Completion Report

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GENERATION OF SPATIAL DISTRIBUTION MAPS OF RAMIN (*GONYSTYLUS BANCANUS*) USING HYPERSPECTRAL TECHNOLOGY AND DETERMINATION OF SUSTAINABLE LEVEL OF HARVEST OF RAMIN IN PRODUCTION FORESTS OF PENINSULAR MALAYSIA

ITTO-CITES PROJECT

Malaysia's Work Programme for 2008 on Ensuring International Trade in CITES-listed Timber Species is Consistent with their Sustainable Management and Conservation

IMPLEMENTING AGENCY

Forest Research Institute Malaysia (FRIM)
Kepong 52109 Selangor

Completion Report

Generation of Spatial Distribution Maps of Ramin (*Gonystylus bancanus*) using Hyperspectral Technology and Determination of Sustainable Level of Harvest of Ramin in Production Forests of Peninsular Malaysia

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COMPLETION REPORT

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Actual Duration:	24 months (extended to 25 months)
Actual Activity Costs (US$):	**ITTO** = 131,000.00 **GOM (In kind)** = 52,050.00 **TOTAL** = **183,050.00**

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EXECUTIVE SUMMARY

1. Activity Context, Origin and Problem to be Addressed

One important timber species from Peat Swamp Forest (PSF) is *Gonystylus bancanus* or locally known as ramin melawis. With the inclusion of *Gonystylus* spp*.* or ramin in the Appendix ll of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), as well as concern on the unsustainable exploitation of the species, an assessment to identify current distribution, biological and ecological status of this threatened species is needed. This Activity is highly important as a follow-up action to the finding of previous projects, especially those related to the current status of growing stock, biological and ecological condition of *G. bancanus.* This Activity also supports the implementation of Sustainable Forest Management (SFM) in Malaysia and works towards the implementation of the Convention on Biological Diversity. The activities of the Activity were also in-line with the national policies for biological diversity and wetlands conservation in Malaysia.

2. Activity Objectives

Overall objective

The main objective of the Activity is to ensure the international trade in CITES-listed species is consistent with its sustainable management and conservation.

Specific objective

The specific objectives of the Activity are:

1) To generate spatial distribution maps of ramin in a cost-effective manner through the use of hyperspectral technology in Peninsular Malaysia.

2) To determine sustainable level of harvest of ramin (*Gonystylus* spp.) that enhances their conservation status in production forests of Peninsular Malaysia.

3. Most Critical Differences between Planned and Realized Activity Implementation

Activity personnel: There were no changes in personnel implementing this Activity.

Time schedule: There was a slight delay in acquiring hyperspectral data due to the delay in getting flight permission from the Department of Aviation and unpredictable weather condition, thus difficult to get cloud-free day for data acquisition. As such it slightly affected the overall Activity implementation and the Activity was given one month extension to execute and complete the last part of the activities which was to undertake training and transfer of technology to relevant stakeholders.

Budget amendment: The fund was adequate and has been wisely spent as scheduled. A total amount of USD2500 (planned for Auditing) unspent fund was refunded to ITTO.

4. Situation Prevailing after Activity Completion, as Compared to the Pre-Activity Situation Including the Situation of the Target Beneficiaries, and the Post-Activity Sustainability

The outputs produced from this Activity could influence sectoral policies and programmes in the Ministry of Natural Resources and Environment Malaysia, particularly with regards to the following:

a) Mapping procedure for discriminating species of interest such as *G. bancanus* in the natural forest environment;

b) Procedure in monitoring of forest tree species with special interest such as *G. bancanus* for conservation purposes;

c) Procedure in determining the population dynamics of important timber species such as *G. bancanus* by establishment of long-term monitoring and ecological plots; and

d) Procedure in determining the sustainable level of harvest of *G. bancanus*, applicable to other important timber species such as *Shorea* spp.

They are necessary to support and enhance SFM and conservation of *G. bancanus* in Malaysia.

5. Most Relevant Outcome of the Analysis of the Activity Implementation

The management of *G. bancanus* as timber species received a lot of attention from the global community who claimed that the timber species is being over-exploited and could become extinct due to trade. The two components identified by the Activity help to address this issue and develop a model that is applicable to the management of other tropical timber species as well. The population distribution of large-sized *G. bancanus* individuals and sustainable level of harvest of these individuals are the two most crucial information needed in supporting good forest management practices.

The use of airborne hyperspectral remote sensing data to map *G. bancanus* populations and their distribution in the mixed layer of tropical PSF has proven to be very successful. It has enabled accurate information on the status and tree population in the forest be determined for future harvesting planning and conservation purposes.

The outcome of this Activity also generated relevant information required for the preparation of the non-detrimental findings (NDF) reports, as required for species listing under CITES. All this findings proved to be successful in achieving specific objectives identified by the Activity and can be considered as a breakthrough in the sustainable management of *G. bancanus* population in the PSF.

6. Lessons Learnt

1) The Activity benefited tremendously from the cooperation and participation of various stakeholders, in particular the forestry department. Coordination roles played by the executing agency (NRE) were very important to ensure all agencies involved in the Activity implementation participated actively.

2) The engagement of the indigenous Asli Jakun local community residing around the project area during field data collection indirectly contributed to their additional income besides creating awareness among them on the importance of managing forest resources for future generation.

3) The monthly reporting that was practiced during the course of the Activity in one way or another helped in ensuring the planned Activity is being undertaken as scheduled.

4) Upon Activity completion, some aspects of the study under the Activity should be continued to sufficiently maintain small representative study plots as a long-term monitoring plot.

7. Recommendations

The Activity overall objective has been successfully achieved in accordance with the problems raised in the Activity document, with the full involvement of stakeholders and wise use of resources to produce the outputs. It is recommended that similar activities be replicated in different geographical zones, in Sarawak for instance.

1.0 ACTIVITY IDENTIFICATION

1.1 Context

Social, economic and environment

Tropical peat swamp forest (PSF) is a unique and diverse ecosystem with abundant highly adapted fauna and flora. The PSF is the most important of Malaysia's wetland types in terms of biodiversity and area. Biogeographically, it accounts for approximately 75% of total wetland area. The total PSF in Malaysia is about 1.54 million ha as shown in Table 1. In Peninsular Malaysia, the majority of the PSF is found in a single, nearly contiguous area in the state of Pahang. These PSF areas safeguard enormous biological diversity which is highly significant globally, both for their diverse and threatened species as well as representatives of unique ecosystems. One important timber species from the PSF is *Gonystylus bancanus* or locally known as ramin melawis. With the inclusion of ramin in the Appendix ll of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), an assessment to identify current distribution, biological and ecological status of this threatened species is needed.

Table 1 Distribution, area and types of forest in Malaysia (million ha)

Region	Land area	Natural Forest			Plantation forest	Total Forested land	Total Land Area (%)
		Dry inland	Swamp forest	Mangrove forest			
Pen. Malaysia	13.16	5.40	0.30	0.10	0.08	5.88	44.7
Sabah	7.37	3.83	0.12	0.34	0.11	4.40	59.7
Sarawak	12.30	7.92	1.12	0.14	0.06	9.24	75.1
Total (Malaysia)	32.83	17.15	1.54	0.58	0.25	19.52	59.5

Source: FAO, 2010

Activity location

The site chosen for this Activity is Pekan Forest Reserve (FR) in the state of Pahang, Peninsular Malaysia. This is the largest remaining PSF that had been gazetted as Permanent Forest Reserve (PFR) in Peninsular Malaysia. The state government with the assistance of UNDP/GEF-FRIM had recently successfully completed a project to develop and implement plans, and to encourage processes that will ensure the conservation and sustainable use of globally significant genetic, species and ecosystem diversities within the PSF in Malaysia. Therefore, it is anticipated that the lessons learnt from this Activity will be widely applicable to other PSF areas, both within Malaysia and the world.

Relevant national and regional policies and programmes

G. bancanus represents the most important peat swamp timber species in Malaysia. Most of the timber species is extracted from the permanent forest reserves (PFR) designated for sustainable timber production. In recent years, forest management practices in Malaysia have undergone considerable changes to minimize degradation of natural forest ecosystems and unsustainable logging practices.

In Malaysia, the National Forestry Policy 1978 laid a firm foundation for the development of the forestry sector. It was revised in 1993 in recognition of the role of forests in providing a multiplicity of goods and services. The revised policy has had direct impacts on the management of forests through the establishment of the PFR, large-scale forest plantations, importation of logs, greater incentives for downstream processing, promoting the utilization of lesser-known species and small-diameter logs, and manufacturing of value-added products. The National Forestry Policy 1978 and the National Forestry Act 1984 provide Malaysia with a strong policy framework and laws to support sustainable forest management. Both the national policy and act provide a sufficient basis for the protection against harmful activities, promote establishment of wildlife parks and reserves, and reduce activities that may cause detrimental impacts on the environment.

As demand to use biological resources increases, new laws and policies are urgently needed to further safeguard biological diversity and to promote beneficial relationships with commercial ventures as well as livelihood of local communities. Since more information is needed, several priority areas in the research on the conservation of forest biological diversity have been identified for the Ninth Malaysia Plan (2006-2010) with emphasis on ecology and conservation of flora and fauna of Malaysia, conservation and management of natural forest habitats, and domestication and *ex situ* conservation of forest plants. In line with this, a Plant Conservation Strategy was prepared. In addition, a threat assessment project on Malaysian plant species is also ongoing together with the development of a central network of database on biological diversity that will provide accurate and timely information for the development of the conservation policy.

The inclusion of *Gonystylus* spp. into CITES Appendix III, and then Appendix II has brought some consequences in *Gonystylus* spp. harvesting and trade regulations. According to the pre-project findings, the implementation of CITES on *Gonystylus* spp. as well as other listed species still face some barriers. Some of the barriers include lack of institutional and human resource capacity, especially in the implementation of harvesting and trade regulations which have contributed to the continuous degradation of *Gonystylus* spp. population.

This Activity supported the implementation of Sustainable Forest Management (SFM) in Malaysia and worked towards the implementation of the Convention on Biological Diversity. The activities of the Activity were also in-line with the national policies for biological diversity and wetlands conservation. This Activity also complemented the recently concluded Peat Swamp Forest Project (2008) initiated by the Government of Malaysia, funded by the United Nations Development Programme/Global Environment Facility (UNDP/GEF). The project aimed at developing and implementing plans which encourage processes to ensure the conservation and sustainable use of the PSF (UNDP-GEF 2002).

1.2 Origin and Problem to be addressed

During the ITTO Expert Meeting on the Effective Implementation of the inclusion of ramin (*Gonystylus* spp.) to Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 16 - 19 May, 2006 held in Kuala Lumpur, Malaysia recommended that biological and ecological studies of ramin (*Gonystylus* spp.) should be undertaken in order to ensure ramin conservation. The meeting suggested Forest Research Institute Malaysia (FRIM) to take the lead in preparing a proposal for consideration of funding by ITTO. Hence, this Activity which is part of the international project on "Ensuring international trade of CITES-listed timber species is consistent with their sustainable management and conservation" was undertaken by FRIM.

The genus *Gonystylus* consists of about 31 species that are distributed throughout the Malesian region with the exception of Central and East Java and the Lesser Sunda Islands. Eastward, the distribution area extends towards the Solomon Islands, Nicobar and Fiji. The vast majority of species are found on Borneo (27 species), especially in Sarawak, followed by Peninsular Malaysia and Sumatra, the Philippines and other areas with seven, two and single species, respectively.

Six species are currently known to be commercially valuable. These species include *G. affinis, G. bancanus, G. forbesii, G. macrophyllus, G. maingayi* and *G. velutinus. G. bancanus* (ramin) is the most commonly traded of the six species. Other than for timber and wood products, ramin is also used as incense but the trade however, does not appear to be significant in comparison to the timber trade.

Due to concern on the unsustainable exploitation of ramin, an assessment to identify its current distribution, biological and ecological status of this threatened genus is needed. This study however, focused only on *G. bancanus* which can be found growing in the PSF area. This Activity is highly important as a follow-up action to the findings of previous projects, especially those related to the current status of growing stock, biological and ecological condition of *G.bancanus* .

2.0 ACTIVITY OBJECTIVES AND IMPLEMENTATION STRATEGY

The main objective of the Activity is to ensure the international trade in CITES-listed species is consistent with its sustainable management and conservation.

2.1 Objectives

The specific objectives of the Activity are:

1) To generate spatial distribution maps of ramin in a cost effective manner through the use of hyperspectral technology in Peninsular Malaysia.

2) To determine sustainable level of harvest of ramin (*Gonystylus* spp.) that can enhance their conservation status in natural production forests of Peninsular Malaysia.

There were four main outputs anticipated from the Activity namely:

1) Spectral library of *G. bancanus* developed
2) Spatial distribution maps and non-spatial database of ramin established
3) Population dynamics of *G. bancanus* determined
4) Sustainable harvest levels of ramin in natural production forests determined

2.2 Implementation Strategy

During the starting period of the Activity, a project team members were identified and recruited within the scientists in FRIM based on their expertise and knowledge on the subject of interest. The team comprises two main experts from the remote sensing group (to focus on objective number 1) and the ecology group (to focus on objective number 2).

Upon formation of the team, the first task undertaken by the team was to review the Activity elements, get updates of the project site, conduct relevant literature reviews, propose Activity operational framework and detail work plan. Initial consultation with the relevant stakeholders in particular the Pahang Forestry Department was also undertaken to ensure their continuous support during implementation of the Activity.

The initial stages of the Activity implementation focused on the collection of secondary data, and the compilation and preparation of base map of the project area. Subsequently, a collection of new field data including those from forest survey and mapping activities was gathered. Field surveys were done by using manpower from FRIM and occasionally with support from the Pahang Forestry Department staff. At this stage various on-site trainings were organised to ensure the Forestry Department staff is familiar with the survey activities including tree mapping technique, in particular. This is considered as part of the transfer of knowledge components of the Activity.

Acquisition of airborne hyperspectral remote sensing data which is the core activities in this study was done by a team of expert. Data analysis was then carried out by the scientists in FRIM.

Dissemination of Activity outputs was done at various levels including by presenting the results and finding at seminar and workshop, publishing articles related to the study in various publications including journals and books. The Activity also organised workshop as a mean to discuss and disseminate the findings.

Throughout the implementation of the Activity, a series of technology transfer was undertaken through training on various aspects related to the Activity including tree mapping using GPS and forest species mapping using hyperspectral data.

In term of management structure, the Activity was implemented by FRIM. A Project Steering Committee (PSC) at the Ministry of Natural Resources and Environment (NRE) was established to govern the implementation of the project. The PSC provided guidance on matters pertaining to the implementation of the Activity and ensure that the Activity is directed towards achieving its intended goals. At the same time, a Technical Working Committee was also established to give advice on technical matters and facilitate the data collection and analysis.

The progress of the Activity was monitored through the PSC. Annual progress reports were submitted to the PSC for consideration. A Senior Officer of the Forestry and Environment Division in FRIM who acted as the Project Coordinator was responsible for the preparation of the reports. Short monthly progress reports were prepared and submitted to the PSC and a final report was prepared by FRIM within two months of Activity completion for submission to ITTO.

At the same time, the progress of the Activity was also monitored through Project Evaluation Meeting (PEM) conducted internally in FRIM on half yearly basis. Monitoring and evaluation of the Activity was also done by the Management & Evaluation team led by NRE, with the latest visit conducted in November 2010.

2.3 Assumptions and risks

Various studies in temperate conifer and mixed deciduous forests have demonstrated accurate empirical estimates of canopy chemistry from airborne hyperspectral. However, its application is relatively new in tropical forests, thus may introduce new challenges, i.e. weather conditions and varying forest composition. Consequently, additional work needs to be carried out in order to develop spectral libraries for the selected tree species, *G. bancanus*.

3.0 ACTIVITY PERFORMANCE (Activity elements planned and implemented)

3.1 Performance of each Activity

The performance of each activity is presented in Table 2.

Table 2 Performance of each activity

Outputs and Operational Activities		
Output 1.1 Development of spectral library for *G. bancanus*.		
	Schedule (Duration)	**Remarks**
Activity 1.1.1 Acquire high resolution airborne hyperspectral data.	January 2009 - January 2010	Slight delay due to: a) the delay in getting flight permission from the Department of Aviation b) Unpredictable weather condition – difficult to get cloud-free day for data acquisition
Activity 1.1.2 Study of spectral signature and ground truthing.	April 2009 – April 2010	Slight delay due to the delay in data acquisition

Activity 1.1.3 Data processing and analysis.	December 2009 – August 2010	As above
Activity 1.1.4 Hands-on training for project counterparts and targeted stakeholders.	October 2009 – October 2010	Conducted three trainings as scheduled
Output 1.2 Spatial distribution maps and non-spatial data for *G. bancanus*.		
	Schedule (Duration)	**Remarks**
Activity 1.2.1 Production of *G. bancanus* spatial distribution maps.	Jun 2010 – October 2010	Completed on scheduled
Activity 1.2.2 Developing stocking density classification maps from spatial and non-spatial information.	July 2010 – October 2010	Completed on scheduled
Output 2.1 To determine population dynamics of *G. bancanus*.		
	Schedule (Duration)	**Remarks**
Activity 2.1.1 Assessing stocking and population dynamics of *G. bancanus.*	December 2009 – August 2010	Completed as scheduled
Output 2.2 To project the sustainable harvest levels of *G. bancanus* in natural forest stands in Peninsular Malaysia.		
	Schedule (Duration)	**Remarks**
Activity 2.2.1 Assessment of growth projection model and existing growing stock to determine the sustainable level of harvest in Peninsular Malaysia.	April 2009 – August 2010	Completed as scheduled
Activity 2.2.2 Dissemination of the project materials and outputs that can be accessed by interested stakeholders.	August 2010 – December 2010	Outputs including books and technical reports disseminated as planned

3.2 Outputs Achievement

Output 1.1 Development of spectral library for *G. bancanus*

The airborne hyperspectral data over the study area was acquired in February 2010. The data was analyzed and a spectral signature of *G.bancanus* was studied involving both digital computer analysis and field measurement. Comparison was also made with data captured using spectroradiometer. A spectral library of *G. bancanus* was developed and used in mapping of the species distribution in the study area. A standard operating procedure (SOP) in developing the *G. bancanus* spectral library using the hypersepctral data is currently being prepared for final documentation.

One regional workshop and three series of hands-on training for Activity counterparts and targeted stakeholders on various aspects related to tree mapping using GPS and also hyperspectral data processing were undertaken as presented in Table 3 below:-

Table 3 List of training conducted during the Activity implementation period

No.	Training/workshop	Date	Participants
1.	**Title:** Training on the use of GPS for tree mapping in the forest Objective: To train participants on the technique of using GPS and GIS for mapping of tree location such as *G. bancanus* in the forest.	27-30 October 2009	A total of 45 participants from State Forestry Departments of Pahang and Kelantan, Terengganu Timber Industry (KPKKT), and FRIM attended the training
2.	**Title:** Training on GER 1500 Spectroradiometer and Demonstration of High Precision GPS Objectives: a. To expose participants on the use of handheld spectroradiometer for collecting spectral signature information of various object in particular the different species of trees in the forest. b. To teach the use of high precision Global Positioning System (GPS) for tree mapping purposes.	19-20 January 2010	A total of 17 participants from FRIM, institutions of higher learning and industry attended the training

3.	**Title:** Training on the processing of hyperspectral and Lidar data for mapping of forest tree in particular the *G. bancanus* Objectives: a. To teach the use of hand-held spectroradiometer and processing technique of its data. b. To teach the basic processing technique of hyperspectral data for forestry application. c. To improve knowledge on the use of spectroradiometer, Lidar and hyperspectral data for forest mapping purposes.	26 – 27 October 2010	A total of 19 participants from State Forestry Departments of Kelantan, Kedah, Perak, Pahang, Terengganu, Johor, Selangor, Sarawak, Forestry Department Peninsular Malaysia,; Terengganu timber industry (KPKKT), and institutions of higher learning participated in the training
4.	**Title:** ITTO-CITES-FRIM Regional Workshop 2010. Sharing of findings from the Activities implemented in Indonesia and Malaysia under the ITTO-CITES Project on ensuring international trade in CITES-listed timber species is consistent with their sustainable management and conservation. Objectives: a. To share, learn and discuss the findings of each Activity implemented in Indonesia and Malaysia under the ITTO-CITES Project. b. To identify and adapt relevant findings from the Indonesia activities, vice versa. c. To identify potential projects and activities to further ensure that the international trade of Gonystylus spp. is consistent with their sustainable management and conservation practices.	1 – 4 December 2010	A total of 61 participants attended a four-day workshop including ten invited guests during the opening ceremony. Participants were from all states forestry departments in Malaysia, institutions of higher learning, forest related industries and ten representative from Indonesia

Output 1.2 Spatial distribution maps and non-spatial data for *G. bancanus.*

Two types of spatial distribution maps for *G. bancanus* were produced. The first map was developed based on field survey covering a total of 100 ha of virgin and logged-over peat swamp forest in Compartment 77 of Pekan FR. A total of about 670 *G. bancanus* trees were surveyed, mapped and their non-spatial information kept in a GIS database. The second map was developed based on hyperspectral data captured in the study area. This map was prepared based on spectral signature analysis and spectral library information generated for *G. bancanus* as described earlier. The map accuracy is about 86% with a standard errors of ± 4 trees per ha. This is an acceptable map accuracy taking into consideration the complexity of the peat swamp forest ecosystem. The study was also able to develop reliable correlation between crown size of *G. bancanus* and its DBH with more than 95% accuracy. This information can be used to produce *G. bancanus* stocking density map.

Output 2.1 To determine population dynamics of *G. bancanus.*

Assessment of the stocking and population dynamic of *G. bancanus* was made in the study site at Pekan FR. The assessment was done based on available secondary data as well as some additional primary data from three ecological plots and twelve seedling dynamics plots. The secondary data were sourced from the UNDP/GEF PSF, Danida and FRIM's projects that had been conducted in Pekan FR since 2004. Generally, the forest in Pekan FR can be classified into rich, medium and poor stocking of *G. bancanus*. The main factors are due to the different site characteristics including the peat depth, organic matter content, and water table in the respective forest areas.

Output 2.2 To project the sustainable harvest levels of *G. bancanus* in natural forest stands in Peninsular Malaysia.

Growth projection model for several important PSF species including the *G. bancanus* was developed from this Activity. The model can be used to forecast the growth and yield of the species for future utilisation. In general, the growth rate of trees in the PSF is slower than trees in the inland forest with an average diameter increment of between 0.2 to 0.6 cm yr^{-1}. In this study, a simple yet accurate and user-friendly projection model, namely Growth and Yield Model for Tropical Peat Swamp Forest (GYMTPSF) was successfully developed. The study also indicated that the volume mean annual increment (MAI) for the whole stand in PSF is about 1.8 m^3 ha^{-1} yr^{-1} for all trees greater than 15 cm diameter. It can also be concluded that the medium and high cutting limits produced a better future growth response. For management purpose, it is also suggested that the optimum initial growing stock after felling should be at least 100 m^3 ha^{-1} (15 cm+). The optimum cutting cycle is projected at 40 years with a gross harvestable volume at 72 m^3 ha^{-1} for all species and 8.9 m^3 ha^{-1} for *G. bancanus.*

Output 2.3 Outputs produced and disseminated

The Activity outputs and findings have been disseminated to the various interested stakeholders. Among others, the Activity materials and outputs were published in the form of a technical book, scientific papers and proceedings as listed below. Regular monthly reports were also prepared and submitted to the NRE and ITTO-CITES which can be accessed by interested stakeholders. In addition, training manuals (tree mapping & GIS, and mapping using hyperspectral data) were also prepared and disseminated to various stakeholders during training and transfer of technology programme.

List of publications

1. KHALI AZIZ, H., MOHD AZAHARI, F., TAN, S.A., & HAMDAN, O., 2010. Generation of spatial distribution maps of *Gonystylus bancanus* (ramin) using hyperspectral technology. Paper presented at the ITTO-CITES Regional Workshop. 1-4 December 2010. Kuantan, Pahang, 26 -32.

2. ISMAIL, H., ABD RAHMAN, K., ISMAIL, P. & HARFENDY, O. 2010. Population dynamics and optimum harvest of *Gonystylus bancanus* in production forests of Peninsular Malaysia. Paper presented at the ITTO-CITES Regional Workshop. 1-4 December 2010. Kuantan, Pahang, 44- 51.

3. KHALI AZIZ, H. ISMAIL, P., ABD RAHMAN, K., CHE HASHIM, H., GRIPPIN, A. & NIZAM, M.S. 2009. Ecological characteristics of a *Gonystylus bancanus*-rich area in Pekan Forest Reserve, Pahang, Malaysia. *Journal of Tropical Life Sciences Research* 20(2):15 - 27.

4. ISMAIL, P., KHALI AZIZ, H., AHMAD ALSRAF, A.M., KOH, H.L., NIK MOHD SHAH, N.M., NORCHAHAYA, H., AIMI LEE, A. & NGUI, S.K. 2009. Ecological and management status of ramin (*Gonystylus* spp.) in Malaysia. Paper presented at Asian Workshop of the ITTO-CITES Project, Bogor, Indonesia, 1-2 July 2009. 14 pp.

5. SHAMSUDIN, I., ISMAIL, H., KHALI AZIZ, H., ISMAIL, P., ABD RAHMAN, K., TAN, S.K., ABD RAZAK, O. MUHAMMAD FARID, A.R. & MOHD AZAHARI, F. 2009. Generation of spatial distribution maps of *Gonystylus bancanus* (ramin) using hyperspectral technology and determination of sustainable level of harvest of ramin in production forests. Paper presented at PEM, FRIM. Awana Genting, Genting Highlands. Sept. 9, 2009. 4 pp.

6. ISMAIL, P., ABD RAHMAN, K., WAN MOHD SHUKRI, W.A., SAMSUDIN, M. & HARFENDY, O. 2010. Development of local volume table (LVT) for peat swamp in Pekan Forest Reserve, Pahang with special reference to *Gonystylus bancanus* (ramin melawis). Paper presented at MAJURUS, 21/9/10. 14pp.

7. ISMAIL, P., NIZAM, M.S., LATIFF, A., FARIDAH HANUM, I. & SHAMSUDIN, I. 2011. Phenology of *Gonystylus bancanus* in Pahang, Peninsular Malaysia. Journal of Tropical Forest Sciences 23 (2): 143-151.

8. KHALI AZIZ, H., ISMAIL, P., ANI SULAIMAN, MOHD AZAHARI, F., HARRY, Y., AND IHSAN SABRI, K. 2010. *Gonystylus bancanus* – Jewel of the Peat Swamp Forest. FRIM Publication. 89 pp.

9. ISMAIL, P., & ISMAIL, H. 2011. Technical Handbook - Optimum harvesting regime of peat swamp forest in Peninsular Malaysia. 79 PP.

10. MOHD AZAHARI, F., KHALI AZIZ, H., & HAMDAN O. 2011. High resolution airborne hyperspectral data for mapping of ramin (*Gonystylus bancanus)* distribution in peat swamp forest.

11. MOHD AZAHARI, F., KHALI AZIZ, H., & AZHAN SHAH I. 2010. Discriminating of endangered peat swamp forest species using hyperspectral image analysis at canopy scale (Poster presented at the International Symposium of Forestry and Forest Product 2010 (ISFFP). 5-7 October 2010. The Legend Hotel, Kuala Lumpur.

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3.3 Total Amount of Expenditures and Analysis

The detail of budget amount spent for the ITTO and GOM in kind budgets are reflected in Annex 1A-1B and Annex 2A-2B respectively. From the ITTO contribution of USD 131,000.00, a total of USD 125,724.29 was spent with a balance of USD 5,275.71 as reflected in the Activity cash flow statement – ITTO Contribution' and the 'Activity Financial Statement – ITTO Contribution' in Annex 1A-1B. The contribution from the Government of Malaysia was USD 52,050.00, of which a total of US 54,268.29 spent (additional USD 2,218.29 covered by GOM) as shown in the Annex 2A-2B - 'Activity cash flow statement – Government of Malaysia Contribution' and the 'Activity Financial Statement – Government of Malaysia Contribution'.

4.0 ACTIVITY OUTCOME, TARGET BENEFICIARIES INVOLVEMENT

4.1 Achievement of specific objectives

The outcomes from the Activity have definitely contributed towards better improvement of managing *G. bancanus* in the natural environment for both conservation and sustainable use. The improvement is based on the Activity findings on (i) generation of spatial distribution maps of *G. bancanus* in a cost-effective manner through the use of hyperspectral technology in Peninsular Malaysia, and (ii) determination of sustainable level of harvest of ramin (*G. bancanus*) that enhances their conservation status in production forests of Peninsular Malaysia.

4.2 Outputs

The following four outputs were produced indicating the achievement of the two objectives mentioned above:

a) Spectral signature library of ramin developed. The information is useful in discriminating *G. bancanus* from other tree species in the mixed peat swamp forest environment.

b) Spatial distribution maps and non-spatial database of *G. bancanus* established. The map produced has 86% accuracy and can be used for resource planning in the forest area. The procedure can be extended to the entire peat swamp forest for mapping of *G. bancanus* population in the natural environment.

c) Population dynamics of *G. bancanus* in Pekan FR determined. It also includes impacts of harvesting to the residual stands. The information is useful to predict growth and increment of *G. bancanus* natural stands in virgin and logged-over forests.

d) Sustainable harvest levels of *G. bancanus* in natural production forests in Pekan FR determined. Based on the population dynamics and sustainable harvest information, utilization of *G. bancanus* can be done sustainably.

4.3 Impact/outcome

The four outputs indicated above could influence sectoral policies and programs in the Ministry of Natural Resources and Environment Malaysia, particularly with regards to the following:

a) Mapping procedure for discriminating species of interest such as *G. bancanus* in the natural forest environment,

b) Procedure in monitoring of forest tree species with special interest such as *G. bancanus* for conservation purposes,

c) Procedure in determining the population dynamics of important timber species such as the *G. bancanus* by establishment of long-term monitoring and ecological plots, and

d) Procedure in determining the sustainable level of harvest of the *G. bancanus*. This procedure might be applicable to other important timber species such as *Shorea* spp.

4.4 Situation at Activity completion

The management of *G. bancanus* as timber species received a lot of attention from the global community who claimed that the timber species is being over-exploited and could become extinct due to trade. The two components identified by the Activity help to address this issue and develop a model that is applicable to the management of other tropical timber species.

The population distribution of large-sized *G. bancanus* individuals and sustainable level of harvest of these individuals are the two most crucial information needed in supporting good forest management practices.

The use of airborne hyperspectral remote sensing data to map *G. bancanus* population and its distribution in the mixed layer of tropical PSF has proven very successful. This has enabled accurate information on the status and tree population in the forest be determined for future harvesting planning and conservation purposes.

At the end of the Activity, relevant government agencies in Malaysia, particularly the forestry departments have better understanding on the population structure of *G. bancanus* in the natural forest and can contribute to better management of this species in the future.

The outcome of this Activity has also generated relevant information required for the preparation of the non-detrimental findings (NDF) reports, as required for species listing under CITES.

All this findings proved to be successful in achieving specific objectives identified by the Activity and can be considered as a breakthrough in the sustainable management of *G. bancanus* population in the PSF. The findings form a new paradigm in managing *G. bancanus* in tropical peat swamp forest that allow forest managers to engage in a better decision making process in selecting individual trees within the population to be harvested on an optimal basis.

4.5 Participation of targeted beneficiaries

The Activity complements the sustainable management and utilization of the PSF in Malaysia. It ensures continuous supply of *G. bancanus* for the industry thus protecting the industry in the long run. This would provide direct benefits for the industry. The sustainable harvest of this species and its contribution towards overall sustainability of the forest will also protect the forest ecosystem and contributes towards the conservation of biological diversity. This will provide benefits not only to Malaysia but also to the global community.

The forestry departments will also be direct beneficiaries as they are committed to ensuring management and utilisation of the resources on a sustainable basis. The methods developed for mapping *G. bancanus* and its management can also be applied to the management of other major species and species groups.

FRIM as the implementing agency in Malaysia benefited in terms of enhancement of its knowledge and capacity in carrying out the mapping and assessment of the species using hyperspectral data and the development of growth and yield model for sustainable harvest of the *G. bancanus*.

Indirect beneficiaries include research institutions, academicians, conservationists, forest communities, environmental NGO's and the public at large. Although the Activity focuses on *G. bancanus,* the methods and outputs developed could also be applied to other species and/or species groups. The results and outputs could also be easily adapted and applied to other tropical countries as well.

4.6 Expectations of Activity sustainability

The mapping technique using hyperspectral technology will be documented in the form of Standard Opening Procedure so that it can be used by relevant agencies to manage *G. bancanus* for both conservation and sustainable use. The procedure in determining the sustainable level of harvest of the *G. bancanus* developed in this study can also be replicated in other similar PSF environment as well as to other important PSF timber species such as *Shorea* spp. As such, the sustainability of this Activity is very promising

in-line with the Malaysian Government commitment in managing the forest resource on a sustainable basis.

5.0 ASSESSMENT AND ANALYSIS

a. The Activity was designed efficiently such that all the objectives were achieved according to the plan.
b. The execution of the Activity was in accordance with the milestones and expectation outlined during preparation of the proposal.
c. The participation and support given by the targeted stakeholders which are the forestry departments were very encouraging throughout the Activity. Their active participation among others, was reflected during the field data collection that had enabled indirect transfer of technology to their staff.
d. In addition as a stakeholder, the forestry department also participated in various discussion, meeting and workshop with the Activity team members for exchange of views related to the Activity implementation.
e. In general, it can be said that the Activity was implemented on schedule except a short extension of one month given to carry out training for the stakeholders on the Activity findings.

6.0 LESSON LEARNT

Activity identification and development, including problem analysis and stakeholder identification and participation

The Activity benefited tremendously from the cooperation and participation of various stakeholders in particular forestry departments. Coordination roles played by the NRE were very important to ensure all agencies involved in the Activity implementation participated actively.

Additional arrangements that could improve cooperation between the relevant parties interested in the Activity

The implementation of the Activity was coordinated by NRE. It is important that the coordination be made systematically in order to make the Activity runs smoothly. This could be done if a full time desk officer is employed under this Activity. The full time desk officer should be responsible to monitor and oversee the smooth implementation and coordination of the Activity. This element was lacking in the current project set-up and as a consequence, problem such as delay in the process of submitting reports for fund disbursement, arose. The delay has a domino effect on getting the allocation to mobilize the activities of the Activity.

Activity design, including implementation strategy, which most contributed to success or failure in achieving the Specific Objective

The design of the Activity was sufficient to enable an effective implementation of the Activity. Early consultation with the state authority helped in getting support and

approval from them to undertake the Activity in the proposed study area. The Activity implementation also took into consideration the active involvement of the state forestry department staff, in particular during the field survey. This indirectly led to an interest by the staff to learn and gain more knowledge related to the work. In addition, the indigenous Asli Jakun local community residing in the vicinity of the project area had also been engaged in the field survey work. This indirectly contributed to their additional income as well as creating awareness on the importance of managing forest resources for future generation.

Actions to be taken to avoid variations between planned and actual implementation (schedule, costs, etc); quality of Activity planning

What needed to avoid the variations between planned and actual implementation of the Activity is a good coordination by the team members. The monthly reporting that was practised had helped in ensuring the planned Activity is on scheduled. In addition, internally, FRIM monitors all research activities including the ITTO-CITES Activity during its biannual Project Evaluation Meeting (PEM) to ensure the smooth implementation of all research undertaken by the institute.

Activity sustainability after completion including dissemination strategy, post Activity strategy, and involvement stakeholders

Upon Activity completion, some aspect of the study should be continued at a scale that sufficiently represents the study plot as a long-term monitoring plot. For that matter, the local institution needs to secure fund from either the state or the federal authorities. With the success of the implemented Activity, it is hoped that it will path the way for the authority to secure the fund.

Activity organization and management

The organization and the management of this Activity have been successful in implementing the planned operational activities.

Flow of funds

In general, the flow and the use of the Activity fund have been appropriate to enable the implementation of the planned activities. However, the mechanism to disburse the fund by one agency where multi-agencies were involved in the Activity implementation needs to be revised. Since the budget disbursement rely on the percentage of progress implemented, a delay in the implementation of one Activity will result in the delay of the entire fund disbursement. Slight delay in fund disbursement did happen leading to the need of the implementing agency to use its own fund prior to the fund disbursement. To some extent, efficient coordination among agencies involved in the Activity implementation will minimise delay in the fund disbursement.

Definition of the roles and responsibilities of the institutions involved in the Activity implementation

The role and responsibility of each organization involved was clearly understood.

Activity documentation

All documents of the Activity are kept at the Activity secretariat and FRIM for records.

Monitoring and evaluation

During the implementation of the Activity, there were three monitoring and evaluations of the Activity by ITTO, four monitoring meetings by NRE and three internal monitoring and evaluations by FRIM.

- ITTO: on the 18/8/2009 by the Regional Project Coordinator (Asia) - Mr. Thang Hooi Chiew
- ITTO: on 17/11/2009 during the Mid-term review evaluation by the Regional Project Coordinator (Asia) - Mr. Thang Hooi Chiew and independent member Mr. Jorge Mallueux
- ITTO: on the 21/9/2010 by the Regional Project Coordinator (Asia) - Mr. Thang Hooi Chiew
- NRE : on the 17/8/2009, 5/6/2010, 3/9/2010 and 15/11/2010
- FRIM: on 6/2/2009, 9/9/2009 and 3/5/2010.

External factors that influenced the Activity implementation and that could have been foreseen and that could have not been foreseen

External factors that influenced the Activity implementation were the involvement of relevant stakeholders and physical condition on-site during field activity. The stakeholders are state forestry departments and other key stakeholders.

7.0 CONCLUSIONS AND RECOMMENDATIONS

The Activity objective has been successfully achieved in accordance with the problems raised in the Activity document, with the full involvement of stakeholders and wise use of resources to produce the outputs. It is recommended that similar activities be replicated in different geographical zones for instance, in Sarawak. Nonetheless, the duration was found inadequate to fulfill all objectives including the report writing. Extension should be given whenever necessary.

8.0 REFERENCES

FAO 2010. Global Forest Resource Assessment 2010. Main Report. Fao Forestry Paper 163. 343 pp.

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ANNEX 1 A Activity financial statement (ITTO)

ACTIVITY FINANCIAL STATEMENT (in US Dollar)							
ITTO CONTRIBUTION FUNDING							
		Component	**Original**	**Expenditures To-date**			**Available**
			Amount	**Accrued**	**Expended**	**Total**	**Funds**
			(A)	**(B)**	**(C)**	**(D)**	**(E)**
				b/		**{ B + C }**	**{ A - D }**
I.	**Funds managed by Executing Agency**						
10.	Personnel						
	11.	Coordinator					
	12.	Other Personnel					
		12.1 Assistant 1					
		12.2 Assistant 2					
		12.3 Other labour					
	13.	National Experts					
		13.1 Expert 1	50,000.00	0.00	48,838.32	48,838.32	1,161.68
		13.2 Expert 2					
		13.3 Expert 3					
	14.	International Consultant(s)					
		14.1 Consultant 1					
		14.2 Consultant 2					
	15.	**Personnel Total:**	**50,000.00**	**0.00**	**48,838.32**	**48,838.32**	**1,161.68**
	16.	Workshop/Seminar and Training					
		(specify beneficiaries)					
		16.1 Travel/Transportation (participants)					
		16.2 Daily Subsistence Allowances (participants)					
		16.3 Venue and Logistics					
		16.4 Workshop Materials					
		16.5 Others	0.00	0.00	3,052.19	3,052.19	-3,052.19
	17.	**Workshop/Seminar and Training Total:**	**0.00**	**0.00**	**3,052.19**	**3,052.19**	**-3,052.19**
20.	Sub-contracts						
	21.	Sub-contract (Tree Mapping)	5,000.00	0.00	5,906.55	5,906.55	-906.55
	22.	Sub-contract (Training)	2,500.00	0.00	2,991.40	2,991.40	-491.40
	29.	**Component Total:**	**7,500.00**	**0.00**	**8,897.95**	**8,897.95**	**-1,397.95**
30.	Travel						

	31.	Daily Subsistence Allowance					
		31.1 National Expert(s)	14,000.00	0.00	8,240.70	8,240.70	5,759.30
		31.2 International Consultant(s)					
		31.3 Others					
	32.	International Travel					
		32.1 National Expert(s)	0.00	0.00	544.32	544.32	-544.32
		32.2 International Consultant(s)					
		32.3 Others					
	33.	Local Transport Costs					
		33.1 National Expert(s)					
		33.2 International Consultant(s)					
		33.3 Others	8,000.00	0.00	8,704.00	8,704.00	-704.00
	39.	**Travel Total:**	**22,000.00**	**0.00**	**17,489.02**	**17,489.02**	**4,510.98**
40.	Capital Items						
	41.	Premises					
	42..	Vehicle(s)					
	43.	Capital Equipment					
		43.1 Computer Equipment (specify)					
		43.2 Others					
	49.	**Capital Items Total:**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
50.	Consumable Items						
	51.	Raw Materials	35,000.00	0.00	31,482.40	31,482.40	3,517.60
	52.	Spares					0.00
	53.	Utilities	2,000.00	0.00	3,398.66	3,398.66	-1,398.66
	54.	Office Supplies	3,000.00	0.00	3,326.09	3,326.09	-326.09
	59.	**Consumable Items Total:**	**40,000.00**	**0.00**	**38,207.16**	**38,207.16**	**1,792.84**
60.	Miscellaneous						
	61.	Sundry	2,500.00	0.00	0.00	0.00	2,500.00
	62.	Contingencies	9,000.00	0.00	9,239.65	9,239.65	-239.65
	69.	**Miscellaneous Total:**	**11,500.00**	**0.00**	**9,239.65**	**9,239.65**	**2,260.35**
70.	Others (specify)						
	71.	Others (Management cost)					
	79.	Others Total					
100.		**GRAND TOTAL:**	**131,000.00**	**0.00**	**125,724.29**	**125,724.29**	**5,275.71**
Note: -Mean Exchange rate USD to MYR ~ 3.29							

ANNEX 1 B Activity cash flow statement (ITTO)

ACTIVITY CASHFLOW STATEMENT (in US Dollar)						
ITTO CONTRIBUTION FUNDING						
		Component			**Amount**	
			Reference	**Date**	**in US$**	**Local Currency**
A.	**Funds received from ITTO:**					
	1.	First instalment		Nov.08	35,200.00	125,458.05
	2.	Second Instalment		Feb.10	34,030.00	114,871.41
	3.	Third instalment		Jul.10	18,200.00	55,867.57
	4.	Fourth instalment		Dec.10	43,570.00	134,762.01
	7.	Interest on bank deposits				
		Total Funds Received:			**131,000.00**	**430,959.04**
B.	**Expenditures (by Executing Agency):**					
10.	Personnel					
	11.	Coordinator				
	12.	Other Personnel				
		12.1 Assistant 1				
		12.2 Assistant 2				
		12.3 Other labour				
	13.	National Experts				
		13.1 Expert 1			48,838.32	160,666.53
		13.2 Expert 2				
		13.3 Expert 3				
	14.	International Consultant(s)				
		14.1 Consultant 1				
		14.2 Consultant 2				
	15	**Personnel Total:**			**48,838.32**	**160,666.53**
	16.	Workshop/Seminar and Training				
		(specify beneficiaries)				
		16.1 Travel/Transportation Costs (participants)				
		16.2 Daily Subsistence Allowances (participants)				
		16.3 Venue and Logistics				
		16.4 Workshop Materials				
		16.5 Others			3,052.19	10,041.00
	17.	**Workshop/Seminar and Training Total:**			**3,052.19**	**10,041.00**
20.	Sub-contracts					

	21.	Sub-contract (Tree Mapping)			5,906.55	19,431.14
	22.	Sub-contract (Training)			2,991.40	9,841.00
	29.	**Sub-contracts Total:**			**8,897.95**	**29,272.14**
30.	Travel					
	31.	Daily Subsistence Allowance				
		31.1 National Expert(s)			8,240.70	27,109.95
		31.2 International Consultant(s)				
		31.3 Others				
	32.	International Travel				
		32.1 National Expert(s)			544.32	1,790.70
		32.2 International Consultant(s)				
		32.3 Others				
	33.	Local Transport Costs				
		33.1 National Expert(s)				
		33.2 International Consultant(s)				
		33.3 Others			8,704.00	28,634.10
	39.	**Travel Total:**			**17,489.02**	**57,534.75**
40.	Capital Items					
	41.	Premises				
	42	Vehicle(s)				
	43	Capital Equipment				
		43.1 Computer Equipment (specify)				
		43.2 Others (specify)				
	49.	**Capital Items Total:**			**0.00**	**0.00**
50.	Consumable Items					
	51.	Raw materials			31,482.40	103,569.66
	52.	Spares				
	53.	Utilities			3,398.66	11,180.80
	54.	Office Supplies			3,326.09	10,943.07
	59.	**Consumable Items Total:**			**38,207.16**	**125,693.53**
60.	Miscellaneous					
	61.	Sundry				
	62.	Contingencies			9,239.65	30,396.26
	69.	**Miscellaneous Total:**			**9,239.65**	**30,396.26**
70.	Others (specify)					
	71.	Others (specify)				
	79.	**Others Total:**			**0.00**	**0.00**
		Total Expenditures To-date:			125,724.29	413,604.21
		Remaining Balance of Funds (A-B):			**5,275.71**	**17,354.83**
Note: -Mean Exchange rate USD to MYR ~ 3.29						

ANNEX 2A Activity financial statement (GOM)

ACTIVITY FINANCIAL STATEMENT (in US Dollar)							
GOVERNMENT OF MALAYSIA FUNDING							
		Component	**Original**	**Expenditures To-date**			**Available**
			Amount	**Accrued**	**Expended**	**Total**	**Funds**
			(A)	**(B)**	**(C)**	**(D)**	**(E)**
				b/		**{ B + C }**	**{ A - D }**
I.	**<u>Funds managed by Executing Agency</u>**						
10.	Personnel						
	11.	Coordinator	11,000.00		11,000.00	11,000.00	0.00
	12.	Other Personnel					
		12.1 Assistant 1	8,000.00		8,000.00	8,000.00	0.00
		12.2 Assistant 2	6,000.00		6,000.00	6,000.00	0.00
		12.3 Other labour					
	13.	National Experts					
		13.1 Expert 1					
		13.2 Expert 2					
		13.3 Expert 3					
	14.	International Consultant(s)					
		14.1 Consultant 1					
		14.2 Consultant 2					
	15.	**Personnel Total:**	**25,000.00**	**0.00**	**25,000.00**	**25,000.00**	**0.00**
	16.	Workshop/Seminar and Training					
		(specify beneficiaries)					
		16.1 Travel/Transportation (participants)					
		16.2 Daily Subsistence Allowances (participants)					
		16.3 Venue and Logistics					
		16.4 Workshop Materials					
		16.5 Others					
	17.	**Workshop/Seminar and Training Total:**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
20.	Sub-contracts						
	21.	Sub-contract (Tree Mapping)					
	22.	Sub-contract (Topic 2)					
	29.	**Component Total:**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
30.	Travel						

	31.	Daily Subsistence Allowance					
		31.1 National Expert(s)					
		31.2 International Consultant(s)					
		31.3 Others					
	32.	International Travel					
		32.1 National Expert(s)					
		32.2 International Consultant(s)					
		32.3 Others					
	33.	Local Transport Costs					
		33.1 National Expert(s)					
		33.2 International Consultant(s)					
		33.3 Others					
	39.	**Travel Total:**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
40.	Capital Items						
	41.	Premises					
	42..	Vehicle(s)					
	43.	Capital Equipment					
		43.1 Computer Equipment (specify)					
		43.2 Others					
	49.	**Capital Items Total:**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
50.	Consumable Items						
	51.	Raw Materials					
	52.	Spares					
	53.	Utilities	0.00	0.00	29,268.29	29,268.29	-29,268.29
	54.	Office Supplies					
	59.	**Consumable Items Total:**	**0.00**	**0.00**	**29,268.29**	**29,268.29**	**-29,268.29**
60.	Miscellaneous						
	61.	Sundry	3,000.00	0.00	0.00	0.00	3,000.00
	62.	Contingencies	2,000.00	0.00	0.00	0.00	2,000.00
	69.	**Miscellaneous Total:**	**5,000.00**	**0.00**	**0.00**	**0.00**	**5,000.00**
70.	Others (specify)						
	71.	Others (Management cost)	22,050.00	0.00	0.00	0.00	22,050.00
	79.	**Others Total**	**22,050.00**	**0.00**	**0.00**	**0.00**	**22,050.00**
100.		**GRAND TOTAL:**	**52,050.00**	**0.00**	**54,268.29**	**54,268.29**	**-2,218.29**

ANNEX 2B Activity cash flow statement (GOM)

ACTIVITY CASHFLOW STATEMENT (in US Dollar)						
GOVERNMENT OF MALAYSIA FUNDING						
		Component			**Amount**	
			Reference	**Date**	**in US$**	**Local Currency**
A.	**Funds received from ITTO:**					
	1.	First instalment		Nov. 2008	52,050.00	170,724.00
	2.	Second instalment				
	3.	Third instalment				
	4.	Fourth instalment				
	5.	Interest on bank deposits				
		Total Funds Received:			**52,050.00**	**170,724.00**
B.	**Expenditures (by Executing Agency):**					
10.	Personnel					
	11.	Coordinator			11,000.00	36,080.00
	12.	Other Personnel				
		12.1 Assistant 1			8,000.00	26,240.00
		12.2 Assistant 2				
		12.3 Other labour			6,000.00	19,680.00
	13.	National Experts				
		13.1 Expert 1				
		13.2 Expert 2				
		13.3 Expert 3				
	14.	International Consultant(s)				
		14.1 Consultant 1				
		14.2 Consultant 2				
	15	**Personnel Total:**			**25,000.00**	**82,000.00**
	16.	Workshop/Seminar and Training				
		(specify beneficiaries)				
		16.1 Travel/Transportation Costs (participants)				
		16.2 Daily Subsistence Allowances (participants)				
		16.3 Venue and Logistics				
		16.4 Workshop Materials				
		16.5 Others				
	17.	**Workshop/Seminar and Training Total:**			**0.00**	**0.00**
20.		Sub-contracts				
	21.	Sub-contract (Tree Mapping)				
	22.	Sub-contract (Topic 2)				

	29.	**Sub-contracts Total:**			**0.00**	**0.00**
30.	Travel					
	31.	Daily Subsistence Allowance				
		31.1 National Expert(s)				
		31.2 International Consultant(s)				
		31.3 Others				
	32.	International Travel				
		32.1 National Expert(s)				
		32.2 International Consultant(s)				
		32.3 Others				
	33.	Local Transport Costs				
		33.1 National Expert(s)				
		33.2 International Consultant(s)				
		33.3 Others				
	39.	**Travel Total:**			**0.00**	**0.00**
40.	Capital Items					
	41.	Premises				
	42	Vehicle(s)				
	43	Capital Equipment				
		43.1 Computer Equipment (specify)				
		43.2 Others (specify)				
	49.	**Capital Items Total:**			**0.00**	**0.00**
50.	Consumable Items					
	51.	Raw materials				
	52.	Spares				
	53.	Utilities			29,268.29	96,000.00
	54.	Office Supplies				
	59.	**Consumable Items Total:**			**29,268.29**	**96,000.00**
60.	Miscellaneous					
	61.	Sundry				
	62.	Contingencies				
	69.	**Miscellaneous Total:**			**0.00**	**0.00**
70.	Others (specify)					
	71.	Others (specify)				
	79.	**Others Total:**			**0.00**	**0.00**
		Total Expenditures To-date:			**54,268.29**	**178,000.00**
		Remaining Balance of Funds (A-B):			**-2,218.29**	**-7,276.00***

Note: *Covered by GOM