authority, farmers, scientists, private-owned company, universities and some related persons were invited and actively involved in workshop and stakeholder consultation to contribute in improving technical report and discussing the appropriate locations of conservation gardens. In some extends, the related stakeholders had provided some important suggestions to implement the activity smoothly

4.4. Expectation of Project sustainability after Project completion

After Activity was completed, some measures had and need to be taken to ensure its sustainability as follows:

Technical reports, manual and guides (printed and electronic files) were disseminated to related stakeholders as source of important information and technical guidance to manage agarwood sustainably, at its natural habitat and plantation as well. Those publications will also be published electronically through website of the Center for Conservation and Rehabilitation and website of FORDA (Forestry Research and Development Agency)

The established conservation garden was handed offer to the Center for Conservation and Rehabilitation for further tending

As the budget and time constraints, the collection of seeds from natural habitat was not able to cover all species and provenances of *Aquilaria* and *Gyrinops* in Indonesia. Therefore, further exploration is required. The local government, where natural habitat of *Aquilaria* and *Gyrinops*, are encouraged to establish their own conservation garden of those two genera. Awareness raising to the agarwood community on the importance of plant genetic conservation for future use is also necessary. Ex-situ conservation should be promoted by responsible institutions with active participation from various communities

Specific research on reproductive biology and ecology of each individual species should be carried out to predict breeding pattern and genetic diversity of the species under the two genera

Promote innovation to conserve and preserve genetic material of selected species, such as pollen, seeds and clones for long term conservation program.

Rehabilitation activities could be carried out in combination with ex-situ conservation and commercial plantation in accordance with guidelines provided by competent institutions

5. Assessment and Analysis

- a. Implementation strategies which have been taken, through desk study, field survey and stakeholder consultation (Meetings) have been effective in the execution of operational activities and to achieve Activity objective
- b. Activity was implemented on schedule with three-month extension with no additional funding from ITTO, mainly due to raising period of seedlings at the nursery until ready to be planted
- c. No specific organization involved in the execution of the project activity. However, during the technical workshop and stakeholder consultation all potential and qualified persons were invited to deliver their contribution. The participants were identified based on their expertise, working experience and other relevant activities, such as plantation, conservation, CITES etc as well as their knowledge on botany, ecology, and silviculture.
- d. As for conservation, the planted agarwood species is not for the production of agarwood. The pure line should be maintained based on the source of origin (provenance) and no treatment (such as inoculation) to be applied to promote agarwood production. Therefore, the site for ex-situ conservation should be legally and formally designated for long term program and ecological benefit will be produced in the future as plant genetic resources

6. Lesson Learned

Tropical forests in Indonesia are widely spread to all over islands in the archipelago. Species of *Aquilaria* and *Gyrinops* have been reported to be found in almost all of those islands. There are six species of *Aquilaria* and seven species of *Gyrinops* are naturally distributed in Indonesia. Those agarwood producing trees are widely distributed throughout Indonesia. It is therefore, certainly require huge efforts to collect planting materials from all its natural distribution. The activity, which implemented in 15 months, could collect only in some parts of its huge natural distribution. The involvement of local government and other related parties, where the agarwood producing trees are naturally distributed, is unquestionably important. That local government should have a sufficient awareness of conserving the genetic materials from its natural stands in form of in-situ and ex-situ conservation sites. It will not a trouble-free exertions, however, it is not an impossible works as well. A continues effort on awareness raising of the local government from the central authority and related institutions on the importance of conserving the genetic materials of agarwood producing trees, will in some extend has a significant result. In this case, the local governments and other related entities are encouraged to establish conservation

garden in a relatively small area comprising of all available genetic resources of *Aquilaria* and *Gyrinops*.

7. Conclusion and Recommendations

With full support of all involved persons and experts, the activity had been adequately completed as scheduled. Slight extension was required without additional funding, as waiting the time of seedlings at nursery to ready to be planted.

In order to avoid further loss of genetic resources of *Aquilaria* and *Gyrinops* in its natural distribution, there are some recommendations as follows:

- a. *Aquilaria* and *Gyrinops* have been planted tremendously in Indonesia, mostly by private farmers. Many natural agarwood producing trees are conserved in home gardens to produce seeds and seedlings for planting stocks. Meanwhile the technology of inoculation in producing artificial agarwood has been developed. Therefore, the production of artificial agarwood could be projected to increase in the future. This artificial agarwood product, as an incentive to the farmers, is allowed to be exported beyond the allocated quota. This certainly will gradually replace the export of agarwood from nature, which is expected to be decreasing from time to time. On the other hand, strong law enforcement should be implemented to effective conservation and protection of genetic resource, especially in the wild
- b. Raise the awareness of local governments, where agarwood producing trees are naturally distributed, in the conservation of genetic resources of *Aquilaria* and *Gyrinops*. The local governments are encouraged to establish small genetic conservation garden of the two genera.
- c. It was hard to obtain information on *Gyrinops* species. Information on ecology, habitat, phenology, propagation, pest and disease of *Gyrinops* was not available. Therefore, further exploration and study on these genera are strongly recommended.

Responsible for the Report



Name: Didik Purwito
Date : 31 December 2014

Position held: Activity Team Leader

Appendix 1. Activity Financial Statement (In US Dollar) - ITTO Contribution

Programme Title ITTO CITES Program - Support to ITTO-CITES Implementation for Tree Species and Trade/Market Transparency (TMT)

Activity Title Promoting Conservation of Plant Genetic Resources of *Aquilaria* and *Gyrinops* Species in Indonesia

Period Covered (ending on): 31 December 2014

Component	Original Amount (A)	Expenditure To-date			Available Funds (E) (A-D)
		Accrued (B)	Expended (C)	Total Expended D (B+C)	
I. Funds managed by Executing Agency					
10. Personnel					
11. National Expert	\$17,500.00	\$ -	\$ 17,500.00	\$ 17,500.00	\$ -
12. Speakers	\$ 726.92	\$ -	\$ 726.92	\$ 726.92	\$ -
13. Other Labors	\$ 5,301.69	\$ -	\$ 5,231.42	\$ 5,231.42	\$ 70.27
14. Activity Secretary	\$ 7,500.00	\$ -	\$ 7,500.00	\$ 7,500.00	\$ -
15. Team Leader	\$ 11,250.00	\$ -	\$ 11,250.00	\$ 11,250.00	\$ -
16. Assistant	\$ 1,200.00	\$ -	\$ 1,200.00	\$ 1,200.00	\$ -
19. Component Total	\$ 43,478.61	\$ -	\$ 43,408.34	\$ 43,408.34	\$ 70.27
20. Sub-contract					
21. Sub-contract	\$ -	\$ -	\$ -	\$ -	\$ -
29. Component Total	\$ -	\$ -	\$ -	\$ -	\$ -
30. Duty Travel					
31. DSA	\$ 18,434.73	\$ -	\$ 18,434.73	\$ 18,434.73	\$ -
32. Return Ticket	\$ 7,449.62	\$ -	\$ 7,446.79	\$ 7,446.79	\$ 2.83
33. Local Transport	\$ 5,631.42	\$ -	\$ 5,164.04	\$ 5,164.04	\$ 467.38
39. Component Total	\$ 31,515.77	\$ -	\$ 31,045.56	\$ 31,045.56	\$ 470.21
40. Capital Items					
41. Office space	\$ -	\$ -	\$ -	\$ -	\$ -
42. Vehicles	\$ -	\$ -	\$ -	\$ -	\$ -
49. Component Total	\$ -	\$ -	\$ -	\$ -	\$ -
50. Consumable Items					
51. Materials	\$ 2,459.51	\$ -	\$ 2,450.64	\$ 2,450.64	\$ 8.87
52. Fuel and Utilities	\$ 1,072.37	\$ -	\$ 1,025.60	\$ 1,025.60	\$ 46.77
53. Office Supplies	\$ 926.40	\$ -	\$ 866.27	\$ 866.27	\$ 60.13
53. Other consumable items	\$ 322.37	\$ -	\$ 304.27	\$ 304.27	\$ 18.10
59. Component Total	\$ 4,780.65	\$ -	\$ 4,646.78	\$ 4,646.78	\$ 133.87

60. Miscellaneous					
61. Sundry	\$ 2,140.80	\$ -	\$ 2,004.18	\$ 2,004.18	\$ 136.62
62. Printing and Editing	\$ 9,060.85	\$ -	\$ 9,013.55	\$ 9,013.55	\$ 47.30
63. Workshop Package	\$ 3,752.87	\$ -	\$ 3,752.87	\$ 3,752.87	\$ -
63. Other miscellaneous	\$ 1,440.45	\$ -	\$ 1,325.05	\$ 1,325.05	\$ 115.40
69. Component Total	\$ 16,394.97	\$ -	\$ 16,095.65	\$ 16,095.65	\$ 299.32
70. Executing Agency Management Cost	\$ -	\$ -	\$ -	\$ -	\$ -
100. GRAND TOTAL:	\$ 96,170.00	\$ -	\$ 95,196.33	\$ 95,196.33	\$ 973.67

Appendix 2. Activity Cash – Flow Statement (In US Dollar) - ITTO Contribution

Programme Title ITTO CITES Program - Support to ITTO-CITES Implementation for Tree Species and Trade/Market Transparency (TMT)

Activity Title Promoting Conservation of Plant Genetic Resources of *Aquilaria* and *Gyrinops* Species in Indonesia

Period Covered (ending on): 31 December 2014

Component	Reference	Date	Amount	
			in US \$	Local Currency
A. Fund received from ITTO				
1. First installment	G0132801428901	October 7, 2013	\$ 50,000.00	Rp 570,900,000.00
2. Second installment	G0141474296401	May 28, 2014	\$ 46,170.00	Rp 531,786,060.00
3. Other revenue*)			\$ 270.80	Rp 3,101,821.00
Total Funds Received:			\$ 96,440.80	Rp 1,105,787,881.00
B. Expenditures (by Executing Agency):				
10. Personnel				
11. National Expert			\$ 17,500.00	Rp 200,115,000.00
12. Speakers			\$ 726.92	Rp 8,300,000.00
13. Other Labors			\$ 5,231.42	Rp 60,080,000.00
14. Activity Secretary			\$ 7,500.00	Rp 85,985,000.00
15. Team Leader			\$ 11,250.00	Rp 129,052,500.00
16. Assistant			\$ 1,200.00	Rp 13,701,600.00
19. Component Total			\$ 43,408.34	Rp 497,234,100.00
20. Sub-contract				
21. Sub-contract			\$ -	Rp -
29. Component Total			\$ -	Rp -
30. Duty Travel				
31. DSA			\$ 18,434.73	Rp 211,355,200.00
32. Return Ticket			\$ 7,446.79	Rp 85,431,300.00
33. Local Transport			\$ 5,164.04	Rp 59,251,760.00
39. Component Total			\$ 31,045.56	Rp 356,038,260.00
40. Capital Items				
41. Office space			\$ -	Rp -
42. Vehicles			\$ -	Rp -
49. Component Total			\$ -	Rp -

50. Consumable Items				
51. Materials			\$ 2,450.64	Rp 28,076,200.00
52. Fuel and Utilities			\$ 1,025.60	Rp 11,761,141.00
53. Office Supplies			\$ 866.27	Rp 9,916,440.00
53. Other consumable items			\$ 304.27	Rp 3,497,375.00
59. Component Total			\$ 4,646.78	Rp 53,251,156.00
60. Miscellaneous				
61. Sundry			\$ 2,004.18	Rp 23,073,825.00
62. Printing and Editing			\$ 9,013.55	Rp 103,813,000.00
63. Workshop Package			\$ 3,752.87	Rp 42,850,240.00
63. Other miscellaneous			\$ 1,325.05	Rp 15,233,010.00
69. Component Total			\$ 16,095.65	Rp 184,970,075.00
70. Executing Agency Management Cost			\$ -	Rp -
Total Expenditures To-date:			\$ 95,196.33	Rp 1,091,493,591.00
Remaining Balance of Funds (A-B) :			\$ 1,244.47	Rp 14,294,290.00

Notes :

(1). Amount in US \$ are converted using the rate exchange when funds were received by the executing agency

(2). Total expenditure to-date should be the same as amount shown in Sub Total of column (C) of the Financial Statement

(3). Remaining balance of funds:

Cash on hand as of 31 December 2014	\$	-	Rp	-
Mandiri Account	\$	1,244.47	Rp	14,294,290.00
Total Remaining balance of funds	\$	1,244.47	Rp	14,294,290.00

(4). Other revenue*

Bank Interest (Net)	\$	357.61	Rp	4,095,861.00
Bank Administration	\$	(26.19)	Rp	(300,000.00)
Stamp duty	\$	(22.31)	Rp	(255,000.00)
Statement fee	\$	(8.31)	Rp	(95,000.00)
Transfer expenses	\$	(30.00)	Rp	(344,040.00)
Total other revenue	\$	270.80	Rp	3,101,821.00

(5). Covered period for total expenditure is: October 2013 - December 2014

Appendix 3. Activity Financial Statement (In US Dollar) –Gol in-kind Contribution

Programme Title ITTO CITES Program - Support to ITTO-CITES Implementation for Tree Species and Trade/Market Transparency (TMT)

Activity Title Promoting Conservation of Plant Genetic Resources of *Aquilaria* and *Gyrinops* Species in Indonesia

Period Covered (ending on): 31 December 2014

Component	Original Amount (A)	Expenditure To-date			Available Funds (E) (A-D)
		Accrued (B)	Expended (C)	Total Expended D (B+C)	
I. Funds managed by Executing Agency					
10. Personnel					
11. National Expert	\$ -	\$ -	\$ -	\$ -	\$ -
12. Speakers	\$ -	\$ -	\$ -	\$ -	\$ -
13. Other Labors	\$ -	\$ -	\$ -	\$ -	\$ -
14. Activity Secretary	\$ -	\$ -	\$ -	\$ -	\$ -
15. Team Leader	\$ -	\$ -	\$ -	\$ -	\$ -
16. Assistant	\$ -	\$ -	\$ -	\$ -	\$ -
19. Component Total	\$ -	\$ -	\$ -	\$ -	\$ -
20. Sub-contract					
21. Sub-contract	\$ -	\$ -	\$ -	\$ -	\$ -
29. Component Total	\$ -	\$ -	\$ -	\$ -	\$ -
30. Duty Travel					
31. DSA	\$ -	\$ -	\$ -	\$ -	\$ -
32. Return Ticket	\$ -	\$ -	\$ -	\$ -	\$ -
33. Local Transport	\$ -	\$ -	\$ -	\$ -	\$ -
39. Component Total	\$ -	\$ -	\$ -	\$ -	\$ -
40. Capital Items					
41. Office space	\$10,000.00	\$ -	\$ 10,000.00	\$ 10,000.00	\$ -
42. Vehicles	\$ 2,000.00	\$ -	\$ 2,000.00	\$ 2,000.00	\$ -
49. Component Total	\$12,000.00	\$ -	\$ 12,000.00	\$ 12,000.00	\$ -
50. Consumable Items					
51. Materials	\$ -	\$ -	\$ -	\$ -	\$ -
52. Fuel and Utilities	\$ -	\$ -	\$ -	\$ -	\$ -
53. Office Supplies	\$ -	\$ -	\$ -	\$ -	\$ -
53. Other consumable items	\$ -	\$ -	\$ -	\$ -	\$ -
59. Component Total	\$ -	\$ -	\$ -	\$ -	\$ -

60. Miscellaneous					
61. Sundry	\$ -	\$ -	\$ -	\$ -	\$ -
62. Printing and Editing	\$ -	\$ -	\$ -	\$ -	\$ -
63. Workshop Package	\$ -	\$ -	\$ -	\$ -	\$ -
63. Other miscellaneous	\$ -	\$ -	\$ -	\$ -	\$ -
69. Component Total	\$ -	\$ -	\$ -	\$ -	\$ -
70. Executing Agency Management Cost	\$ 9,617.00	\$ -	\$ 9,617.00	\$ 9,617.00	\$ -
100. GRAND TOTAL:	\$21,617.00	\$ -	\$ 21,617.00	\$ 21,617.00	\$ -

Appendix 4. Activity Cash – Flow Statement (In US Dollar) – GoI in-kind Contribution

Programme Title ITTO CITES Program - Support to ITTO-CITES Implementation for Tree Species and Trade/Market Transparency (TMT)

Activity Title Promoting Conservation of Plant Genetic Resources of *Aquilaria* and *Gyrinops* Species in Indonesia

Period Covered (ending on): 31 December 2014

Component	Reference	Date	Amount	
			in US \$	Local Currency
A. Fund received from ITTO				
1. First installment		October 7, 2013	\$ 21,617.00	Rp 246,822,906.00
2. Other revenue*)			\$ -	Rp -
Total Funds Received:			\$ 21,617.00	Rp 246,822,906.00
B. Expenditures (by Executing Agency):				
10. Personnel				
11. National Expert			\$ -	Rp -
12. Speakers			\$ -	Rp -
13. Other Labors			\$ -	Rp -
14. Activity Secretary			\$ -	Rp -
15. Team Leader			\$ -	Rp -
16. Assistant			\$ -	Rp -
19. Component Total			\$ -	Rp -
20. Sub-contract				
21. Sub-contract			\$ -	Rp -
29. Component Total			\$ -	Rp -
30. Duty Travel				
31. DSA			\$ -	Rp -
32. Return Ticket			\$ -	Rp -
33. Local Transport			\$ -	Rp -
39. Component Total			\$ -	Rp -
40. Capital Items				
41. Office space			\$ 10,000.00	Rp 114,180,000.00
42. Vehicles			\$ 2,000.00	Rp 22,836,000.00
49. Component Total			\$ 12,000.00	Rp 137,016,000.00

50. Consumable Items				
51. Materials			\$ -	Rp -
52. Fuel and Utilities			\$ -	Rp -
53. Office Supplies			\$ -	Rp -
53. Other consumable items			\$ -	Rp -
59. Component Total			\$ -	Rp -
60. Miscellaneous				
61. Sundry			\$ -	Rp -
62. Printing and Editing			\$ -	Rp -
63. Workshop Package			\$ -	Rp -
63. Other miscellaneous			\$ -	Rp -
69. Component Total			\$ -	Rp -
70. Executing Agency Management Cost			\$ 9,617.00	Rp 109,806,906.00
Total Expenditures To-date:			\$ 21,617.00	Rp 246,822,906.00
Remaining Balance of Funds (A-B) :			\$ -	Rp -

Appendix 5. Documentations of Activity



Herbarium collecting to support identification of taxonomy and population status of *Aquilaria* and *Gyrinops*



Technical Workshop on Activity 1.1. "Taxonomical and Population Status of *Aquilaria* and *Gyrinops* in Indonesia"



Discussed and interviewed activities to collect data and information on Aquilaria and Gyrinops in- situ and ex-situ conservation in Indonesia



Focus Group Discussion on Technique on Development of Conservation Garden of *Aquilaria* and *Gyrinops* Species in Indonesia



Collecting seed and seedlings for the establishment of Conservation Garden



Cultivated seed and seedlings in the nursery



Establishment of Agarwood Conservation Garden



Several meetings and discussions on the implementation of the activity



Monitoring and Evaluation Visit





Center for Conservation and Rehabilitation Research and Development

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