Annual Progress Report 2019

January – December 2019

<Project Profile>

Project code	AFoCO/010/2016
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 Agencies	Forest Research Institute Malaysia (FRIM) Royal Forest Department (RFD), Thailand
National Focal Point(s)	N/A
Project Site	Malaysia- FRIM Research Station at Bidor, Perak Thailand- Mae Moh Mine, Lampang - Takua Pa, Phang Nga
Target Area	Primary target area: PA 2 (Supporting Research and Development in Climate Change Adaptation Approaches)
Budget and Source of Finance	Total: US $5,293,920 - AFoCO: US $1,200,000 ($600,000 / $600,000), funded by KFS - Malaysia (in-kind): US $2,947,470 - Thailand (in-kind): US $1,146,450
Annual Budget and Source of Finance in 2019	Total: US $1,089,080.82 *(excluding carry over)* - AFoCO: US $187,984.82 ($115,955.00 / $72,029.82), funded by KFS - Malaysia (in-kind): US $491,246.00 - Thailand (in-kind): US $409,850.00

<Implementing Agency Profile>

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Project Staff	Dr Ho Wai Mun
	Ms 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.

Name	Royal Forest Department (RFD), Thailand
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Project Staff	Mr Somchai Nongnuang (Mae Moh)
	Ms Waranyu Ratcharoen (Takua Pa)
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.

Abbreviations and Acronyms

AFoCo	ASEAN-ROK Forest Cooperation
AFoCO	Asian Forest Cooperation Organization
ASEAN	Association of Southeast Asian Nations
EETS	Endangered, endemic and threaten species
FRIM	Forest Research Institute Malaysia
RFD	Royal Forest Department, Thailand

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1. Project Overview

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. This 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 to ASEAN countries, funding by AFoCO Secretariat .The project plots will be a seed production area of EETS after the project finished in 2022.

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

2.1.1 Malaysia

Activity No.	Key Activity	Progress Description	Timeline		Percentage Executed
			planned	actual	
A Site Characteristics					
A.1	Site characterization	Site selection and marking completed for new 3.6 ha plot.	Mar 2019	Mar 2019	100
A.1.3	Producing Site Locality Map	Site locality maps were produced (**Annex-1**).	June 2019	Apr 2020	100
A.2	Procurement of EETS	Procurement process for seedlings, planting and tending. These activities are combined in one job in accordance to national rule.	Apr 2019 (Planting)	Apr 2019 (Planting)	100
A.3	Establishment of model plots				
A.3.2	Tending of 2016 planting including refilling		Feb 2021 (Tending)	Feb 2021 (Tending)	50
A.4	Documentation of site properties	Assessment of plant growth and determination of site properties. Soil samples being analyzed by lab.	Dec 2019	June 2020	70
B Regional Seminar					
B.1	Regional Seminar	A regional workshop was held on 7-8 November 2019. Attended by 20 participants and lecturers from 9 ASEAN countries and Republic of Korea (**Annex-2**).	Nov 2019	Nov 2019	100
C Technology Transfer and Capacity Development					
C.1	Cross visits	Cross visit to Thailand was carried out on 14–19 October 2019 and provided technical information to Thailand on planting and tending of EETS (**Annex-3**). Cross visit to Indonesia was carried out 2–6 December 2019 (**Annex-4**).	June & Dec 2019	Oct & Dec 2019	100
C.2	Knowledge and technology transfer	Leaflet on the project will be postponed.	Dec 2019	April 2020	0
D Local Operation					

Activity No.	Key Activity	Progress Description	Timeline		Percentage Executed
			planned	actual	
D.1	External auditing	Not applicable.	-	-	-
D.2	Attending overseas meetings	3 officers attended the Evaluation Workshop in Korea 16–21 December 2019. Project activities and achievements were presented to AFoCO Secretariat (17 December) and Korea Forest Service (19 December) (**Annex-5)**.	Dec 2019	Dec 2019	100
D.3	Project Coordination Meeting (PCM)	The 5th (7–8 August) and 6th (6 November) Project Committee Meetings were held in Malaysia.	Nov 2019	Nov 2019	100
D.4	Annual report	Annual report will be submitted to AFoCO Secretariat by February 2020. Financial report is being prepared for external auditing.	Feb 2020	Feb 2020	50

Activity No.	Key Activity	Progress Description	Timeline		Percentage Executed
			planned	actual	
D.5	Miscellaneous	Four (4) papers presented in workshops and 1 poster presented in conference: i) Ang LH, Ho WM, Tang LK, Kang HS & Lee DK. 2019. The survival and vegetative growth of a 60-month-old tropical rainforest tree species trial established under *Hopea odorata* nursestand at an ex-tin mine in Peninsular Malaysia. Poster presented at the Malaysian Society of Plant Physiology Conference, 27-29 August 2019, Kota Kinabalu (**Annex-6**). ii) Ang LH. 2019. Lessons learnt from reclamation, rehabilitation and restoration of some disturbed terrestrial ecosystems. Paper presented at the Regional Workshop on "Domestication of endangered, endemic and threatened species in disturbed terrestrial ecosystems", 7-8 November 2019, Kepong. iii) Ang LH. 2019. Some challenges in domestication of endangered, endemic and thretened tree species in Malaysia. Paper presented at the Regional Workshop on "Domestication of endangered, endemic and threatened species in disturbed terrestrial ecosystems", 7-8 November 2019, Kepong. iv) Ang LH. 2019. Paper presented at the Workshop on Enhancing Capacity in International Forest Cooperation, 19 December 2019, Daejeon.	Dec 2019	Dec 2019	100

2.1.2 Thailand

Activity No.	Key Activity	Progress Description	Timeline		Percentage Executed
			plan	actual	
A Site Characterization					
A.1 Selection of planting sites in denuded and disturbed forest, and identification of EETS for domestication					
A.1.2	GPS mapping	Site selected at Mae Moh mine, Lampang province and Takua Pa, Phang nga province for 2018 plot site. Total area is 5.30 ha, 4.8 ha at Mae Moh site (2018-2019) and 0.5 ha. At Takua Pa site. GPS mapping expected to finish by February 2020.	Apr-Dec 18	February 2020	70
A.1.3	Producing Site Locality Map	Site locality maps at Mae Moh mine plot include boundary map, existing trees map and planted EETS map were produced by February 2020.	Apr-Dec 18	February 2020	70
A.2 Procurement of EETS					
A.2.1	Purchase of seedlings or saplings	Seedlings of each 10 EETS were purchased. 1,000 banana shoots were bought and used as nursing plants. - *Dalbergia cochinchinensis,* - *Dalbergia oliveri,* - *Aquilaria crassna,* - *Dalbergia cultrate*, - *Magnolia sirindhorniae*, - *Dillenia ovata*, - *Magnolia rajaniana*, - *Pakia sumatrana,* - *Aquilaria malaccensis* and - *Neobalanocarpus heimii*. Seedling for Mae Moh plot site is now internal process approval. Seedling for Takua Pa plot site has been finished.	Apr-Sep 18	January 2020	91
A.3 Establishment of model plots (Site preparation, planting stock, planting, tending, monitoring)					
A.3.1	Planting	For 2018 plot, contracts are in progress for planting activity for Mae Moh Plot. Planting activity for Takua Pa plot site finished.	Oct-Dec 18	February 2020	80

Activity No.	Key Activity	Progress Description	Timeline		Percentage Executed
			plan	actual	
	Tending	Tending 2016 plot of both sites, contracts are in progress. For 2018 Takua Pa plot site is under internal process.			
A.3.2	Fire protection line and inspection road	Road for fire protection and watering route was built on both sides of the 2018 planting plot.	Jan-Mar 18	Jan and Nov 18	100
A.3.3	Demarcation and wind protecting and fence	The site is not windy but has more than 10,000 cattle roaming. Fencing made from cement post with barbed wire installed to prevent cattle from encroaching into the both planting plots at Mae Moh. Takua Pa site has been finished.	Jan-Mar 18	Dec.19	100
A.3.4	Planting & Tending	Site preparation and EETS planting and tending at Mae Moh site is internal approval. Planting for 2018 Takua Pa plot site has been finished and tending is in the process of approving the TOR for contractor.	Apr-Sep 18	Feb.2020	70
A.3.5	Tending of 2016 planting	The detail of this activity is shown in **Annex-7.**	Jan-Dec 19	Jan-Dec 19	100
A.3.7	Monitoring/supervising of site preparation, planting and tending	Every step of work during site preparation, planting and tending was photographed and reported by Project staff as appear in Annex II. Monitoring/supervising committees consist of Director of Forest Research and Development Bureau, Director of State Reforestation Division, Director of Silvicultural Research Division, Expert on Forest Management Research and Director of International Forestry Cooperation Division.	Jan-Dec 19	Jan – Dec 19	100
A.4 Documentation of biophysical site properties, planting techniques and assessment of growth					
	Documentation of biophysical site properties, planting techniques and assessment of growth	Survival rates and growth measurement of plants at 36 months after planting were recorded. The data analyze shown in graph appear in Annex III.	Jan-Jun 18	Jan-Dec 19	100
A.4.1	Soil analysis	Soil collection has finished, Soil analysis is in the process of approving the TOR for contractor. Information on biophysical site	Apr-Jun 18	Feb.2020	40

Activity No.	Key Activity	Progress Description	Timeline		Percentage Executed
			plan	actual	
		properties, planting techniques and assessment of growth and soil is in **Annex-8**.			
A.4.2	Purchase of microclimate sensors / rain gauge	All data loggers are out of order. Instead, data from Mae Moh Mine and Phang Nga Forestry Research Station have been used.	Jan-Mar 18	Dec19	0
B. Regional Workshop					
B.1	Domestication of EETS in ASEAN countries	A Regional Workshop in Malaysia was held during 7-8 November 2019. 4 Persons from Project staff were attended the workshop which 1 staff was funded by Malaysia. EGAT staff was a representative of Thailand. (**Annex-2 and 9**).	Nov 19	Nov 19	100
C. Technology Transfer and Capacity Development					
C.1	Cross visits	7 Project staffs from Thailand join with 3 persons from Malaysia went to Korea during 16-21 December 2019. The details of the cross visits are combined with Malaysia's in **Annex-5**.	Jul-Sep 18	Dec19	100
C.2 Knowledge and technology transfer					
C.2.2	Leaflet	Leaflet is not be printed.	Oct-Dec 18	Dec19	0
C.2.3	Poster and roll up	Posters and roll up have not been printed.	Oct-Dec 18	Dec 19	0
C.2.4	Website maintaining	The Project website was maintained and can be accessed through http://afocothailand-malaysia.com/. More data need to be added. The Project website maintained finished in March 2019.	Oct-Dec 18	Dec 19	100
D. Local Operation					
D.1	External Auditing	Not applicable	0	0	0
D.2	Attending overseas meetings	Attending local/overseas conferences has not done	Oct-Dec 19	Dec 19	0
D.4	Annual report	30 copies of 2018 Annual report has been printed.	Oct-Dec 19	August 19	100
D.5 Miscellaneous					
D.5.1	Office supply	Office supplies	Jan -Dec 19	Jan-Dec 19	100

Activity No.	Key Activity	Progress Description	Timeline		Percentage Executed
			plan	actual	
D.5.2	Phone, Fax, Mailing costs	12 monthly payment for the calling and internet fee for 3 Samsung Galaxy S7 edge using by Project Director, Project Manager and Project Account Officer with registered number as +66-63982516991, +66-632715998 and +66-819257119, respectively.	Jan -Dec 18	Jan -Dec 19	100
D.5.4	Local part-time Coordinator	Sign new contract with Ms. Suphansa Chatmueang New contract finished in May 2019 Ms Suphansa Chatmueang was contracted as an Local part-time coordinator	Jan -Dec 19	Jan –Dec19	100
D.6	PCC Meeting	4 persons from Thai staff to attend 5th PCC meeting at FRIM in 7-8 August 2019 3 persons from Thai staff to attend 6th PCC meeting at FRIM in 5-6 November 2019.	Jan–Dec 19	Jan. – Dec.19	100

2.2 Key Decisions of Project Coordination Meeting in 2019

Main Issues	Decisions	Follow-up Actions
5th PCM, 7-8 August 2019, FRIM (**Annex-10**)		
There is a need to compare the site in Mae Moh Mine as it is a lignite mine, not tin mine.	Thailand will consider and explore the possibility of planting and expansion of site to another ex-lignite mine in order to compare to the site at Mae Moh Mine.	The Meeting was informed at the 6th PCM that Thailand decided not to have another project site based on site conditions.
Thailand requested for technical information from Malaysia for improving planting sites.	Thailand shall invite Malaysia and the Secretariat to assess stand quality of the plantings in October 2019 and to explore the possibility of a joint publication.	Officers from Malaysia visit both planting sites in Thailand and helped assess the sites.
6th PCM, 7-8 August 2019, FRIM (**Annex-11**)		
Implementing countries to present project activities and achievements to AFoCO Secretariat and Korea Forest Service.	Thailand informed that a cross country visit to Republic of Korea (ROK) has been planned on 16–21 December 2019.	Malaysia and Thailand visited ROK on 16–21 December 2019 and both countries made presentations.
Different planting years can be misleading in reporting.	Thailand needs to acknowledge planting activities according to the budget year	Planting activities are referred to budget year accordingly.
Two PCMs to be organized every year.	The 7th (Bangkok & Lampang) and 8th (Phuket & Phang-Nga) PCM will be organized in Thailand. The Meeting was further informed that Thailand will organize a Regional Workshop in Phuket and 8th PCM back to back in November 2020.	Venues to follow as suggested by Thailand.
Disbursement of all budget should be completed within the project period by April 2022	Previous claims for the committed monthly activities such as tending activities and others that had been conducted must be paid accordingly before the end of the second quarter in 2020.	Payments to be made for all activities conducted.
Remaining activities and budget of previous years are difficult to be monitored.	It is agreed that remaining activities and budget of previous years should be presented in a separate table.	All information was submitted to AFoCO Secretariat after 6th PCM. The final work and budget plan will be included into 2020 AWB.

2.3 Review of Performance Indicators and Activities

2.3.1 Malaysia

Activity No.	Key Activity	Objectively Verifiable Indicators in 2019		Comments
		Target	Accomplishments	
A. Site Characterization				
A.1 Selection of planting sites in denuded and disturbed forest, and identification of EETS for domestication				
A.1.1	Site selection and identification of EETS for domestication	3 ha	3.8 ha	
A.1.2	GPS mapping	3 ha	3.8 ha	
A.1.3	Producing Site Locality Map	3 ha map	3.8 ha map produced but more information can be included	
A.2 Procurement of EETS				
A.2.1	Purchase of seedlings or saplings			
A.3 Establishment of Model plots (Site preparation, planting stock, planting, tending, monitoring)				
A.3.1	Planting	3 ha, 6 species, 1,650 seedlings	3.8 ha, 12 species, 1,650 seedlings	
A.3.2	Fire protection line and inspection road			
A.3.3	Demarcation and wind protecting			
A.3.4	Planting & Tending	Until Feb 2021	On-going until Feb 2021	Contract for tending is from 2019 to 2021
A.3.5	Monitoring/supervising of site preparation, planting and tending			
A.4 Documentation of biophysical site properties, planting techniques and assessment of growth				
A.4.1	Soil analysis	Dec 2019	On-going	
A.4.2	Assessment of growth	On-going	On-going	
A.4.3	Purchase of height meter (vertex) /shredder machine	2	Not purchased	Will be purchased in 2020
A.4.4	Purchase of diameter tapes/ shredder machine	3	Not purchased	Will be purchased in 2020
B. Regional Workshop				

Activity No.	Key Activity	Objectively Verifiable Indicators in 2019		Comments
		Target	Accomplishments	
B.1 Regional Workshop		16 participants	17 participants	3 invited lecturers
C. Technology Transfer and Capacity Development				
C.1	Cross visits	2 persons (Thailand) 2 persons (Indonesia)	2 persons (Thailand) 2 persons (Indonesia)	
C.2 Knowledge and technology transfer				
C.2.1	Manual			
C.2.2	Leaflet	200	Postponed to Jun 2020	
C.2.3	Poster and roll up			
C.2.4	Website maintaining			
D. Local Operation				
D.2	Attending overseas meetings	1 (Republic of Korea)	1 (Republic of Korea)	
D.4	Annual report			
D.5 Miscellaneous				
D.5.1	Office supply	1 year	1 year	
D.5.2	Phone, Fax, Mailing costs			
D.5.3	Office automation			
D.5.4	Local full-time administrative officer (contract)			
D.6	PCC Meeting	2 meetings	2 meetings	Held in Malaysia in August and November 2019
D.7	Stakeholder Meeting	-	-	

2.3.2 Thailand

Activity No.	Key Activity	Objectively Verifiable Indicators in 2019		Comments
		Target	Accomplishments	
A. Site Characterization				
A.1 Selection of planting sites in denuded and disturbed forest, and identification of EETS for domestication				
A.1.1	Site selection and identification of EETS for domestication	1 site 3 ha and 6 EETS	2 sites 5.3 ha and 10 EETS - Mae Mot 4.8 ha 8 EETS - Takua Pa 0.5 ha 4 EETS	10 EETS includes 6 new species and 4 old species planted in 2016, altogether is 12 EETS.
A.1.2	GPS mapping	3 ha	4.8 ha	0.5 ha at Takua Pa was done in 2019.
A.1.3	Producing Site Locality Map	60	60	A map at Takua Pa site will be produced by February 2020.
Activity A.2 Procurement of EETS				
A.2.1	Purchase of seedlings or saplings	2,815 EETS seedlings	There are 4,415 seedlings (include nurse plant) in total. 550 *Dalbergia cochinchinensis,* 275 *Dalbergia oliveri,* 225 *Aquilaria crassna,* 420 *Dalbergia cultrata*, 75 *Magnolia sirindhorniae*, 200 *Dillenia ovata*, 450 *Magnolia rajaniana*, 325 *Pakia sumatrana,* 125 *Aquilaria malaccensis,* and	The remained seedlings will be purchased later depend on availability in market. 54,250 seedling of *Chrysopogon zizanioides* will be purchased.

Activity No.	Key Activity	Objectively Verifiable Indicators in 2019		Comments
		Target	Accomplishments	
			120 *Neobalanocarpus heimii.* 25 *Cotylelobium lanceolatum* 25 *Vatica diospyroides* 300 Senna *siamia* 300 *Acacia auriculiformis* 1,000 banana shoots were purchased.	
A.3 Establishment of Model plots (Site preparation, planting stock, planting, tending, monitoring)				
A.3.1	Planting Tending	3.5 ha -2016 plot, 3.8 ha. for Mae Moh plot site and 0.5 ha. for Takua Pa plot site. -2018 plot 4.8 ha. for Mae Moh Plot site and 0.5 ha for Takua Pa site.	Planting is under internal process for Mae Moh Mine plot site. 2018 Takupa plot site has been finished. For irrigation is carried out manually at Mae Moh site while drip irrigation system is installed at Takua Pa site. Watering at Mae Moh site was carried out 6 times, Drip-irrigation for 2018 plot at Takua pa has been installed.	Mae Moh plot site will be finished planting in February 2020. For 2016 plot, tending and watering was under contractor. For 2018 plot, tending activity is expected to begin by January 2020 for Takua Pa plot site and February 2020 for Mae Moh plot site. 0.5 ha irrigation system has been finished set up at Takua Pa, manual watering at Mae Moh site will be

Activity No.	Key Activity	Objectively Verifiable Indicators in 2019		Comments
		Target	Accomplishments	
			Watering of 3.8 ha of 2016 plot and 4.8 ha of 2018 plot manually.	deployed from February 2020 to early December 2020..
A.3.2	Fire protection line and inspection road	3 km	3 km for Mae Moh plot site 3 km for Takua Pa plot site	Inspection road was in-kind contributed by EGAT. For Mae Moh plot site. For Takua Pa plot site has been finished by constructor.
A.3.3	Demarcation and wind protecting	3 ha	4.8 ha at Mae Moh and 0.5 ha at Takua Pa	Fencing and protection from direct sunlight installed at Mae Moh site.
A.3.4	Planting & Tending	2,200 plants	2,420 EETS plants will be planted at Mae Moh plot site and, another 400 EETS plants were planted at Takua Pa plot site.	-600 tree plants and 1,000 [illegible]na plants will be planted as a nurse plant at Mae Moh plot site. -Takua Pa plot site, finished planting.
A.3.5	Monitoring/supervising of site preparation, planting and tending	90 days	133 days	2 monitoring
A.4 Documentation of biophysical site properties, planting techniques and assessment of growth				
A.4.1	Soil analysis	39 samples	-15 samples for Mae Moh plot site - 24 samples for Takua Pa plot site	In the process
A.4.2	Purchase of microclimate sensors	0	0	Microclimate sensors were out of order. The Data will be used from Mae Moh

Activity No.	Key Activity	Objectively Verifiable Indicators in 2019		Comments
		Target	Accomplishments	
				Mine and Phang Nga Forestry Research Station.
A.4.3	Purchase of height meter (vertex) /shredder machine	0	0	
A.4.4	Purchase of diameter tapes/ shredder machine	0	0	
B. Regional Workshop		1 workshop	1 workshop	A Regional Workshop in Malaysia was held during 7-8 November 2019. 4 Persons from Project staff were attended the workshop which 1 staff was funded by Malaysia.
C. Technology Transfer and Capacity Development				
C.1	Cross visits	7 persons for 42 days	7 persons 42days	7 Project staffs from Thailand join with 3 persons from Malaysia went to Korea during 16-21 December 2019.
C.2 Knowledge and technology transfer				
C.2.1	Manual	250	0	Soil manual will be published in August 2020 .
C.2.2	Leaflet	250	0	
C.2.3	Poster and roll up	10 sets	0	
C.2.4	Website maintaining	1 website	1 website	The website is maintained and update regularly.
D. Local Operation				
D.2	Attending overseas meetings	1 person	1 person	
D.3	Inception Meeting	-	-	
D.4	Annual report	1 report	1 report	2018 annual report

D.5 Miscellaneous				
D.5.1	Office supply	1 year		

Activity No.	Key Activity	Objectively Verifiable Indicators in 2019		Comments
		Target	Accomplishments	
D.5.2	Phone, Fax, Mailing costs	1 year	1 year	
D.5.3	Office automation	1 year		
D.5.4	Local full-time administrative officer (contract)	1 person	1 person	
D.6	PCC Meeting	1 meeting	2 PCC meeting	Held in Malaysia in August and November 2019
D.7	Stakeholder Meeting	-	-	

2.3.3 EETS status

	Species *(alphabetical order)*	IUCN-Red/ Non-IUCN-Red	Location of plantation	Actual number of planting seedlings, including re-planting ones	Survival rate (as of 2019) (%)	Remarks
	1. Malaysia (Bidor, 6.8 ha in total, 1st plot- 3.0 ha, 2nd plot- 3.8 ha)					
1	*Aquilaria malaccensis*	IUCN-Red List	1 & 2	600	94.2	Mortality is mainly due to wildlife
2	*Dipterocarpus cornatus*	IUCN-Red List	2	180	99.4	Mortality is mainly due to wildlife
3	*Dipterocarpus baudii*	IUCN-Red List	2	300	99.2	Mortality is mainly due to wildlife
4	*Dryobanalops aromatica*	IUCN-Red List	2	150	100	Mortality is mainly due to wildlife
5	*Hopea helfri*	IUCN-Red List	1&2	245	86.8	Mortality is mainly due to wildlife
6	*Lagerstroemia langkawiensis*	IUCN-Red List	1&2	350	100	Mortality is mainly due to wildlife
7	*Shorea glauca*	IUCN-Red List	1&2	250	96.3	Mortality is mainly due to wildlife
8	*Shorea longisperma*	IUCN-Red List	2	50	100	Mortality is mainly due to wildlife
9	*Shorea multiflora*	IUCN-Red List	2	90	94.4	Mortality is mainly due to wildlife
10	*Shorea platyclados*	IUCN-Red List	2	200	100	Mortality is mainly due to wildlife
11	*Shorea sumatrana*	IUCN-Red List	1&2	250	95	Mortality is mainly due to wildlife
12	*Parashorea stellate*	IUCN-Red List	2	50	100	Mortality is mainly due to wildlife
13	*Dipterocarpus charteus*	IUCN-Red List	1	150	96.4	Mortality is mainly due to wildlife
14	*Hopea ferruginea*	IUCN-Red List	1	50	10.7	Mortality due to root diseases
15	*Neobalanopcarous heimii*	IUCN-Red List	1	165	93.9	Mortality due to wildlife
16	*Dryobalanops oblongifolia*	IUCN-Red List	1	50	96	Mortality due to wildlife
17	*Palaquium maigayi*	IUCN-Red List	1	80	96.7	Mortality due to wildlife

	Species *(alphabetical order)*	IUCN-Red/ Non-IUCN-Red	Location of plantation	Actual number of planting seedlings, including re-planting ones	Survival rate (as of 2019) (%)	Remarks
	2. Thailand (9.68 ha in total, Mae Moh- 8.68 ha, Takua Pa- 1 ha)					
1	*Aquilaria crasssna*	National Rare, Non- IUCN-Red	- Mae Moh - Takua Pa	1. 300 2. 225 1. 100	1. 24.33 2. – 1. 54.00	As Nov 2019
2	*Aquilaria malaccensis*	National Rare and Threatened, Non- IUCN-Red	- Mae Moh - Takua Pa	2. 25 2. 100	2. - 2. -	
3	*Cotylelobium lanceolatum*	National Rare and Threatened, Non- IUCN-Red	- Mae Moh - Takua Pa	1. 300 2. 25 1. 100	1. 28.00 2. - 1. 74.00	
4	*Dalbergia cochinchinensis*	Vulnerable IUCN-Red	- Mae Moh	1. 730 2. 550	1. 88.67 2. -	
5	*Dalbergia cultrata*	Near threatened IUCN-Red	- Mae Moh	2. 420	2. -	
6	*Dalbergia oliveri*	Endangered IUCN-Red	- Mae Moh	1. 300 2. 275	1. 67.33 2. -	
7	*Dillinia ovata*	National Threatened, Non- IUCN-Red	- Mae Moh	2. 200	2. -	
8	*Magnolia rajaniana*	National Rare and Threatened, Non- IUCN-Red	- Mae Moh - Takua Pa	2. 350 2. 100	2. - 2. -	
9	*Magnolia sirindhorniae*	National Rare, Non- IUCN-Red	- Mae Moh	2. 75	2. -	
10	*Neobalanocarpus heimii*	National Rare, Threatened and Critically endangered, Non- IUCN-Red	- Mae Moh - Takua Pa	1. 300 2. 25 1. 100 2. 100	1. 5.33 2. - 1. 63.00 2. -	

	Species *(alphabetical order)*	IUCN-Red/ Non-IUCN-Red	Location of plantation	Actual number of planting seedlings, including re-planting ones	Survival rate (as of 2019) (%)	Remarks
11	*Parkia sumatrana* subsp. *streptocarpa*	National Threatened, Non- IUCN-Red	- Mae Moh - Takua Pa	2. 225 2. 100	2. - 2. -	
12	*Vatica diospyroides*	National Rare and Threatened, Non- IUCN-Red	- Mae Moh - Takua Pa	1. 396 2. 25 1. 100	1. 69.33 2. - 1. 80.00	
1	*Acacia auriculiformis*	Nursing plant	- Mae Moh	2. 300	-	
2	Banana	Nursing plant	- Mae Moh	1. 1,800 2. 1,000	-	
3	*Cassia siamea*	Nursing plant	- Mae Moh	2. 300	-	
4	*Chrysopogon zizanioides*	Nursing plant	- Mae Moh	2. 54,250	-	

2.3.4 Capacity building activities (training / meetings / workshops)

Outputs/ Activities	2016			2017			2018			2019			Main target
	Total number	Achieved		Total number	Achieved		Total number	Achieved		Total number	Achieved		
		Male	Female		Male	Female		Male	Female		Male	Female	
1 Malaysia													
National Workshop on Domestication of Climax Rainforest Species in Problematic Sites 15-17 November 2016	**25**	17	8	**-**	-	-	-	-					
Seminar on Reclamation, Rehabilitation and Restoration of Disturbed Sites: Planting of National and IUCN Red List Species 15-17 August 2017	**-**	-	-	**40**	22	18	-	-	-				
Regional Workshop on Domestication of Endangered, Endemic and Threatened Species in Disturbed Terrestrial Ecosystems 7-8 November 2019										**20**	12	8	
5th PCM in Malaysia										**9**	5	4	
6th PCM in Malaysia										**7**	3	4	

Outputs/ Activities	2016			2017			2018			2019			Main target
	Total number	Achieved		Total number	Achieved		Total number	Achieved		Total number	Achieved		
		Male	Female		Male	Female		Male	Female		Male	Female	
2 Thailand													
PSC meeting in Thailand	**15**	10	5	**-**	-	-	**-**	-	-				Consult about the Project
Inception meeting	**11**	8	3	**-**	-	-	**-**	-	-				Start project consultation and site visit
PCC meeting in Thailand	**10**	5	5	**-**	-	-	**15**	9	6				Consult, planning and progress report
Stakeholders meeting	**111**	61	50	**36**	27	9	**-**	-	-				Stakeholders around the project site understood and known the target of the project
Domestication of Endangered, Endemic and Threatened Plant Species in Disturbed Terrestrial Ecosystem	**-**	-	-	**-**	-	-	**47**	29	18				To know ASEAN Countries work about Planting and Visit the Project site
Evaluation workshop (ccv to ROK)	**-**	-	-	-	-	-	-	-	-	11	6	5	

2.3.5 Advocacy materials and publications

	Type	Title	Number	Year	Language
1. Malaysia					
1	Brochure	Domestication of Endangered, Endemic and Threatened Plant Species in Disturbed Terrestrial Ecosystem in Malaysia and Thailand	1	2018	English
2	Research Article	- 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	1	2016	English
		- ANG LH. 2017. Successful greening models of some disturbed sites in Peninsular Malaysia. Pp 6–14 in Ho WM, Jeyanny, V, Sik HS & Lee CT (Eds) Proceedings of the Seminar on Rehabilitation and Restoration of Disturbed Sites: Planting of National and IUCN Red List Species. Forest Research Institute Malaysia, Kepong. eISBN 978-967-2149-08-8.	1	2017	English
		- ANG LH, HO WM & TANG LK. 2017. Domestication of ten endemic, endangered and threatened tree species in a degraded terrestrial ecosystem in Peninsular Malaysia. Pp 114–118 in Ho WM, Jeyanny, V, Sik HS & Lee CT (Eds) Proceedings of the Seminar on Rehabilitation and Restoration of Disturbed Sites: Planting of National and IUCN Red List Species. Forest Research Institute Malaysia, Kepong. eISBN 978-967-2149-08-8.	1	2017	English
		- HO WM, ANG LH, TANG LK & SITI ZAHARAH MI. 2017. Can ex-tin mine be a depository for indigenous and red list species? Pp 119–123 in Ho WM, Jeyanny, V, Sik HS & Lee CT (Eds) Proceedings of the Seminar on Rehabilitation and Restoration of Disturbed Sites: Planting of National and IUCN Red List Species. Forest Research Institute Malaysia, Kepong. eISBN 978-967-2149-08-8.	1	2017	English
		- HO WM & SIK HS. 2017. Impacts of *Hopea odorata* stand on biomass acccumulation and carbon cycle in an ex-tin mine. Poster presented at the 3rd Restoring Forests Congress, 12–14 September 2017, Lund.	1	2017	English
		- 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.	1	2017	English
		- LAI HOE ANG , WAI MUN HO , LAI KUEN TANG , HO SANG KANG AND DON KOO LEE. 2018. The survival and Vegetative Growths of a 60 Month-Old Tropical Rainforest Tree Species Trial Established under a *Hopea odorata* Nurse at an Ex-Tin Mine in Peninsular Malaysia. Journal of Environmental Science and Engineering B 7 (2018) 131-140.	1	2018	English

		- HO WM., FARIDAH, AA, AMIR SAAIFFUDIN K. & ANG LH. 2018. Assessment of growth And Biomass of *Shorea roxburghii* G.Don In Selected Area of Peninsular Malaysia. International Journal of Agriculture, Forestry and Plantation. 7(Dec): 41-45. ISSN 2462-1757.	1	2018	English
		- ANG LH, HO WM & TANG LK. 2018. Survival of ten endemic, endangered and threatened tree species grown on slime tailing at six months after planting. Pp 238-239 in Che Fauziah I, Mohd Izuan EH, Daljit SK, Muhammad Firdaus S & Annur MR (Eds) Proceedings of the 10th International Symposium on Plant-Soil Interactions at Low pH June 25-28, 2018, Putrajaya. ISBN 978-967-16101.	1	2018	English
3	Poster	- Ang LH, Ho WM, Tang LK, Kang HS & Lee DK. 2019. The survival and vegetative growth of a 60-month-old tropical rainforest tree species trial established under Hopea odorata nurse stand at an ex-tin mine in Peninsular Malaysia. Poster presented at the Malaysian Society of Plant Physiology Conference, 27-29 August 2019, Kota Kinabalu.	1	2019	English
		- Ang LH. 2019. Lessons learnt from reclamation, rehabilitation and restoration of some disturbed terrestrial ecosystems. Paper presented at the Regional Workshop on "Domestication of endangered, endemic and threatened species in disturbed terrestrial ecosystems", 7-8 November 2019, Kepong.	1	2019	English
		- Ang LH. 2019. Some challenges in domestication of endangered, endemic and thretened tree species in Malaysia. Paper presented at the Regional Workshop on "Domestication of endangered, endemic and threatened species in disturbed terrestrial ecosystems", 7-8 November 2019, Kepong.	1	2019	English
		- Ang LH. 2019. Paper presented at the Workshop on Enhancing Capacity in International Forest Cooperation, 19 December 2019, Daejeon.	1	2019	English
2. Thailand					
1	Audio-visual presentation	Project Website	1	2016-2019	English
2	Report	Annual Report 2016 and Annual Report 2017	30, 20	2016, 2017	English
3	Brochure	AFoCo Regional Project: Domestication of Endangered, Endemic and Threatened Plant Species in Disturbed Terrestrial Ecosystem in Malaysia and Thailand	500	2016	English
4	Manual	Weed manual of Mae Moh Mine Project Site 2018	250	2018	English

2.3.6 Procurement status

No.	List (model description)	Plan	Actual	Location	Remarks
Country: Malaysia					
1	GPS			FRIM, Bidor, Malaysia	2017
2	Height meter	2	2	FRIM, Bidor, Malaysia	2017
3	Diameter tape	3	3	FRIM, Bidor, Malaysia	2017
Country: Thailand					
1	Purchase of microclimate sensors	4	5		3 data loggers and 1 USB with interface cables in 2016,2017 (Waste)
2	Height meter (vertex)	2	2	Northern Forest Tree Seed Center and Southern Forest Tree Seed Center	2017
3	Diameter tape	4	4	Northern Forest Tree Seed Center and Southern Silvicultural Research Center	2017
4	High resolution digital camera	2	2	Northern Forest Tree Seed Center and Forest Tree Seed Research and Management section	2016
5	Samsung Galaxy S7 edge	3	3	Northern Forest Tree Seed Center，Forest Research and Development Bureau and Forest Tree Seed Research and Management section	2016
6	Notebooks	2	2	Northern Forest Tree Seed Center and Forest Tree Seed Research and Management section	2016
7	Projector	1	1	Forest Tree Seed Research and Management section	2016
8	Digital cameras	1	2	Northern Forest Tree Seed Center and Forest Tree Seed Research and Management section	2016
9	Printers	2	2	Northern Forest Tree Seed Center and Forest Tree Seed Research and Management section	2016
10	Shredder machine	1	1	Northern Forest Tree Seed Center	2018
11	Insect sprayers	2	2	Northern Forest Tree Seed Center and Southern Silvicultural Research Center	2018
12	Scanner		1	Forest Tree Seed Research and Management section	2017
13	Monitor		1	Forest Tree Seed Research and Management section	2017

3. Financial Report *(to be finalized in March 2020 after audit)*

3.1 Malaysia

3.1.1 Statement of Cash Flow

3.1.2 Balance Sheet

3.1.3 Supplementary Funding

3.2 Thailand

3.2.1 Statement of Cash Flow

3.2.2 Balance Sheet

3.2.3 Supplementary Funding

Description	Amount (USD)
Office car บ0753 สุโขทัย 5 days	625
Office car ยง4253 เชียงใหม่ 14 days	1,750
Office car 2กน2370 กทม 26 days	3,250
Office car กจ 2638 สงขลา 15 days	1,875
Office car สน8560 กทม 19 days	2,375
Office car บบ8898 ขอนแก่น 3 days	375
Watering truck 83-9051 นครราชสีมา	2,200
Office 6 wheels trucks 80-8543 ลำปาง and 80-7695 พะเยา	4,000
Office space at RFD	2,000
Office at Northern Seed Center, Ngao Lampang	1,000
Planting area 0.5 ha at Mae moh mine	14,000
Electricity	1,000
Water supply for offices and planting sites	3,500
Telephone and internet for 20 officers	300
Salary for 20 officers for 12 months	365,000
Meeting rooms for Thai Evaluate committee team meeting at Mae Moh mine 1 day (contribute by EGAT)	1,000
Meeting rooms for Thai Evaluate committee team meeting at meeting at Takua Pa 1 day (contribute by Kasetsart University)	1,000
Meeting rooms for Project Evaluate committee meeting at Mae Moh mine 1 day (contribute by EGAT)	1,000
Meeting rooms for Project Evaluate committee meeting at meeting at Takua Pa 1 day (contribute by Kasetsart University)	1,000
CAT Motor Grader 2 days (clearing inspection road and fire line) (contribute by EGAT)	500
Renovation of fence	100

EETS seedlings for refilling dead plants	2,000
Total	409,850

4. Issues & Lessons Learned

4.1 Malaysia

No.	Description of Issues	Actions Taken and Lessons Learned
1.	Disturbance by wild animals	The perimeter fence has been established in 2017 to prevent intrusion of wild animals. However, it was found that the fence has to be repaired almost daily to prevent more serious damages.
2.	Choice species at planting site	In 2017 planting, it was noted that *Hopea ferruginea* was prone to attack by wild boar. This species was not chosen for the 2019 planting.
3.	Delay in procurement issue	Application for procurement of planting and tending for 2019 has been submitted the year before in 2018. Therefore, the planting in 2019 could be performed on time.

4.2 Thailand

No.	Description of Issues	Actions Taken and Lessons Learned
1.	Encroachment and attack of Seedlings/ Saplings by cows causing loss of plants and cost by replanting	Fencing
2.	Mortality 2.1 The plant species from high moisture forest such as *Neobalanocarpus heimii*, *Cotylelobium lanceolatum* 2.2 Insect attack	 2.1 Planting of this species will be avoided in dry site. 2.2 Insecticide using, bio-chemical is not done
3	Big hole planting technique	Dr. Ang Lai Hoe and Dr. Ho Wai Mun visited Thailand to give advice on big hole planting.

(Photos are in **Annex-12.**)

5. Conclusion and Recommendation

5.1 Malaysia

- Quality assessment on the annual achievements

The AFoCo project site in Malaysia accounted for 6.8 ha with 3 ha planted in 2017 and 3.8 ha in 2019. To-date, a total of 17 species and 3,160 trees were planted in this project. For 2019 planting, it was observed that all seedlings had above 90% of survival at six months after planting. Six out of 12 species planted recorded almost 100% of survival which included *Shorea sumatrana* and *Aquilaria malaccensis*. Both species also achieved considerable growth which can be recommended for planting at other similar degraded sites.

- Narrative outcome assessment

The project with 17 species of endangered, endemic and threatened species (EETS) planted could be model plots of rehabilitation and conservation on ex-tin mine. The site has already been visited by local government and non-government agencies/ organizations as well as participants of international workshop. In future, more visits from both local and international bodies are expected with sharing of knowledge in establishing a repository of EETS in a degraded area.

- Recommendations on project management

From this project, it was learnt that some species are vulnerable to attacks by wild animal and thus is not suitable to be planted on the site. In the 2019 planting, 12 species were selected and all have recorded high survival indicating that all species chosen were suitable to be planted at the ex-tin mine. These species could thus be recommended as choice species for similar sites as a repository for EETS provided substantial tending of plants for at least three years and protection from encroachment by wild animals.

5.2 Thailand

- Quality assessment on the annual achievements

The results that show in the 2016 plot reveal that *Neobalanocarpus heimii* is the least surviving at Mae Moh plot site while *Dalbergia cochinchinensis* is the most. For Takua Pa plot site, *Vatica diospyroides* is the most surviving but *Aquilaria crassna* is the least but it still higher than Mae Moh mine plot site.

For growth analysis, Mae Moh mine plot site *Dalbergia cochinchinensis* is the highest height while *Cotylelobium lanceolatum* is the lowest height. For Takua Pa site, *Vatica diospyroides* is the highest height while *Cotylelobium lanceolatum* is the lowest height, the same as Mae Moh plot site but it's still higher than Mae Moh plot site.

Nurse plant: Banana is an effective nursing plant that can provide shade, soil moisture and cool atmosphere for the planted seedlings. Spacing between the banana and the seedling must be concerned. 1 meter away was proved too close since the banana seems to overgrown the seedlings. This year, we were included *Senna siamia* and *Acacia auriculiformis* as a nurse plant.

Shading: Plastic shading is necessary for EETS from rain forest such as *Aquilaria crassna*, *Magnolia sirindhorniae*, *Dillenia ovata*, *Magnolia rajaniana*, *Pakia sumatrana, Aquilaria malaccensis* but not for *Dalbergia cochinchinensis* and *Dalbergia oliveri* and *Dalbergia cultrata* which are the species from dry deciduous forest. Surrounded by plastic sheet has practiced this year.

Weeding: Herbicide or any chemical is not allowed at Mae Moh mine. More frequency of manual weeding therefore is needed to be performed. The weed, however, plays role as ground cover to prevent soil erosion in slope area like Mae Moh dumping site.

Watering: In the dry season, Mae Moh site is very dry. Watering as often as possible will be the best practice but costly. Mulching with rice straw is one thing to keep soil moisture content. In the year of 2019, At Mae Moh mine has long dry weather in rainy season that the watering has been done in rainy this year.

Soil: Mae Moh plot site is land reclamation (soil dumping) that the soil is very poor and tight. This year, study focuses on planted *Chrysopogon zizanioides* around the edge of the base tree to protect soil erosion, water erosion and root of *Chrysopogon zizanioides* help to loose soil density and increase soil porosity. Soil collection sample for analysis should be collected only 1 sample/point because of land reclamation.

- Narrative outcome assessment

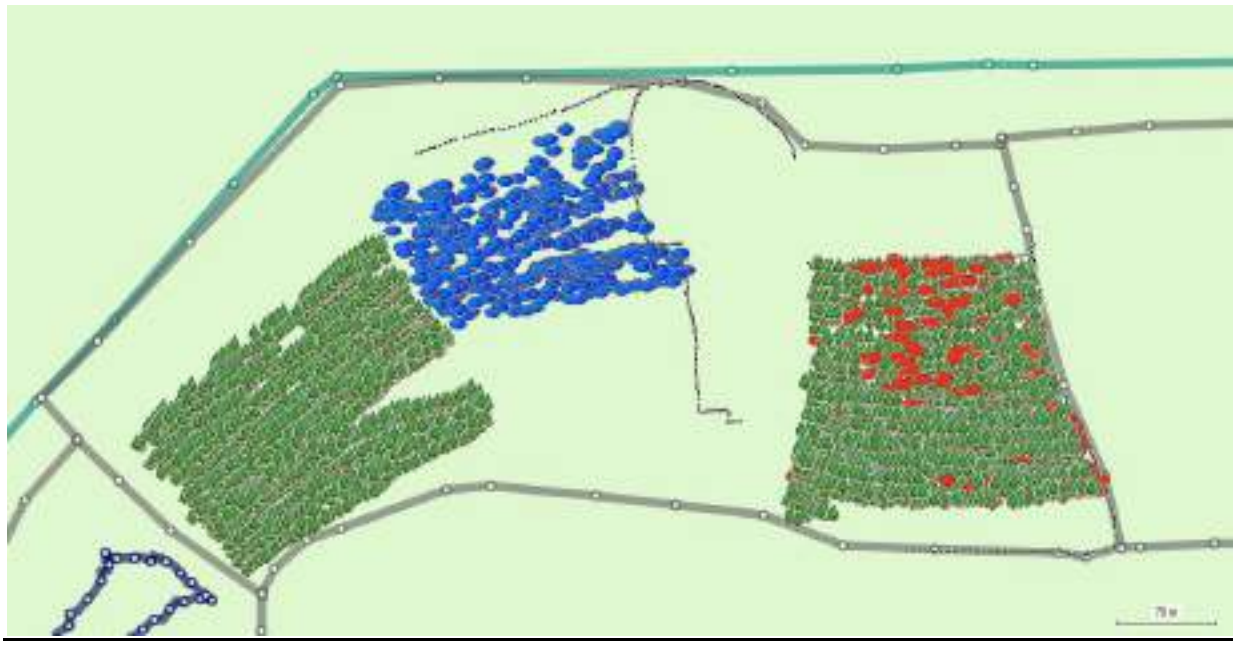
  n/a

- Recommendations on project management

  n/a

Annex-1. Site locality maps and establishment of model plots in Bidor, Malaysia

- Site locality maps



Note: Green marker represents planted trees, red marker represents existing & regenerated trees, blue marker represents regenerated trees in non-planted area.

Green markers on left side of the map indicate trees planted in 2017 while those on the right were planted in 2019. A regeneration study was also conducted to compare the type and number of regenerated trees in planted and non-planted areas.

It was found that regeneration on ex-mining area was contributed by enrichment planting which encouraged the visit of birds which brought seeds. A survey revealed that there are a total of 5 dominant species which are pioneer species/ late secondary species.

- Establishment of model plots

Site preparation of 2019 planting

A total of 12 species and 1,650 seedlings of endangered, endemic and threatened species planted in the new 2019 planting site.

The 5th and 6th PCM were held in the traditional spirit of ASEAN-ROK cooperation and cordiality on 7–8 August and 6 November 2019, respectively in FRIM. Visit to the project site in Bidor, Perak was also conducted after each Meeting.

Site visit to 2017 (left) and 2019 (right) AFoCo planting sites on 8 November 2019 representatives from Royal Forest Department, Thailand and AFoCO Secretariat.

Annex-2. Regional workshop

- Title: Regional Workshop on “Domestication of Endangered, Endemic and Threatened Species in Disturbed Terrestrial Ecosystems”
- Date: 7–8 November 2019
- Total participants & lecturers: 20 persons (9 ASEAN countries + ROK)
- Total papers presented: 3 keynote papers, 12 oral papers (including by 3 post-graduate students)
- Average satisfaction score: 4.57/5.00 (based on 12 respondents)
- Best presentation: Awarded to Ms Kee Sze Lue (Panel of judges: Dr Ang, Dr Sakhan & Dr Rogelio)
- Summary:

  The Workshop was officiated by FRIM Director General, Datuk Dr Abdul Latif. It began with a 1-day classroom presentation by invited speakers and representatives from nine ASEAN countries. The three invited speakers were Dr Ang Lai Hoe (Malaysia), Dr Sakhan Teejuntuk (Thailand) and Dr Rogelio T. Andrada II (Philippines). This was followed by country presentations from Cambodia, Indonesia, Myanmar, Singapore, Thailand and Vietnam. All presentations discussed mainly on efforts in rehabilitation and conservation of native or endangered plants across the region with particular interest on challenges in the former. Five post-graduate students from both public and private universities also joined the Workshop and three presented findings on their Masters projects. Out of the 8 oral presentations by participants, the Best Presentation Award was given to Ms Kee from University Malaysia of Sabah.

  On the second day of the Workshop, participants and invited speakers were brought to FRIM Research Station in Bidor which is also the current AFoCo project site. The participants were given a briefing by Dr Ang LH, Station Coordinator, regarding plantings of endemic, endangered and threatened species (EETS) at the AFoCo project site in year 2017 and 2019. The site is a model of rehabilitation of ex-tin mine with EETS as an *ex-situ* conservation effort. Besides being introduced about the environment in an ex-tin mine, the visitors were also briefed on the site treatments and selection of species in order to ensure good survival and growth of the EETS.

Collage of photos during Opening Ceremony on 7 November 2019

Site visit to AFoCo planting site in FRIM Research Substation in Bidor on 8 November 2019

Annex-3. Cross Country Visit to Thailand on 14–19 October 2019

A cross country visit by Dr Ang LH and Dr Ho WM was organized 14–19 October 2019 to visit and provide technical assistance at Mae Moh and Phang Nga in Thailand. Counting of survival at both sites was also conducted. During the visit to Mea Moh planting site, soil around the plantings was being loosened as mine tailings can be highly compacted affecting water retention capacity in soil and retarding root growth. Big hole planting was suggested for both degraded sites and the holes measuring 1m X 1m X 1m were filled with original soil added with ash (as organic material) and good soil at a prescribed ratio. After planting, the hole was to be covered with rice straw as mulching. After observing the planting of trees, the teams from both Malaysia and Thailand conducted a survival count on the trees at both sites.

Survival counting at Mae Moh (left) and planting at Phang Nga (right).

Annex-4. Cross Country Visit to Indonesia on 2-6 December 2019

Another cross country visit to Bogor Botanical Garden (BBG) by Dr Ang LH and Ms Tang LK on 2–6 December 2019. The visit was to determine the number of dipterocarps that are domesticated in the BBG. This will help in planning for the next project on domestication of dipterocarps that are now growing on sinking land mass and possible volcanic threats. In addition, it helps to record the available germplasm of the dipterocarps in BBG for future reference. Total of genus of the dipterocarps in BBG is 11 and has 65 species.

Annex-5. Poster presented at the Malaysian Society of Plant Physiology Conference, 27–29 August 2019

The Survival and Vegetative Growths of a 60 Month-Old Tropical Rainforest Tree Species Trial Established under a *Hopea odorata* Nurse Stand at an Ex-Tin Mine in Peninsular Malaysia.

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Abstract

AFoCo (Asian Forest Cooperation) Project in 2011 has funded a research and development project in Malaysia for enriching a mono-species stand established in an ex-tin mine. The project covered only for a period of 12 months. A study plot of 1 ha size was established in TTAC (Tin Tailings Afforestation Centre). Twenty indigenous tropical rainforest tree species were planted and their five year-old survival count, diameter and H (top height) growths are reported in this study. Some of them are red list species of IUCN (International Union of Conservation of Nature). The survival of the 1 ha planting trial was 53%. Mortality of the tree species is mainly caused by wild boars. The tropical rainforest tree species in this planting trial had similar growth to those planted at good mineral soils. This paper also documented the tending treatments which were implemented during post-planting that have contributed to healthy growth of the mixed-species stand. The mixed-species stand is being properly tended till to-date and hence sustained growth of the stand is anticipated.

Key words: Rainforest species trial, ex-tin mine, restoration, red-list tree species.

1. Introduction

Tin mining activities completely destroy the terrestrial ecosystem and reduce once diversified tropical rainforest into denuded ex-tin mines. Ex-tin mine is an impoverished site comprising slime and sand tailings and has adverse microclimate for plant growths and hence poor in natural regeneration [1]. An ex-tin mine covering 121.5 ha was successfully greened by FRIM in 2002 and it is known as TTAC (Tin Tailings Afforestation Centre), which is located at Bidor, Perak in Peninsular Malaysia [2]. The greened site has been a model for rehabilitation of ex-tin mines in Malaysia and the region comprising 20 timber tree species [3,4]. These man-made forests established in TTAC are but an island surrounded by farmlands, housing estates and oil palm plantation. Hence, the species composition of the natural regeneration is lack of main climax tree species of lowland rainforest [5]. The demonstration plot is a mixed stand of twenty rainforest tree species established under the nurse species Hopea odorata. This paper aims to document the survival and vegetative growth of the mixed stand of rainforest tree species established on a greened slime tailings site at five years after planting.

2. Material and Methods

2.1 Study Site

A study plot was established under a ten-year-old Hopea odorata stand grown at slime tailings located in TTAC, Bidor, Perak, Peninsular Malaysia. The study site has an average monthly rainfall of 283-290 mm, average daily maximum temperature of 34 to 35 °C and average mean daily minimum temperature of 22 to 24 °C [5]. The ten year-old nurse stand of H. odorata was with mean stand height and mean stand diameter of 13.3 ± 2.5 m and 8.7 ± 2.8 cm, respectively. The undergrowth mainly comprised of early pioneer plant species and they were cleared between the 4 × 5 m interspace of the two planting rows. The distance between two planting rows is 5 m apart. The slime tailings were then loosened to a depth of 1 m using a back-hoe machine. Planting hole of each planting point was dug manually with a specification of 30 cm radius and 50 cm depth. The planting distance was at 2 × 2 m for each planting point. The 1 ha plot is located between two forest roads namely Jalan Biodiversiti and Jalan Pasir in TTAC, it is further divided into two subplots of each 0.5 ha size (Figure 1).

Fig. 1 The location of the two subplots (not to scale) in TTAC.

2.2 Planting Stock

Seedlings of twenty rainforest tree species had an average height of 45-50 cm and collar diameter of < 1 cm were acclimatized for three months before planting. They were planted during the wet season in December 2011.

2.3 Survival and Growth Parameters

The survival of each species was counted. The diameter at breast height (dbh) was measured at 1.4 m above ground level using a Richter fiber-glass diameter measuring tape. The top height (H) of saplings and trees was measured using a telescopic height measuring stick (Fig. 2). Mean diameter or height annual increment is calculated by mean diameter or height divided by five years (Mean dbh/5 or H/5).

Fig. 2 Height measurement of the rainforest trees grown under the *Hopea odorata* stand.

Fig. 3 Debarking of trees by the wild boars which eventually killed the five year-old *Dryobalanops aromatica*.

4.0 Results and Discussion

4.1 Survival

Mortality of the planting is mainly due to destruction of seedlings by wild boars which contributed to 90% of the total mortality of the mixed stand (Fig. 3). Generally, dipterocarp species had higher survival count than non-dipterocarps grown on the greened slime tailings . *Shorea roxburghii* had survival more than 80%, followed by *Neobalanocarpus heimii* and *Dryobalanops aromatica*. Shorea platyclados in this study had the lowest survival of 54.2%, as it severely suffered from wild boar attacks. However, despite growing in an impoverished slime tailings site, it has the same range of survival as it was planted in a good mineral soils of a logged-over forest [10].

3.2 Mean dbh and MAID (Mean dbh Annual Increment)

Table 4 shows that Forest tree species grown on slime tailings had greater MAID than those grown in a good mineral soils at a logged-over forest [10,11].

3.3 Mean H and Mean Annual Top Height Increment

Interesting to note that *Shorea platyclados*, *Neobalanocarpus heimii*, *S. parvifolia*, *S. curtisii*, *Agathis borneensis* and *Pentaspadon motleyi*, *S. accuminata*, *S. macroptera*, *Sindora cordacea* and *S. curtisii* are species used for enriching the timber stock in logged-over forests which have good mineral soils [10,11]. They are now grown to survive and grow healthily in a greened slime tailings site under the nurse stand of Hopea odorata (Table 5).

4.0 Conclusion

Based on the results of survival and vegetative growth parameters of the mixed-species stand grown on slime tailings, most of selected tropical rainforest tree species are suitable for growing on the improved slime tailings through under-planting the nurse stand except strong light demander such as Melaleuca cajuput. It is important to highlight the good growth for most of the species in the five year-old mixed stand is largely contributed by the proper tending practices being implemented. To reduce further mortality caused by wild boars to the mixed stand, a research on how to prevent the wild boar attacks may need to be conducted. The tending practices of the mixed-species stand developed in this study provide a plantation know-how to further enrich a successful rehabilitation phase of ex-tin mine from a mono-species stand to a mixed-species stand which will eventually lead to restoration success of turning barren ex-tin mine into a man-made tropical forest.

Annex-6. Evaluation workshop and cross-country visit to the Republic of Korea on 16-21 December 2019

- **Evaluation workshop**

1. Inception evaluation with the Secretariat on 16 December 2019

This evaluation workshop was attended by project members from Forest Research Institute Malaysia (FRIM), Royal Forest Department, Thailand (RFD) and AFoCO Secretariat including Executive Director with aims to i) present progress of the project, and ii) discuss on future implementation of project. The Workshop also discussed on the financial expenditures of the project which was briefed by project leaders from FRIM & RFD.

2. Evaluation workshop with Donor side on 19 December 2019

Dr. Ang Lai Hoe was invited to the workshop to present the current progress of domestication of EETS in Malaysia and Thailand. One paper was presented during the visit to Republic of Korea:
ANG LH, PHUANGPHAN W, SUCHAT K, SOMCHAI N, HO WM, TANG LK, WARANYU R, BANGRAK C, KRITCHANA N & MONTRI I. 2019. Domestication of Endangered, Endemic and Threatened Plant Species in Disturbed Terrestrial Ecosystem in Malaysia and Thailand: Progress and Achievements.

3. Self-evaluation and wrap-up session at the Secretariat on 20 December 2019

During this session, all attendees discussed on the overall achievement of the project and conclude on the visit. The cross country visit to Republic of Korea has allowed the transfer of information and technology to the project members from Malaysia and Thailand. There are several important lessons which can be learnt from this visit. Korea National Arboretum is a very good example of conservation of biodiversity that included species from temperate and even tropical regions. In addition to being a repository for EETS, the arboretum also serves as an area for ecotourism as well as a center of reference thus benefitting both the scientific community as well as the general public. Meanwhile, the Natural Forest Seed and Variety Center, including in the Seed Vault, provides vast opportunities for improvement of planting stocks thus improving yields/production besides its importance as a protected germplasm for genetic biodiversity. The Pocheon Art Valley is also an interesting place where rehabilitation meets landscape beautification and produces income generation through ecotourism and others (filming, photography).

The session ended with an overall presentation on the physical achievements of the project i.e. a total of 16.28ha has been planted in Malaysia and Thailand through this project by domestication of 25 EETS with 8,726 seedlings. The project agreed that refilling has to be done and tending to continue until 2022 when the project ends. The planting sites in both countries can now be a model on conservation of EETS in degraded terrestrial ecosystems which can be replicated under similar conditions using the established methods. The project also agreed that guidebooks can be published from the findings in this project in an effort to share the technology developed. Besides, the project also suggested for display of project achievements during ASOF in year 2020.

- **Cross-country visit to the ROK**

The AFoCo Regional project among AFoCo Secretariat, Malaysia, and Thailand entitled “Domestication of Endangered, Endemic and Threatened Plant Species in Disturbed Terrestrial Ecosystem in Malaysia and Thailand” (the Project) aims to conduct a research to domesticate of plant species in disturbed ecosystem. The project is try to find the most proper methods in order to study, research, knowledge, and lessons for environmental restoration and conservation of biodiversity in the region. The Forest Research Institute of Malaysia (FRIM) together with the Royal Forest Department (RFD) of the Ministry of Natural Resources and Environment, Thailand are the main implementing agencies.

In order to achieve the project goals, the activities to exchange knowledge and develop the potential of personnel through cross visits are plan. According to the 6th Project Coordination Committee Meeting (PCM) on 6 November 2019 at FRIM, Malaysia The meeting agreed to FRIM and RFD to conduct a cross visit to Republic of Korea (ROK) on domestication of plant and biodiversity conservation in disturbed ecosystem Between 16 - 21 December 2019.

10 Participants from Thailand and Malaysia visited Korea National Arboretum, Kwangneung, National Forest Seed and Variety Center, Baekdudaegan Arboretum, Youngju (Seed Vault) and Pocheon Art Valley for knowledge exchanged, lesson and learn.

Korea National Arboretum, Kwangneung

Korea National Arboretum, Kwangneung has been estsblished in 1987, located in UNESCO Kwangneung forest Biosphere Reserve approximately 1,123 ha., including Aquatic Plant Garden, Plants Evolution Garden, Shrub Garden,Lee's Hosta Gallery, Seddum Garden, Temperate House, Forest Museum, Korea National Herbarium, Fern Garden, Peony Garden, Tropical Plant Resources Research Center,Grass Garden, Rare & Endemic Plant Garden, Forest Trail, Needle Fir Trail, Conifir Garden, Wetland Garden,Forest Eco-Deck, Medicinal Plant Garden and Model Garden. (Figure 1) This arboretum has Endemic species 4 species of woody plant.are Hairy pricly caster oil tree, White-flower Korean rhododendron, Gwangneung ash and Hairy Korean Aspen.

Figure 1 a) Map of Korea National Arboretum, Kwangneung b) Needle Fir Trail
c) drawn picture postcard from Lee's Hosta Gallery d) Seed displays as a map

In This arboretum has native plants about 944 species, insect 4,000 species approximately from 49,000 species in the Republic of Korea, 200 species of birds approximately from 500 species in the republic of Korea and about 23% of trees is Korean pine. (*Pinus koraiensis* the most important nut pine species in international trade) but because of global climate change make a period of flower blooming changed the amount of trees have been decreased. And one of important trees species in IUCN Red List of Threatened Species Version 2019-3 is *Abies koreana*, the Korean Emperor tree, The wood has been use for make a furniture.

Figure 2 a) *Abies koreana*, b) *Pinus koraiensis* with 5 needles leaf

1. Forest Museum section, displays forest history has shown a lot of forest stories exhibition, In 1969,,Republic of Korea had a lot of bald mountain, in 1970 start to plant for restoration forest after 2 decade it's become to green area. This museum displays a lot of wood samples and their stories.

Figure 3 a) Bald mountain in 1969, b) *Zelkava serrate* 150 years old
c) Wood samples displays d) Wood sample from Malaysia

2. Wild Forest Plant Seed Bank Section, which including Conservation of plant diversity, Multiplication of useful plant, Conservation and restoration of rare and endemic species and Garden display for Conservation and utilization of wild forest plant seeds

In this section has storage room for conservation seed, short term storage is storage seed less than 5 years at 4^{o}C 40% RH condition, and long term storage is storage seed more than 10 years at -18^{o}C 40% RH condition, storage after seed pass Preservation process. Seed viability test will be done after storage 1, 5, 10 years. Present storage seed for *ex-situ* conservation status of rare species is 414 species, and 177 species of endemic species.

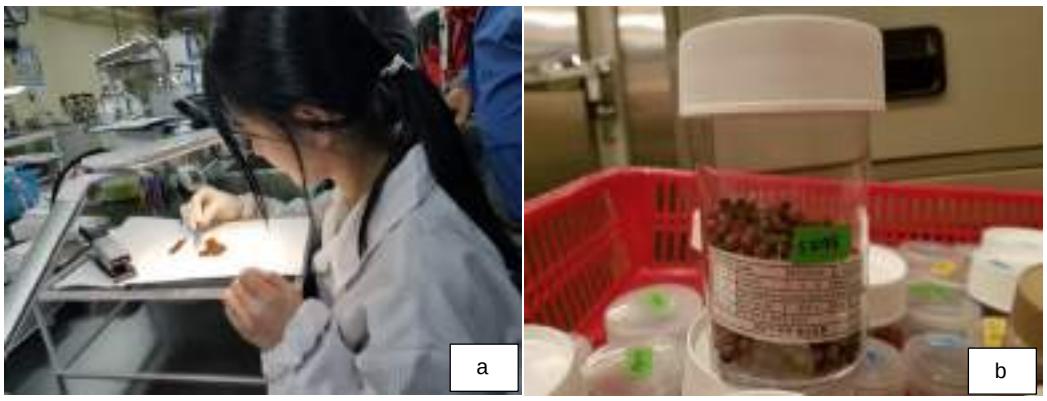

Figure 4 a) Seed purity, b) seed for storage

3. Tropical Plant Resources Research Center, To Research on Tropical plant resources is an investment in the future and Tropical plant resources are valuable assets that should be preserved. There has plant about 3000 species.

Figure 5 a) ASEAN Forest b-d) Sign board explaination tree habbit

National Forest Seed and Variety Center

National Forest Seed and Variety Center, This center has 3 important mission, 1) Plant variety protection and evaluate new varieties 2) Collect and preserve forest bio-resouces and 3) Seed Orchard creation, high quality seed production and distribution. Total seed orchard area 1,757 ha.. The important part of this center is Gene Bank, to manage and operate high qulity seed for distribution. There have a lot of new technology machine to study in seed testing, DNA and tissue cell. This Laboratory is using ISTA's rule for seed testing and has a multi-color scanning electron microscope which usualy SEM printed only in black and white color. There have storage room for short term and mid to long term seed storage.

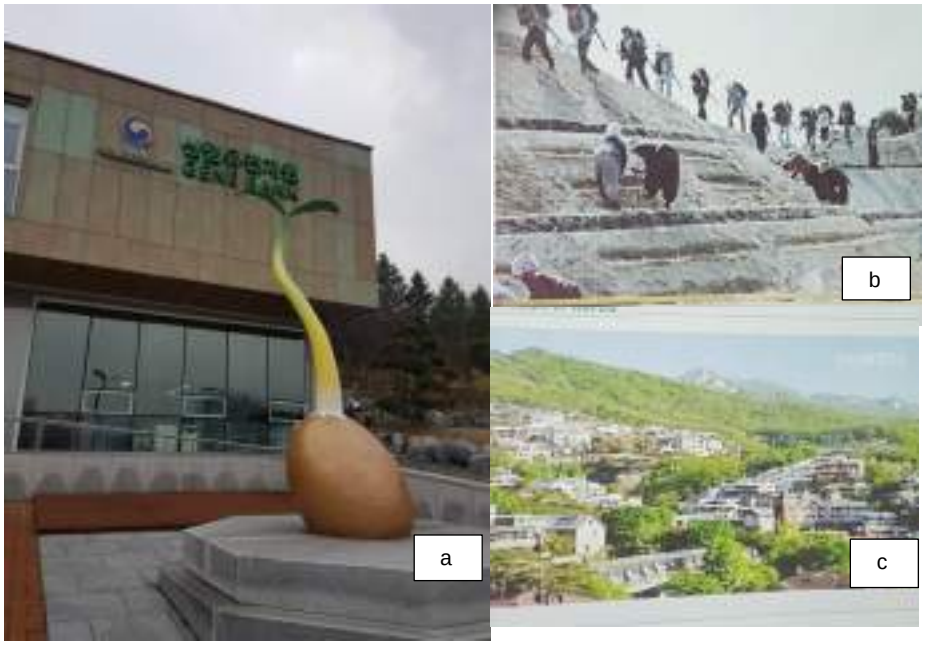

Figure 6 a) In front of Gene Bank b-c) before and after bald mountain planted

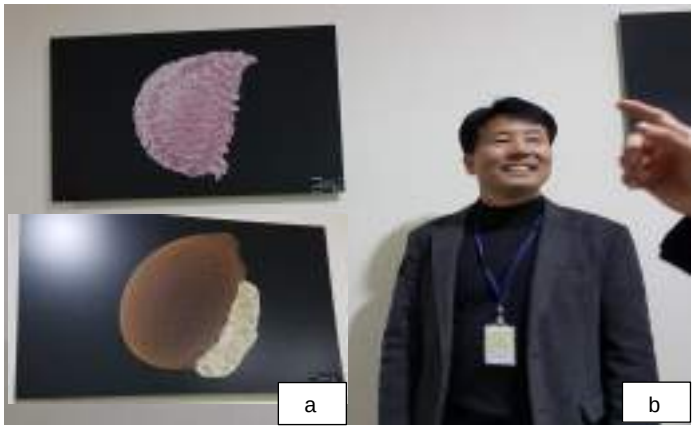

Figure 7 Color picture from Scanning electron microscope

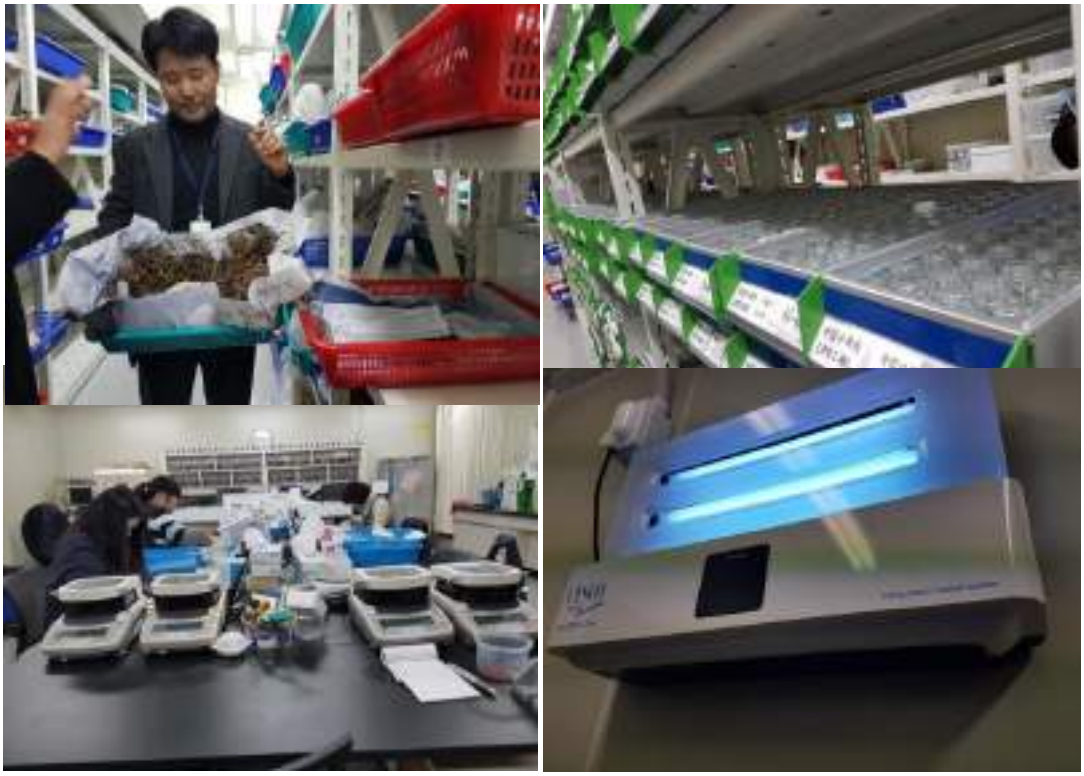

Figure 8 a,b) Fruit and seed drying (15ºC 15%RH),
c) DNA Laboratory
d) Seed insecticide tools

Figure 9 a) Seed testing b) Storage seed and label

Baekdudaegan Arboretum, Youngju (Seed Vault)

Seed Vault is the place to storage seed for long term to preserve germplasm. The storage room is located about 40 m. underground, for keep all of seed survive for human. The seed will be savely backup and delivery to the next generation eventhough we face of ecological crises climate change and diasters. This seed vault has area about 4327 m^2. For long term storage, taget is backup storage of 2 million accessions of worldwide wild plant seeds in 2100. Seed will be decreased moisture to 5 % before storage in seed vault, each bottle contain should not be less than 500 seeds. The temperature inside seedvault – 20^oC with 40%RH.

Figure 10 a) Seed Vault
b) Wall of honor who donate seed to seed vault
c) Inside seed vault

Pocheon Art Valley

Pocheon Art Valley place has established after ex-granite mining rehabilitation. There has a lot of stories and exhibition. This area become to important recreation area for ecotourism. Beautiful scenery that make an important economic for local people.

Figure 11 a) Pocheon Mapping b) Earth exhibition c,d) Decorated area

Figure 12 a) Cheonjuho lake scenery drama shooting place
b) Hosu Open Cocert Hall

Others lesson and learn

Republic Korea is located in temperate Zone, In Winter season, they have to help plant surviving by encase plant stem or cover the base tree with dry grass to make it warm. For Thailand plot site, EETS trees was cover base tree with rice straw. Some tree need to help by supporting there branch for decorated tree form.

Figure 13 a) Encased rose stem b) Enclosed the base stem
c) Drip system along the road d) Cover the base stem
e) Tree branch supporting

Conclusion

After visited those place, Dr. Ang Lai Ho has a conclusion that should be developed new collaborative projects such as Domestication of EETS and Germplasm Preservation of EETS. New Collaboration Projects should be had a project time line by

1. Pre-proposal meeting
2. Submission of proposal
3. Project proposal evaluation
4. Project acceptance

Thailand also will developed a new collaborative project of recalcitrant seed preservation and continue to expand the EETS species to established a small plot in Silvicultural station to observe site matching of EETS.

To preserve the tree, We also did it almost the same, In Republic Korea to make it warm but in Thailand to keep a moisture. In the end of the project, Plot site should be developed to EETS seed production areas, and EETS study trail.

Annex-7. Establishment of model plots (site preparation, planting stock, planting, tending, monitoring)

- **Mae Moh plot site**

Figure 0 Mae Moh site selection for new plot

Plot Site Preparing

Caterpillar was used to prepare plot site and plant hole digging.

Figure 1 a, b) Preparing plot site with Caterpillar c, d) hole and hole line in the plot.

Planting

15-16 October 2019, Dr.Ang Lai Ho and Dr. Ho Wai Mun from Malaysia came to Mae Moh Plot site and gave a good practice how to plant a tree in a big hole.

Figure 2 a) Input soil mixing into the hole b,c,d) Planting, covering with rice straw and shading

Tending

Tending the plot site with

1) Tillage around the base of the tree then mixing and cover with with rice straw after that planted the *Chrysopogon zizanioides* around the edge of the base tree to protect soil erosion, water erosion and root of *Chrysopogon zizanioides* help to loose soil density and increase porosity then shading with camouflage net in dry season.

Figure 3 a) tillage around the base of the tree b) Rice straw mixing
c) planted the *Chrysopogon zizanioides* d) cover with rice straw
e) Shading with camouflage net

2) Weeding should be once a month in rainy season and weeding around the base of EETS tree in dry season.

Figure 4 a, b) Weeding c) After weeding

3) Pruning, In some area nurse plant more shading, It should be pruning to open the shad also some EETS trees should be pruning.

Figure 5 a) After pruning nurse plant b) EETS tree pruning c) After pruning EETS trees

4) Watering, Manual irrigation at Mae Moh plot site all year, especially in dry season should more often watering.

Figure 6 a) truck watering transportation b, c) watering

- **Takua Pa plot site**

Figure 0. Takua Pa site selection for new plot

Plot Site Preparing

The first thing, Using man power to open the line After that caterpillar was used to prepare plot site, soil loosening in 8 line with 2 m. wide 100 m. length 1.5 m. deep, and 400 plant hole digging in 1x1x1 m.

Figure 1 a) Man power line opening b) Clear area by Caterpillar, c) Soil loosening

Figure 2 a,b) Checking hole size after Caterpillar dig a hole c) Hole planting line

Planting

Takua Pa plot site was planted 4 EETS species such as *Magnolia rajaniana*, *Pakia sumatrana, Aquilaria malaccensis,* and *Neobalanocarpus heimii* , 100 trees in each specie.

Figure 3 a) EETS tree planting b) *Aquilaria malaccensis* c) *Neobalanocarpus heimii*
d) *Magnolia rajaniana* e) *Parkia sumatrana* subsp. *streptocarpa*

Tending

Takua Pa plot site, weeding manually and using Dripping irrigation system

Figure 4 Takua Pa plot site after tending

Monitoring

This year, 2 monitoring to evaluate the project had been done 1) RFD Monitoring and Evaluation Committee in June 2019 and 2) AFoCO secretariat in August 2019

Figure 5 a) RFD Monitoring and evaluation b) AFoCO secretariat

Annex-8. Biophysical site properties, planting techniques and assessment of growth and soil, Thailand

Data collection and analysis

2 Plot site, Surviving and growth of EETS were collected until now is 36 months old. Data as shown in Figure2, 3, 4, 5, and 6.

Figure 1. Data collection; a,b) Mae Moh plot site c) Takua Pa plot site

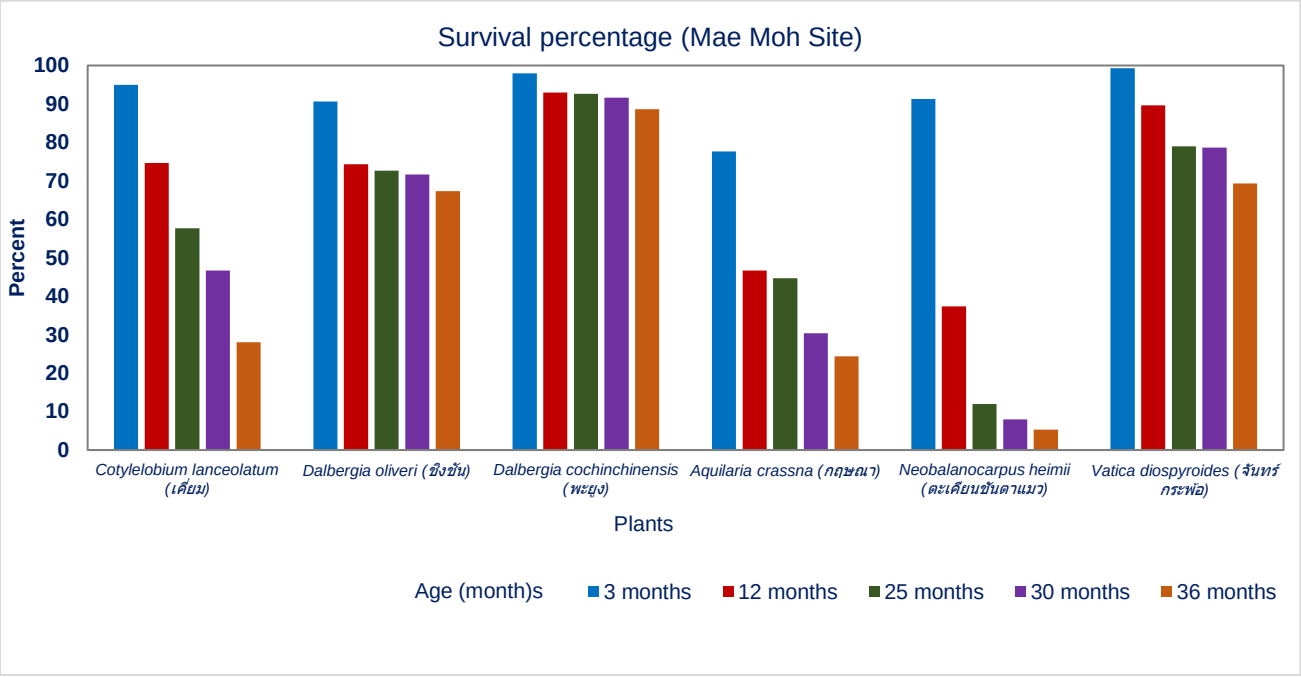

Figure 2. Survival percentage of Mae Moh mine plot site during 3 years

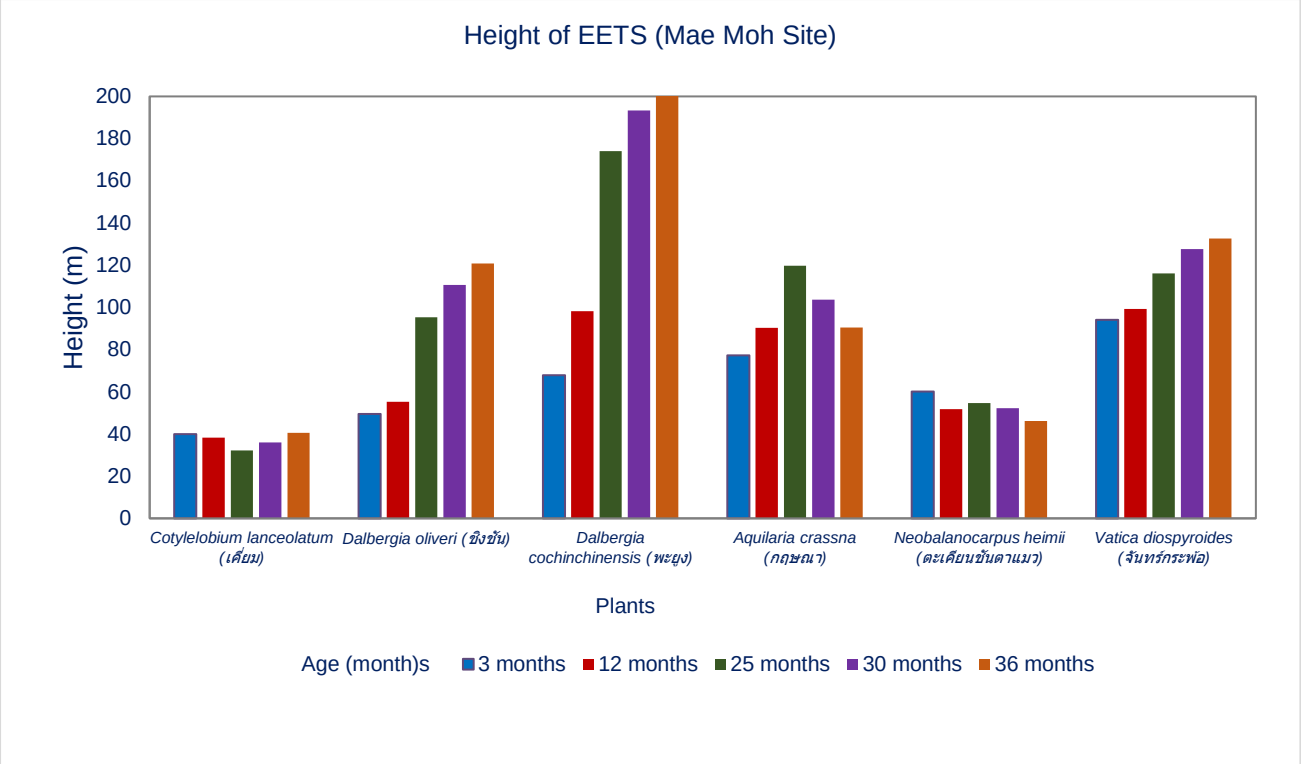

Figure 3. EETS height growth of Mae Moh mine plot site during 3 years

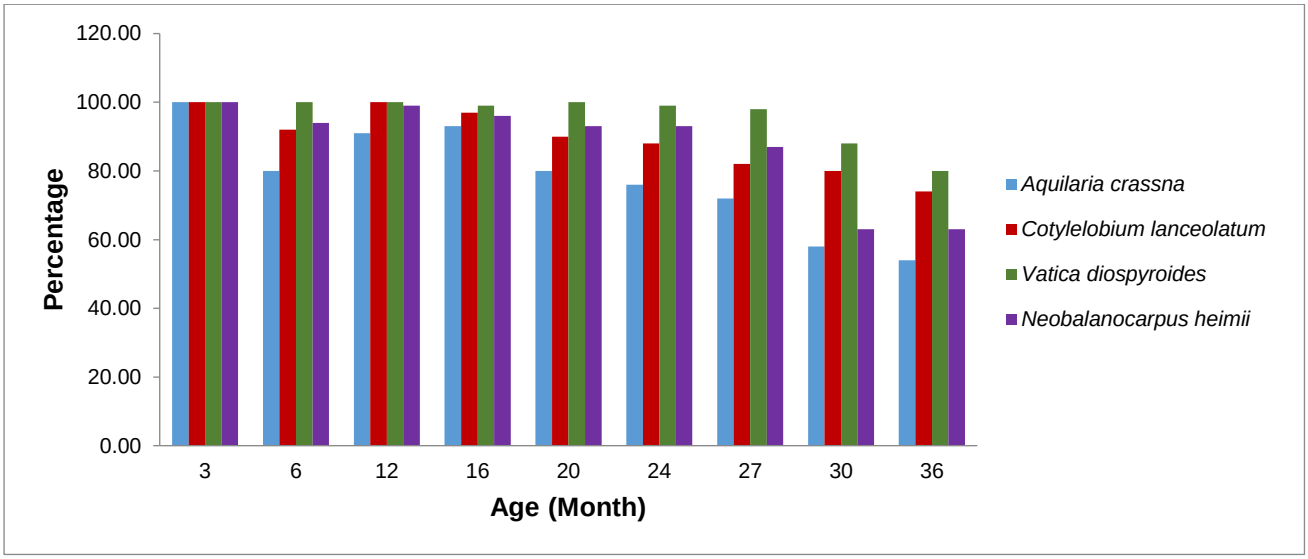

Figure 4. EETS Survival percentage of Takua Pa plot site during 3 years

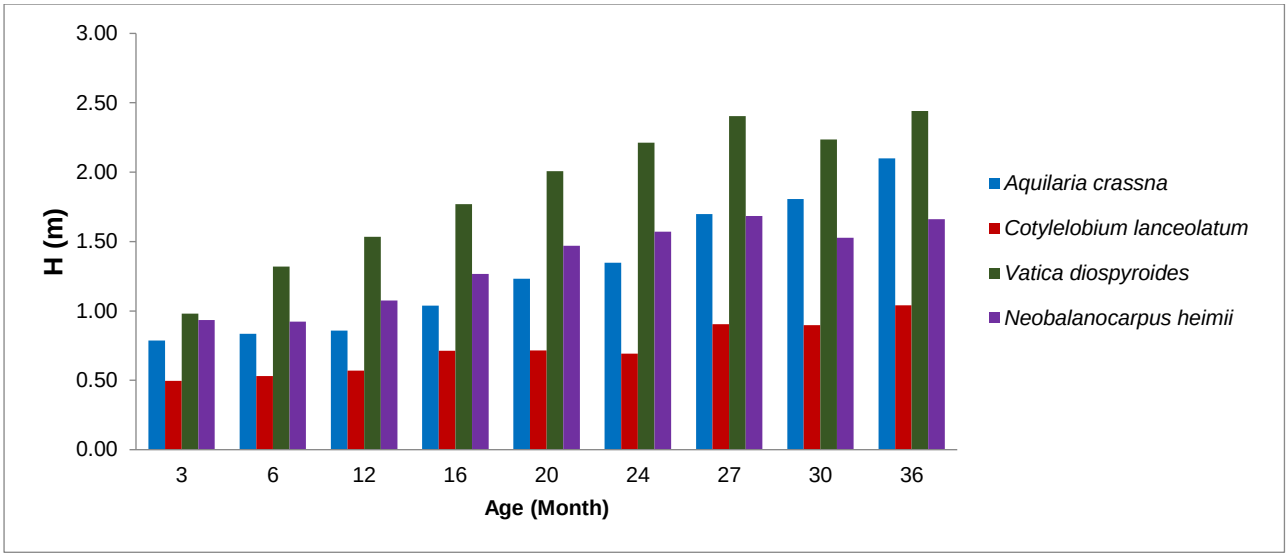

Figure 5. EETS height growth of Takua Pa plot site during 3 years

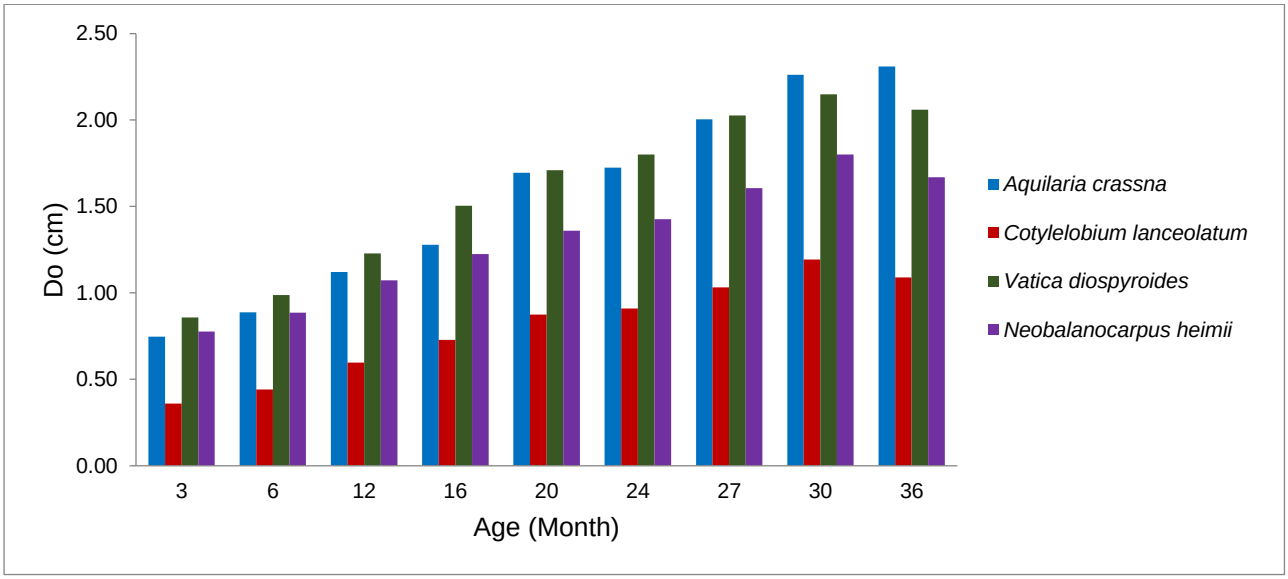

Figure 6. EETS D_0 growth of Takua Pa plot site during 3 years

Soil collection

For Mae Moh plot site, 15 soil samples were collected from 15 holes by 1 hole 1 sample, not level separated because of land reclamation.

For Takua Pa plot site, 24 soil samples were collected from 8 holes by one hole separated soil into 3 layers such as 1) 0 - 15 cm. 2) 15- 30 cm. 3) > 30 cm.

Figure 7. a-c) soil collection d) soil samples of Mae Moh plot site

Figure 8. a-d) soil collection e) soil samples of Takua Pa plot site

Annex-9. Presentation of Thailand at the Regional Workshop

(to be submitted in a separate file)

Annex-10. Record of Discussions on the 5th PCM

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

(AFoCO/010/2016)

5th Project Coordination Meeting

7-8 August 2019, FRIM, Malaysia

Record of Discussion

(Final)

Introduction

1. The 5th 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 7 8 August 2019 in Tin Tailings Afforestation Centre (TTAC) and FRIM, Malaysia. The main objectives of this Meeting were to review the progress of project implementation until June 2019. The Meeting was attended by the officials responsible for implementation of the Project from Malaysia and Thailand as well as from the AFoCO Secretariat (Secretariat). The list of participants is attached in **ANNEX 1**.

2. As part of the Meeting, a field visit to TTAC in Malaysia was organized on 8 August 2019 to observe 6 ha of the domestication plots established by the project (3 ha planted in 2017 and another 3 ha in 2019). 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 8 August 2019 at Tectona Meeting Room, FRIM, Malaysia. Mr Jirasak Chukwamdee, Deputy Director General of Royal Forest Department (RFD), who is also the National Project Director of the project, 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 Malaysia for hosting the Meeting. He looked forward to the Meeting towards better implementation of the project.

4. On behalf of the Secretariat, Ms. Ryang Soozin, Program Officer on Project Implementation and Monitoring, 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. Mr Jirasak Chukwamdee, Deputy Director General of RFD, was unanimously elected as the Chairman of the Meeting.

Agenda 2: Adoption of Agenda

6. The Meeting considered and revised its agenda as attached in **ANNEX 2**.

Agenda 3: Review on the Progress of Implementation of the Project

7. Ms Phuangphan Whuangplong, National Project Coordinator of Thailand presented the progress of project implementation (**ANNEX 3**). Tending for 2016-2017 planting has been carried out but planting for 2019 has yet to be conducted. The survival and growth of plants in Mae Moh Mine and Takuapa are being monitored.

8. Dr. Ang Lai Hoe, National Project Coordinator of Malaysia presented the progress of the project implementation in Malaysia (**ANNEX 4**). He highlighted the achievement of project implementation by each activity. Malaysia completed planting of 3 ha (12 species with a total of 1,650 seedlings) in 2019.

9. Malaysia will organize a Regional Workshop on 7 8 November 2019. Thailand will nominate two participants for the workshop.

Agenda 4: Technical Discussion

10. External auditing will be conducted by Thailand for year 2018 and 2019. Thailand shall request for the budget for Q3 & Q4 2019. For maintenance of the project site, the Meeting recommended Thailand to conduct the following tending activities; loosening soil, water supply during dry season, application of a mixture of organic and inorganic fertilizers.

Agenda 5: Review on the Work and Budget Plan for Year 2019

11. The Meeting noted and agreed on the budget for both countries as presented.

Agenda 6: Other Matters

12. Thailand will consider and explore the possibility of planting and expansion of site to another ex-lignite mine in order to compare to the site at Mae Moh Mine.

13. Thailand shall invite Malaysia and the Secretariat to access stand quality of the plantings in October 2019 and to explore the possibility of a joint publication.

Agenda 7: Adoption of the Record of Discussion of the Meeting

14. The Meeting considered and adopted the record of discussion of the 5th Project Coordination Meeting.

Closing Session

15. Mr Jirasak Chukwamdee, as the Chairperson of the Meeting, thanked FRIM 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.

8th August 2019, FRIM, Malaysia.

Annex-11. Record of Discussions on the 6th PCM

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

(AFoCO/010/2016)

6th Project Coordination Meeting

6 November 2019, FRIM, Malaysia

Record of Discussion

(Final)

Introduction

1. The 6th 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) (hereinafter, the Meeting) was held on 6 November 2019 FRIM, Malaysia. The main objectives of this Meeting were to review the progress of project implementation in 2019 and work and budget plan of 2020. The Meeting was attended by the officials responsible for implementation of the Project from Malaysia and Thailand as well as from the AFoCO Secretariat (Secretariat). The list of participants is attached in **ANNEX 1**.

Opening session

3. A brief opening session was organized on 6 November 2019 at Tectona Meeting Room, FRIM, Malaysia. Dr Lai Hoe Ang, Project Leader in Malaysia, 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 their efforts in collaboration. He looked forward to the Meeting towards better implementation of the project.

4. On behalf of the Secretariat, Ms.Soozin, Ryang Program Officer on Project Implementation and Monitoring, congratulated on the successful implementation of project. She thanked Malaysia and Thailand for the cooperation and looked forward to the success of the Project. Ms Ryang also updated the Meeting that Malaysia will join AFoCO.

Agenda 1: Election of Chair

5. Dr Lai Hoe Ang, Project Leader of Malaysia, was unanimously elected as the Chairman of the Meeting.

Agenda 2: Adoption of Agenda

6. The Meeting considered and revised its agenda as attached in **ANNEX 2**.

Agenda 3: Review on the Progress of Implementation of the Project

7. Dr. Ang Lai Hoe, National Project Coordinator of Malaysia presented the progress of the project implementation in Malaysia (**ANNEX 3**). He highlighted the activities and achievements of project implementation by each activity; site characterization-75%, GPS-90%, local map-75% and regeneration study-90%. Malaysia completed planting of 3 ha (12 species with a total of 1,650 seedlings) in 2019 with a survival of 98.6% until October. Until now, a total of 6.8 ha with 17 species and 3,160 trees.

8. Ms Phuangphan Whuangplong, National Project Coordinator of Thailand presented the progress of project implementation in Thailand (**ANNEX 4**). She informed of a visit by Thai–German Cooperation in 29 October 2019. Until now, a total of 9.68 ha have been planted with 12 species and 5,546 trees. Survival and growth data at Takua Pa site was presented which analysis of data is on-going for Mae Moh Mine. Soil samples have also been collected and awaiting soil analysis.

9. Dr Wai Mun Ho informed the Meeting that a total of 21 participants and speakers have registered for the Regional Workshop on "Domestication of Endangered, Endemic and Threatened Species in Disturbed Terrestrial Ecosystems" which will be held on 7–8 November 2019 in FRIM and a site visit to FRIM Research Station in Bidor.

Agenda 4: Technical discussion on the implementation of project

10. Thailand informed that a cross country visit to Republic of Korea (ROK) has been planned on 16–21 December 2019. The Meeting discussed on the visit schedule (**Annex 5**) and decided that both countries to give presentations on project implementation to AFoCO Secretariat in the ROK during the country visit.

11. Thailand informed the need to acknowledge the plantings according to the budget year.

12. The Meeting agreed to organize the 7th (June, Bangkok & Lampang) and 8th (November, Phuket & Phang-Nga) PCM in 2020 in Thailand. The Meeting was further that Thailand will organize a Regional Workshop in Phuket and 8th PCM back to back in November 2020.

Agenda 5: Finalize work and budget plan for year 2020

13. The Meeting agreed that Thailand should purchase a water storage tank for irrigation in Phang-Nga site.

14. The Meeting highlighted the importance of completing disbursement of all budget within the project period by April 2022. In this context, the Meeting further addressed that previous

claims for the committed monthly activities such as tending activities and others that had been conducted must be paid accordingly before the end of the second quarter in 2020.

15. The Meeting agreed to include the remaining activities and budget of previous years into Work and Budget Plan 2020 in a separate table (**Annexes 6 and 7**). In view of 7th and 8th PCM in Thailand, the Meeting decided that remaining budget of activities from previous years can be allocated for organizing/attending PCM.

16. Thailand proposed to move the budget for 'Activity D.2 Attending Overseas Meeting' in 2019 to 'Activity B Regional Workshop' in 2020. Thailand also proposed to use the budget retained by AFoCO Secretariat in 2019 for organizing PCM in 2020.

17. The Meeting agreed to submit the updated WBP 2020 to the Secretariat in accordance with the budget and work plan in 2020 as discussed (**Annexes 8 and 9**).

Agenda 6: Other Matters

18. Thailand decided not to have another project site based on site conditions.

19. Malaysia team has visited Mae Moh Mine and Takua Pa Experimental sites in October 2019 to provide technical assistance and counting of plant survival.

Agenda 7: Adoption of the Record of Discussion of the Meeting

20. The Meeting considered and adopted the record of discussion of the 6th Project Coordination Meeting.

Closing Session

21. Dr Lai Hoe Ang, as the Chairperson of the Meeting, thanked RFD and AFoCO 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.

6th November 2019, FRIM, Malaysia.

Annex-12. Photos on issues and lesson learned in Thailand

a b c

Figure 1. a and b) a lot of cow come inside plot site c) Fence destroyed and repair

Figure 2. a and b) Insect attack inside EETS tree trunk

Figure 3. *Dabergia cochinchinensis* fruiting after plant 3 years

Figure 4. 16 October 2019 at Mae Moh plot site,
a and b) Dr. Ang Lai Ho and Dr. Ho Wai Mun planted practicing
c) Shading after planted

Figure 5. 18 October 2019 at Takua Pa plot site,
a,b and c) Dr. Ang Lai Ho and Dr. Ho Wai Mun advice and planted practicing