AFoCo/010/2016

PROJECT ANNUAL REPORT

[January 2017 to December 2017]

<Project Profile>

Project Title	Domestication of Endangered, Endemic and Threatened Plant Species in Disturbed Terrestrial Ecosystem in Malaysia and Thailand
Project Duration	Start date: 19 May 2016 End date: 18 May 2022
Implementing Agency	Forest Research Institute Malaysia (FRIM)
Participating Country	Malaysia
Project Site	FRIM Research Station at Bidor, Perak
Budget and Source of Finance	Total (for year 2017): - Secretariat: US$27,437.31 - National budget (in-kind): US$ 491,246.00

<Implementing Agency Profile>

Name	Forest Research Institute Malaysia
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Project Staff	Dr Ho Wai Mun
	Tang Lai Kuen
Declaration	■ This report includes all the essential information on executed activities, achieved outputs, issues and challenges encountered in the period covered by the report meant for higher level of administration. ☐ This project was prepared by the Project Manager and the staffs.

Contents

1. Project Overview

(To include executive summary, immediate objectives and expected output from the Project Document)

Executive Summary

Malaysia and Thailand are a mega-biodiversity landscape and the rapid development and changes of climate had inevitably caused degradation of terrestrial ecosystems. The problem of forest degradation and potential biodiversity loss is critical and Malaysia and Thailand are addressing the problems through research and development activities. Domestication of endangered, endemic and threaten species (EETS) is one of the effective approaches to conserve the germplasm. The Malaysia-Thailand project aims to strengthen bilateral cooperation between the two nations focused on biodiversity conservation, domestication and eco-tourism through pilot testing, workshops on best practices and technology transfer and capacity development.

Immediate Objectives

- To domesticate national red-list species in both countries
- To strengthen cooperation between Malaysia-Thailand on conservation of biodiversity, domestication techniques and technology transfer.
- To exchange knowledge and lessons learned on best practice of rehabilitation and biodiversity conservation.

Expected Outputs

- At least 2 to 5 species of EETS shall be domesticated per year through the cooperation between Malaysia-Thailand.
- Country report of the project is documented and shared through regional workshops.
- Capacity building through short-term training course, internship programme, and publications.

2. Implementation Progress

2.1 Overall Progress

(To indicate the state of progress in a tabular form with specific descriptive comparison between planned and actual project implementation of activities using the final version of corresponding Annual Work and Budget Plan of the Project)

Output/ Activity No.	Key Activity	Progress Description	Timeline	Percentage Executed
A	Site Characteristics			
A.1	Site characterization	• A 2-ha site has been selected. • GPS mapping of 3.0ha completed. • Site locality map needs to be updated due to mortality and changes of species. • 3 GPS units have been purchased.	Mac 2018	35%
A.2	Procurement of EETS	• Procurement of EETS and tending are included in one tender (A.2 & A.3).	Not applicable	Not applicable
A.3	Establishment of model plots	• Tending of 2016 planting including refilling.	April 2018	85%
A.4	Documentation of site properties	• Sampling was completed in November 2017. 70% soil samples analyzed. • 2 height poles and 3 diameter tapes purchased. • Prices quoted for procurement of micrclimate were higher than the budgeted amount. Adjustment of specifications has been made and awaiting 2nd evaluation by Procurement Branch.	Aug 2018 Sept 2018	50%
B	Regional Seminar			
B	Regional Seminar	A regional seminar was held from 15-17 August 2017 which include oral and poster presentations as well as an excursion to project site.		100%

C	Technology Transfer and Capacity Development			
C.1	Cross visits	Cross visit to Singapore (27–31 Mac 2017) and the Philippines (15–19 Jan 2018) were carried out.		100%
C.2	Knowledge and technology transfer	Leaflet on the project is being prepared.	April 2018	20%
D	Local Operation			
D.1	External auditing	A finance audit company which service has been previously rendered to FRIM has been engaged.	May 2018	10%
D.2	Attending overseas meetings	2 officers attended the 3rd Restoring Forests Congress, 12–14 September 2017, Lund and 1 officer visited Kew Botanical Garden, London		100%
D.3	Project Coordination Meeting (PCM)	The 3rd PCM was held 21-25 November 2017 in Tapah.		100%
D.4	Annual report	Annual report completed but Financial report will be submitted separately.	May 2018	50%
D.5	Miscellaneous	2 journal papers were published in a journal.		100%

2.2 Key Decisions of Project Steering Committee /Coordination Meeting

(To summarize key decisions made to address issues and guide the project during PSC/PCC meetings organized during the reporting period)

i) Project Steering Committee not applicable in Malaysia

ii) Project Coordination Meeting (refer Record of Discussion in Appendix 1)

a) Key decisions of 3rd Project Coordination Meeting (PCM)

- Financial report for 2017 will be submitted in May 2018.
- Surplus amount of 2017 to be considered in the budget request for quarter 3 and quarter 4 of 2018. Subsequently, the surplus of quarter 1 and quarter 2 of each year will be considered for budget request of quarter 1 and quarter 2 of the following year.
- Excess amount from D.1.1 External Auditing can be reallocated to other activities under Activity D in 2017.
- With the formalization of the Asian Forest Cooperation Organization (AFoCO), a draft arrangement (draft statement of consent) for smooth transition upon formalization has been prepared for review and consideration of relevant legal officials in Malaysia and Thailand.
- The 4th Project Coordination Meeting will be hosted by Thailand in the last week of November 2018.

2.3 Review of Performance Indicators and Activities

(To review how the project is actually performing against its Work Plan)

Output/ Activity No.	Key Activity	Indicators (Planned)	Indicators (Achieved)	Comments
A	Site Characteristics			
A.1	Site characterization	Site locality map of 3.0 ha produced	Site locality map is 80% completed	Site locality map needs to be updated due to mortality and changes of species and is expected to be completed by March 2018.
A.2	Procurement of EETS	1,500 seedlings purchased	1,500 seedlings purchased and planted	Planting of 1,500 seedlings were completed in April 2017.
A.3	Establishment of model plots	A 3-ha model plot established	A 3-ha model plot established	Tending activities in the plot are done monthly while survival and growth monitoring are done quarterly. Tending and refilling activities will continue until April 2018.
A.4	Documentation of site properties	Biophysical properties and soil properties determined	Soil analysis is 70% completed. Biophysical properties have not been determined	Biophysical properties have yet to be determined as purchase of microclimate sensor has been delayed. Soil analysis by appointed lab is expected to be completed by August 2018.
B.	Regional Seminar			
	Regional Seminar	A Regional Seminar organized	A Regional Seminar was organized from 15 to 17 August 2017. Details in Appendix 2.	The Seminar was attended by 39 participants besides local media representatives. Proceedings of the Seminar has published and made available online.
C	Technology Transfer and Capacity Development			
C.1	Cross visits	Two visits	Visit to Singapore & the Philippines	One cross country visit was completed in March 2017 and another to the Philippines in January

				2018.
C.2	Knowledge and technology transfer	Printing of leaflet and poster	Layout of leaflet has been prepared. 3 posters presented in 3rd Restoring Forests Congress (refer D.2).	Leaflet will be printed by April 2018 which include documentation of planting and establishment of model plot.
D	Local Operation			
D.1	External auditing	Audited accounts of Malaysia & Thailand	Auditor has been engaged	Financial audit report expected to be available in May 2018.
D.2	Attending overseas meetings	Meetings/ seminars attended	2 officers attended the 3rd Restoring Forests Congress, 12–14 September 2017, Lund	3 poster papers were presented by 2 officers. Only 1 officer visited the Kew Botanical Garden due to limitation of budget.
D.3	Project Coordination Meeting (PCM)	PCM held	PCM was held on 22-23 November 2017 in Tapah, Malaysia.	Discussion on reporting and budget were carried out during the PCM (refer Appendix 1).
D.4	Annual report	Annual report	Annual report has been prepared	Financial report to be submitted by May 2018.
D.5	Miscellaneous	Publication	2 journal papers published	2 journal papers published in the International Journal on Agriculture, Forestry and Plantation (IJAFP).

3. Financial Report

   (To be submitted in a separate report)

4. Issues & Lessons Learned

   (To elaborate on any issue encountered and lesson learned within the reporting period. To include quantification of any advance or delay in implementing the Activities and causes and anticipated effects thereof.)

   The delay in acquiring and planting of EETS has been rectified with the completion of planting in April 2017. The plants are now being tended and the plot maintained until April 2018. However, the procurement of microclimate sensors have yet to be carried out due to prices that are higher than the budgeted amount which is against the local procurement procedure. Therefore, further negotiation is needed and the procurement is expected to complete in September 2018. The delay due to fluctuation of prices is unpredictable and the project team is working on to expedite the procurement.

   The mortality of the planting is mainly caused by wildlife and pathogens such as fungus. The reduction of number of saplings/seedlings due to the mortality are not covered by the contractual agreement, hence the contractor will not replace them.

   With regards to the Regional Seminar held in August 2017, the organizer learned that participants would also appreciate discussion groups during the Seminar. The organizer has received comments that encouragement for active participation and interaction was not adequate. This could be improved with discussion groups that will promote better sharing and participation.

5. Conclusion and Recommendation

   (To provide the conclusion reached on the state of project implementation, based on the analyses made above. To also recommend any corrective actions or adjustment necessary for the achievement of the project's objectives.)

   The project is being implemented accordingly but the delay is due to procurement process which is beyond the control of the project team.

   The project shall procure 10% extra quantity of planting stock in the next planting tender to accommodate the wildlife damages

6. Appendices

Appendix 1: Record of Discussion of 3rd Project Coordination Meeting

Domestication of Endangered, Endemic and Threatened Plant Species in Disturbed Terrestrial Ecosystem in Malaysia and Thailand

(AFoCo/010/2016)

3rd Project Coordination Meeting

21-25 November 2017, Tapah, Malaysia

Record of Discussion

(Final)

Introduction

1. The 3rd Project Coordination Meeting for the regional Project "Domestication of Endangered, Endemic and Threatened Plant Species in Disturbed Terrestrial Ecosystem in Malaysia and Thailand" (AFoCo/010/2016) was held on 21-25 November 2017 in Tapah, Malaysia. The main objectives of this Meeting were to review the progress of project implementation in 2017 and finalize the work and budget plan for 2018. The Meeting was attended by the officials responsible for implementation of the Project from Malaysia and Thailand as well as from the Interim Secretariat for the Asian Forest Cooperation Organization (Secretariat). The list of participants is attached in **ANNEX 1**.

2. As part of the Meeting, a field visit to Tin Tailings Afforestation Centre (TTAC) in Malaysia was organized on 23-24 November 2017 to observe 3 ha of the domestication plots established by the project. The Meeting noted that planting of Endangered, Endemic and Threatened Plant Species (EETS) has been completed successfully.

Opening session

3. A brief opening session was organized on 22 November 2017 at Meeting Room, Tapah, Malaysia. Dr. Ang Lai Hoe, Senior Research Officer, Forest Research Institute Malaysia (FRIM), in his opening remarks, warmly welcomed all delegates to the Meeting. He expressed appreciation to the Republic of Korea (ROK) for the support, as well as to Thailand for the collaboration. He looked forward to the successful implementation of the project.

4. On behalf of the Secretariat, Ms. Kim Jimyung, Program Officer on External Relations, extended congratulations to the successful implementation of project. She thanked Malaysia and Thailand for the cooperation and looked forward to the success of the Project.

Agenda 1: Election of Chair

5. Dr. Ang Lai Hoe, Senior Research Officer, FRIM was unanimously elected as the Chairman of the Meeting.

Agenda 2: Adoption of Agenda

6. The Meeting considered and adopted its agenda, which is attached in **ANNEX 2**.

Agenda 5: Progress in the Implementation of the Project

7. Dr. Ang Lai Hoe, National Project Coordinator of Malaysia presented the progress of the project implementation in Malaysia. He highlighted the achievement of project implementation by each activity. Malaysia completed planting of 3 ha (10 species, 1500 seedlings) and noted that the survival rate shows from 40% to 100% depending on the species.

8. Tending activities are done monthly while survival and growth monitoring are done quarterly. Cross-country visit will be organized to Los Baños, Philippines for study on low-land dipterocarp forest conservation and its link to development of eco-tourism.

9. Malaysia successfully held the Seminar on Reclamation, Rehabilitation, and Restoration of Disturbed Sites: Planting of National and IUCN Red List Species in 15-17 August 2017 participated by 39 participants. The Seminar also generated a wide public interest in the planting as reported in several local media. The edited proceedings have been made available online for public access.

10. The soil analysis will be completed in 2018. Microclimate monitoring will be a continuing process until crown closure. The presentation by Malaysia is attached in **ANNEX 3.**

11. Ms. Chumnun Piananurak, National Project Coordinator of Thailand presented the progress of project implementation. Thailand completed planting of 3 ha (6 species, 1800 seedlings) in Mae Moh site, and 0.5 ha (4 species, 400seedlings) is Ta Kua Pa in 2016. Planting of nurse tree, tending, site monitoring, and refilling activities are done in 2017. The Meeting took note the findings of soil analysis and microclimate analysis of the project site. The Meeting noted that the survival rate shows from 55% to 100% depending on the species and sites. Development of website for the project was completed and is currently operational. A stakeholder meeting was held in Ta Kua Pa project site.

12. The Meeting took note that a regional workshop is planned in Thailand in 2018 and further agreed on the proposal of Thailand to schedule the workshop back to back with the Project Coordination Meeting.

13. The presentation by Thailand is attached in **ANNEX 4.**

Agenda 4: Project Work and Budget Plan for 2018

14. Malaysia and Thailand presented the Project Work and Budget Plans (WBP) for fiscal year 2018. The Meeting considered and approved total budget for fiscal year 2018 which is USD 153,720 and USD 167,150 for Malaysia and Thailand, respectively. The quarterly breakdown for Malaysia and Thailand in attached as **ANNEX 5** and **ANNEX 6**. The Meeting agreed to submit consolidated budget plan for 2016-2022 by 31 December 2017 to the Secretariat.

15. Considering the time required for the external auditing, accounting process and financial reporting, the Meeting noted that the financial report for 2017 will be submitted in May 2018. The Meeting noted that the budget needs to be secured before respective domestic procurement procedures. In this regard, the Meeting agreed the surplus amount of 2017 to be considered in the budget request for quarter 3 and quarter 4 of 2018. Subsequently, the surplus of quarter 1 and quarter 2 of each year will be considered for budget request of quarter 1 and quarter 2 of the following year. The surplus of quarter 3 and quarter 4 of each year will be considered for budget request of quarter 3 and quarter 4 of the following year.

Agenda 7: Other matters

16. The Meeting noted and agreed to reallocate excess amount from D.1.1 External Auditing to other activities under Activity D in 2017.

17. The Secretariat informed the Meeting on the anticipated formalization of the Asian Forest Cooperation Organization (AFoCO). The Secretariat further proposed the draft arrangement (draft statement of consent) for smooth transition upon formalization for review and consideration of relevant legal official in Malaysia and Thailand.

18. The Meeting agreed that the 4th Project Coordination Meeting will be hosted by Thailand in the last week of November 2018. The date and venue of the meeting will be decided in due course.

Agenda 8: Adoption of the Record of Discussion of the Meeting

19. The Meeting considered and adopted the record of discussion of the 3rd Project Coordination Meeting.

Closing Session

20. Dr. Ang Lai Hoe, as the Chairperson of the Meeting, thanked the Royal Forest Department of Thailand and the Secretariat for the effort and cooperation. The delegates thanked Forest Research Institute Malaysia for hospitality and excellent arrangement. The Meeting was held in the traditional spirit of ASEAN–ROK cooperation and cordiality.

22nd November 2017, Tapah, Malaysia.

Appendix 2. Detailed Results of Key Activities

(To describe key activities implemented during the reporting period in detail with the use of graphical information, such as maps, tables and graphs.)

Activity B: Regional Seminar

Title: Seminar on "Reclamation, Rehabilitation and Restoration of Disturbed Sites: Planting of National and IUCN Red List Species"

Date: 15–17 August 2017

Total participants: 39 persons (including 10 foreigners)

Total papers presented: 2 keynote papers, 16 oral papers and 21 posters

Site visit: FRIM Research Station, Bidor

Average satisfaction score: 4.49/5.00 (based on 22 respondents)

Outputs:

1) Proceedings of the Seminar on Reclamation, Rehabilitation and Restoration of Disturbed Sites: Planting of National and IUCN Red List Species. 2017. Ho WM, Jeyanny V, Sik HS & Lee CT (eds). Pp. 155. eISBN978-967-2149-08-8.

2) Poster Awards, judged by Dr Stephen Elliot (Keynote Speaker) & Dato' Dr Marzalina Mansor (Director of Forest Biotechnology Division, FRIM), were presented to:

   i) Desiccation Sensitivity and Storage of *Hopea subalata* Seeds — A Critically Endangered Species of Peninsular Malaysia by Nashatul Zaimah N.A. *et al.* (Best Poster)

   ii) Effect of Different Planting Methods to the Growth Performance of *Nypa fruticans* by Mohd Zaki A. *et al.* (Merit)

   iii) Can Ex-tin Mine be a Depository for Indigenous and Red List Species? by Ho W.M. *et al.* (Merit)

3) The Seminar has generated wide publicity through local media with a PR Value amounting to RM486,254 or approximately USD112,241.81.

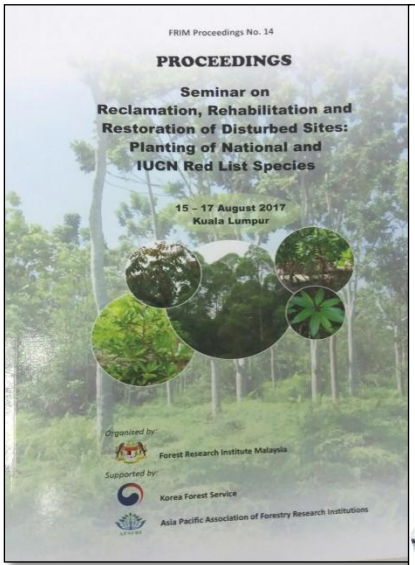
4) Website for downloading of Proceedings: https://info.frim.gov.my/infocenter_applications/downloadDocs/index.cfm

5) Website for promotion of Seminar: http://3rdomestix.blogspot.my/

Collage of photos during Opening Ceremony on 15 August 2018

Dato' Dr Abd Latif (FRIM Director General) and Dr Ang LH with ASEAN participants

Group photo during excursion on 17 August 2017



Proceedings of the Seminar published and made available online

Coverage of the Seminar and excursion in local media

Activity D.2: Attending Oversea Meetings

Three poster papers were presented by two officers attending the 3rd Restoring Forests Congress in Lund, Sweden 12–14 September 2017. Titles of posters presented are:

i) ANG LH, HO WM, TANG LK, KANG HS & LEE DK. 2017. The survival of a 36-month-old enrichment planting under a greened slime tailings in Tin Tailings Afforestation Centre, Bidor, Perak. Poster presented at the 3rd Restoring Forests Congress, 12–14 September 2017, Lund.

ii) ANG LH, HO WM & TANG LK. 2017. Natural regeneration of a greened ex-tin mine. Poster presented at the 3rd Restoring Forests Congress, 12–14 September 2017, Lund.

iii) HO WM & SIK HS. 2017. Impacts of *Hopea odorata* stand on biomass accumulation and carbon cycle in an ex-tin mine. Poster presented at the 3rd Restoring Forests Congress, 12–14 September 2017, Lund.

Activity D.3: Project Coordination Meeting (PCM)

The 3rd PCM has been held in the traditional spirit of ASEAN-ROK cooperation and cordiality on 22 November 2017 in Tapah, Perak. A visit to the project site in Bidor, Perak was also conducted after the Meeting.

Dr Ang briefing Ms Kim from Interim Secretariat for AFoCO

Collaborators from Royal Forest Department, Thailand at the project site in Bidor

Activity D.5: Miscellaneous

Two poster papers presented during the Kuala Lumpur International Agriculture, Forestry and Plantation Conference have been accepted for publication in the International Journal of Agriculture, Forestry and Plantation.

Titles of the journal papers are:

i) HO WM, ANG, LH & TANG LK. 2016. Important Roles of Species-Site Matching in Afforestation of an Ex-Tin Mine. International Journal of Agriculture, Forestry and Plantation. 4(Dec): 63–67. ISSN 2462-1757.

ii) TANG LK, ANG LH & HO WM. The potentials of *Acacia mangium* X *Acacia auriculiformis* hybrid as an Afforestation Species for Impoverished Sand Tailings. International Journal of Agriculture, Forestry and Plantation. 4(Dec): 68–71. ISSN 2462-1757.

International Journal of Agriculture, Forestry and Plantation, Vol. 4 (Dec.) ISSN 2462-1757 2016

IMPORTANT ROLES OF SPECIES-SITE MATCHING IN AFFORESTATION OF AN EX-TIN MINE

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Ang, L.H.,
Tang, L.K.

ABSTRACT

Sites for forest plantation establishment are usually infertile areas compared to those alienated for agriculture purpose. Idle ex-tin mine covers about 60,000 ha in the Peninsular Malaysia. It consists of slime and sand tailings. The potential of ex-tin mines for afforestation purpose is proven and demonstrated in Tin Tailings Afforestation Centre. The purpose of this study is to identify timber tree species suitable for growing on sand and slime tailings. The site constraints of ex-tin mine for tree growing are discussed and their amelioration techniques and approaches are documented. Suitable species for growing on sand and slime tailings are also recorded. This paper briefly discusses the species-site matching for greening the ex-tin mine with timber tree species.

Keywords: afforestation, sand tailings, slime tailings, species-site matching

Introduction

Problematic sites in Malaysia include ex-tin mines, landfills, grasslands together with degraded secondary forests covered 4.6 million ha (Ahmad Zainal, 1992). Ex-tin mine alone covers 113,700 ha of which 70% still remains idle (Chan, 1990; Abd Latif & Ang, 2014). Due to land scarcity particularly in urban areas, some of these ex-tin mines have been converted into agricultural areas, housing estates or recreational areas.

Ex-tin mine is infamous for its poor site quality for growing plants. Fertilizers and irrigation required for turning ex-mines into agriculture purpose are very costly and thus limit their large-scale and long-term use. In addition, with the discovery of unacceptably high levels of heavy metals in food crops grown on tin tailings recently has rendered it a less preferable site for food production. Idle ex-tin mines normally have long stretches of desert-like sand, cannot be recovered naturally due to adverse changes brought to the ecosystem by agents of degradation. These adverse changes include [1] the lack of mother trees or seed sources, [2] adverse soil properties and microclimate, and [3] repeated disturbance by the same agents that preclude the process of regeneration, for instance re-mining.

Rehabilitation of the degraded land with timber tree species is a better option of land use and would improve the soil properties and also can act as a wood production area. Once the land is alienated for forest plantation development, appropriate artificial regeneration approaches shall be employed to green the ex-tin mine. Hence, appropriate site preparation techniques will ensure optimal growth of trees on ex-tin mine (Ang & Ho, 2004). The selection of suitable species is another important factor for successful growing of trees on ex-tin mine. Due to economic constraints during site preparation, planters would often have to determine cost-effective site preparation techniques suitable for a limited species choice. In order to narrow down for achieving one to three species of growing with minimal site preparation, a discipline of species-site matching is employed. Species-site matching is selecting either a suitable species or a group of species for growing on a problematic site which has main site properties similar to the natural habitat of the choice species. Therefore, for any afforestation project to be successful, the right timber species must be selected for different site properties.

Information on species-site matching using tropical rainforest species on ex-tin mine through site amelioration is still scarce and not well-documented. This paper aims to highlight some site constraints of an ex-tin mine and site amelioration techniques together with selection of suitable tree species.

International Journal of Agriculture, Forestry and Plantation, Vol. 4 (Dec.) ISSN 2462-1757 2016

THE POTENTIALS OF *ACACIA MANGIUM* X *ACACIA AURICULIFORMIS* HYBRID AS AN AFFORESTATION SPECIES FOR IMPOVERISHED SAND TAILINGS

Tang, L.K.L.,
Ang, L.H.,
Ho W.M.

ABSTRACT

Acacia hybrid has a great potential for fiber production. It can regenerate profusely after fire whereby a mixture of Acacia mangium, Acacia auriculiformis and A. hybrid seedlings dominantly covering the opening of the dead trees after fire. Only the top 10 to 20% of the regeneration achieving the largest size range of 8 cm dbh and 13 m top height at four years after fire and they are all A. hybrid. The total stand volume of the 20 x 30 plot was calculated and estimated the total stand volume of surviving A. hybrid together with their regeneration, and the total stand volume is greater than A. mangium plantation grown at Chikus Forest Reserve which is located 10 km from the study site with same climatic zone. The study shows that Acacia hybrid can be sustainably managed as a fiber crop grown on impoverished sand tailings.

Keyword: *Acacia* hybrid, sand tailings, fiber crop, fast growing plantation

Introduction

Impoverished site such as sand tailings or sandy sites such as Beach Ridges Interspersed with Swales (BRIS) or high composition of sanding soils often require high inputs for growing timber species, consequently it reduces the cost-effectiveness of the industrial forest plantation. The extent of ex-tin mines and BRIS was estimated to be about 360,000 ha in Peninsular Malaysia but due to development for various uses in the past decades, the remaining idle problematic sites to-date were estimated to be about 250,000 ha (Ang & Latif, 2014). Acacias are favourable plantation species for their fast growth rates on impoverished sites, especially *Acacia mangium* x *Acacia auriculiformis* or *A.* hybrid. In addition, easily available planting stocks, free from any known pest and diseases problems, low tending inputs of fertilizers and other tending practices make *A.* hybrid attractive for a large-scale forest plantation development. It has been planted in Southeast Asia. In Vietnam alone, the forest plantation covers 220,000 ha. A demonstration plot of size 20 x 30 m was established on sand tailings in Tin Tailings Afforestation Centre (TTAC), SPF Bidor. The *A.* hybrid seedlings established on sand tailings were from tissue culture materials produced by Forest Research Institute Malaysia. The mean stand height was 13.0±1.6 m with an average stand diameter at breast height (dbh) of 8.1±0.1 cm and the live-crown-ratio of the stand was 85.2±3.2% at four years after planting. The growth data falls within the growth curve of *A.* hybrid grown in good minerals soils. The stand was covered with undergrowth of shrubs and herbaceous plants. The plot was burnt at age of four years old and a study was carried out on its regeneration. The density of regeneration under the dead trees and surviving trees were monitored at seven years and they maintained at estimated 3,500 stems/ha and 8,900 stems/ha, respectively. This finding indicates that the *A.* hybrid could be managed under a sustainable management regime if it is to be grown as a plantation crop on sand tailings. Hence, this paper aims to highlight the potential of *A.* hybrid as a pulpwood species on impoverished sand.

METHODOLOGY

The approach to propose *A.* hybrid for the development of pulpwood plantation species on impoverished sandy site is based on research findings. Based on published documents together with the planting experiences in TTAC, the species potential for fiber plantation development shall be assessed based on the published data and plantation experiences of its planting stock, tending regime, growth and yield data, pulpwood properties, pests and diseases control.

RESULTS AND DISCUSSIONS

Availability of Planting Stock

This study is based on the experience of planting *A.* hybrid in TTAC using acclimatized tissue culture plantlets. It is also well documented that plantation experiences in Sabah and *A.* hybrid plantation covers 220,000 ha in Vietnam, their planting stock is from clonal materials via tissue culture and cuttings, respectively (Galiana *et al.*, 2003; Sein & Mitlohner, 2011). Hence, availability of planting stock for large-scale planting is not a limiting factor.

Appendix 3. Finalized Annual Work and Budget Plan for forthcoming years

(To provide a final version of detailed Annual Work and Budget Plan for the forthcoming years endorsed by PSC/PCC, with clear indication on any modification made from the Project Document.)

AFoCo Regional project:
Domestication of Endangered, Endemic and Threatened Plant Species in Disturbed Terrestrial Ecosystem in Malaysia and Thailand

Country work and budget plan for Q1, Q2, Q3 and Q4 of the fiscal year 2018 from FRIM, Malaysia

Activity No.	Activity Description	Unit	Quantity	Unit cost	Year 3 (Jan-Dec 2018)				
					Q1 (Jan-Mac)	Q2 (Apr-Jun)	Q3 (Jul-Sep)	Q4 (Oct-Dec)	Malaysia (2018)
A. Site characteristics		-	-	-					
Activity A.1	**Site characterization**	-	-	-	-	3,540	3,140	600	4,375
Activity A.1.1	Site Selection		-	-	-	-	-	-	-
Activity A.1.2	GPS mapping (2 ha) (Purchase of 2 GPS units)	ha	-	1,500.0	-	-	-	-	-
Activity A.1.3	Producing Site Locality Map	set	20	15.0	-	-	300	-	300
Activity A.1.4	DSA	night	33	35.0	-	1,470	1,120	-	1,155
Activity A.1.5	Hotel/lodging allowances	night	32	35.0	-	1,470	1,120	-	1,120
Activity A.1.6	Transportation claims (USD300/trip)	trip	6	300.0	-	600	600	600	1,800
Activity A.2	**Procurement of EETS (3 ha)**	-	-	-	-	**63,475**	-	-	63,475
Activity A.2.1	Purchase of seedlings or saplings (@ USD 10-100/species/plant)	seedling	1,500	40.0	-	60,000		-	60,000
Activity A.2.2	DSA	day	33	35.0	-	1,155	-	-	1,155
Activity A.2.3	Hotel/lodging allowances	night	32	35.0	-	1,120	-	-	1,120
Activity A.2.4	Transportation claims(USD300/trip)	trip	4	300.0	-	1,200	-	-	1,200
Activity A.3	**Establishment of Model Plots (3ha)**	-	-	-	-	**43,165**	**13,500**	-	**56,665**
Activity A.3.1	Site preparation (3 ha)								
Activity A.3.1.1	Ploughing & Organic enhancement	ha	3	5,000.0	-	15,000	-	-	**15,000**
Activity A.3.1.2	Fire protection line and inspection road	km	-	-	-	-	-	-	-
Activity A.3.1.3	Demarcation and fencing	ha	-	-	-	-	-	-	-
Activity A.3.2	Planting & Tending	plant	1,500	15.0	-	22,500			**22,500**
Activity A.3.3	Tending of 2016 planting including refilling	plant	1,500	9.0	-		13,500		**13,500**
Activity A.3.4	DSA Monitoring of site preparation, planting and tending	day	60	35.0	-	2,100		-	**2,100**
Activity A.3.5	Hotel/lodging allowances	night	59	35.0	-	2,065		-	**2,065**
Activity A.3.6	Transportation claims (USD300/trip)	trip	5	300.0	-	1,500		-	**1,500**
Activity A.4	**Documentation of Site Properties**	-	-	-	-	**4,165**	-	-	**4,165**
Activity A.4.1	Biophysical property				-	-		-	-
Activity A.4.1.1	Soil analysis	sample	3	2,500.0	-	-		-	-
Activity A.4.1.2	Purchase of microclimate	sample	3	2,500.0	-	-		-	-
Activity A.4.2	Assessment of growth (purchase of instrument)	set	-	-	-	-		-	-
Activity A.4.2.1	Purchase of height meter (vertex)	number	2	2,500.0	-	-		-	-
Activity A.4.2.2	Purchase of diameter tapes	number	3	200.0	-	-		-	-
Activity A.4.3	DSA	day	30	35.0	-	1,050			1,050
Activity A.4.4	Hotel/lodging allowance	night	29	35.0	-	1,015			1,015
Activity A.4.5	Transportation claims (USD300/trip)	trip	7	300.0	-	2,100	-		2,100
B. Regional Seminar		-	-	-					
Activity B.1	**Domestication of EETS in ASEAN countries**	-	-	-					
C. Technology transfer and capacity development		-	-	-	-		-	13,085	13,085
Activity C.1	**Cross visits (USD3000/person/trip-Thailand/Indonesia/Philippines/Singapore)**	-	-	-	-	-	-	12,135	12,135
Activity C.1.1	Airfare (person)	person	3	1,000.0	-	-	-	3,000	3,000
Activity C.1.2	Hotel/lodging allowance	night	42	105.0	-	-	-	4,410	4,410
Activity C.1.3	DSA (day)	day	45	105.0	-	-	-	4,725	4,725
Activity C.2	**Knowledge and technology transfer**	-	-	-	-	-	-	950	950
Activity C.2.1	Manual				-	-	-	-	-
Activity C.2.2	Leaflet	number	500	0.5	-	-	-	250	250
Activity C.2.3	Poster and roll up	set	200	1.5	-	-	-	300	300
Activity C.2.4	Website development	website	1	400.0	-	-	-	400	400
Activity C.2.5	Lecturer allowances	hour			-	-	-		-
Activity C.2.6	Seminar room & package	room			-	-	-		-
Activity C.2.7	Site visit	trip			-	-	-		-
Activity C.2.8	Hotel/lodging allowance	person			-	-	-		-
Activity C.2.9	DSA (day)	day			-	-	-		-
Activity C.2.10	Seminar kit	kit			-	-	-		-
Activity C.2.11	Transportation	trip			-	-	-		-
D. Local Operation	**D. Local Operation**	-	-	-	-	-	390	6,730	11,005
Activity D.1	**External Auditing**	year				-	-		
Activity D.2	**D.2. Attending oversea meetings (1 or 2 trips)**				-	-	-	6,730	6,730
Activity D.2.1	D2.1. Airfare (person)	person	2	2,000.0	-	-	-	4,000	4,000
Activity D.2.2	D2.2. Hotel/lodging allowance	night	12	105.0	-	-	-	1,260	1,260
Activity D.2.3	D2.3. DSA (day)	day	14	105.0	-	-	-	1,470	1,470
Activity D.3	**D.3 Inception Meeting/Project Coordination Meeting**				-	-		-	3,885
Activity D.3.1	Airfare (person)	person	3	350.0	-	-	1,050		1,050
Activity D.3.2	Hotel/lodging allowance	night	12	105.0	-	-	1,260		1,260
Activity D.3.3	DSA (day)	day	15	105.0	-	-	1,575		1,575
Activity D.4	**Annual Report**		**3**	**100.0**	-	-	**300**		**300**
Activity D.5	**Miscellaneous**		**1**	**90.0**	-	-	**90**		**90**
Grand Total (MALAYSIA)	**Fund Allocated**				-	**114,345**	**17,030**	**21,365**	**153,720**

Note: The annual budget of USD60,000 + USD 106,430 brought forwad from planting progrom budgeted for 2019 = USD166,430

Requested by (Name): Dr Ang Lai Hoe
Designation: Project Leader

Signature:

Approved by (Name): Dato' Dr Abd. Latif Mohmod
Designation: Director General of FRIM

Signature: