CONSOLIDATED PROJECT COMPLETION REPORT

Capacity Building on the Application of Landscape Approach to Support the Sustainable Natural Resources Management in Brunei Darussalam, Indonesia, Philippines and Singapore (AFoCO BIPS Project)

AFoCO-BIPS Technical Working Group – Philippines

2019

Acknowledgement

The AFoCO – BIPS Technical Working Group of the Philippines would like to extend its sincere gratitude to the following persons and groups who, in one way or another, have helped in making this Consolidated Project Completion Report possible, and have been instrumental in the implementation of various activities under the Project:

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The **stakeholders and partner groups** of the project in the BIPS countries, for their active participation in the various activities of the project, including initiatives for sustainability.

Abstract

In CY 2016, the implementation the regional project entitled **"Capacity Building on the Application of Landscape Approach to Support the Sustainable Natural Resources Management in Brunei Darussalam, Indonesia, Philippines and Singapore"** also known as the AFoCO-BIPS Project was initiated under the framework of the agreement between the governments of the member states of the Association of Southeast Asian Nations (ASEAN) and the Republic of Korea (RoK) on Forest Cooperation.

This cooperation Project primarily aimed to strengthen trans-boundary cooperation of respective forestry sector within ASEAN countries through the application of landscape approach in natural resources management. Specific to each BIPS country, the Project was implemented within the context of differentiated environmental and development concerns which cut across the different ecosystems; Brunei Darussalam – beach forest; Indonesia – peat swamp forest; Philippines – natural forest; and Singapore – urban forest.

For three (3) years, the project implemented various activities at the country and regional level which resulted to the following outputs and outcomes:

a. Establishment of model/demonstration site for future replication/adoption;
b. Demonstration plots/learning areas in various landscapes within implementing AFoCO Member Countries properly maintained and protected by the concerned stakeholder;
c. Capacity building activities and its corresponding training modules relative to the application of landscape approach to RRR-DFE among implementing AFoCO Member Countries;
d. Regional workshop and cross-country visits as venue for sharing of experiences between and among implementing AFoCO Member Countries on Project learning and future directions;
e. Documentation reports relative to the lessons and experiences of the Project that will serve as reference in the development of future policy directions by the implementing AFoCO Member Countries;
f. Comparative assessment of management capabilities across communities/ stakeholders and landscapes; and
g. Experiential learning modules (focus is on knowledge and skills acquisition within an established/existing learning sites)

As the culminating activity for the Project, a regional workshop was conducted on 19-22 March 2019 in the Philippines. The activity served as an avenue for the sharing of experiences and lessons learned among implementing AFoCO Member Countries with respect to the implementation of their In-Country project activities. It highlighted good practices, technologies and success stories of the respective implementing AFoCO Member Countries that can be adopted/replicated by other countries, for the improvement of their domestic policies, guidelines and procedures vis-à-vis application of landscape approach in Natural Resource Management (NRM).

<Project Profile>

Project Code	AFoCO/011/2016
Project Title	Capacity Building on the Application of Landscape Approach to Support the Sustainable Natural Resources Management in Brunei Darussalam, Indonesia, Philippines and Singapore (AFoCO BIPS Project)
Project Duration	Start date : March 30, 2016 End date : March 29, 2019
Lead Country	Philippines
Implementing Countries	Brunei Darussalam Indonesia Singapore
Implementing Agencies	Department of Forestry, Ministry of Primary Resources and Tourism, Brunei Darussalam Forest Research and Development Center (FRDC), Forestry and Environment Research, Development and Innovation Agency (FOERDIA), Indonesia Department of Environment and Natural Resources – Forest Management Bureau, Philippines National Parks Board, Singapore
Project Site	**Brunei Darussalam** – Berakas Forest Reserve **Indonesia** – Tumbang Nusa, Central Kalimantan, Indonesia **Philippines** - Barangays Malabon and Taposo, Candelaria, Zambales, Central Luzon, Philippines **Singapore** – N/A
Target Area	**Brunei Darussalam:** Area of 0.5 hectares inside Berakas Forest Reserve **Indonesia:** Primary target area: Tumbang Nusa Forest Research Station Secondary target area: Peatland in Central Kalimantan **Philippines:** 30 hectares degraded natural forest inside the Community-Based Forest Management (CBFM) Area of MALATAPI Community Livelihood Center, Inc. **Singapore:** Habitat enhancement sites in Singapore

Budget and Source of Finance	Total : US$ AFoCO Funding: US$ 539,726.00 Brunei Darussalam : US$ 112,746.00 Indonesia : US$ 112,746.00 Philippines : US$ 214,148.00 Singapore : US$ 100,086.00 Contribution from countries: US$ Brunei Darussalam: __ Indonesia : __ Philippines: US$ 68,855 (personnel time attribution, office space and use of vehicles) Singapore : __

<Regional Project Management Profile>

Name	Department of Environment and Natural Resources – Forest Management Bureau	
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AFoCO Focal Person	Mr. Orlando A. Panganiban	
Regional Project Coordinator	Mr. Marlon M. Atienza	
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Project Coordinators of participating countries	Brunei Darussalam	Ms. Liyana Yahya
	Indonesia	Mr. Agustinus Tampubolon
	Singapore	Mr. Hassan Ibrahim
Declaration	√ This report includes all the essential information on executed activities, achieved outputs, issues and challenges encountered in the period covered, for higher level of administration	
	√ This report was prepared by the Project Manager and Staff	

<Implementing Agency Profiles>

Brunei Darussalam

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Philippines

Name	Department of Environment and Natural Resources – Forest Management Bureau	
Address	Visayas Avenue, Diliman, Quezon City, Philippines	
Project Manager	ASOF Leader : Mr. Nonito M. Tamayo AFoCo Focal Person : Mr. Orlando A. Panganiban Project Manager/Coordinator : Mr. Marlon M. Atienza	
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<Implementing Agency Profile>

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Contents

1. Introduction

Under the framework of the agreement between the governments of the member states of the Association of Southeast Asian Nations (ASEAN) and the Republic of Korea (RoK) on Forest Cooperation, the Korea Forest Service (KFS) of the Republic of Korea (ROK) through the ASEAN-ROK Forest Cooperation Secretariat, made available to the respective implementing AFoCO Member Countries a financial contribution for the implementation of a regional project entitled **"Capacity Building on the Application of Landscape Approach to Support the Sustainable Natural Resources Management in Brunei Darussalam, Indonesia, Philippines and Singapore"** also known as the AFoCO-BIPS Project. The project was approved during the 6th Session of the Governing Council of AFoCo held in Bali, Indonesia on 22 April 2015, with a duration of three (3) years from April 2016 to March 2019.

In line with the establishment of the Asian Forest Cooperation Organization (AFoCO) the management of the Project was assumed by the AFoCO Secretariat as a transition arrangement, in accordance with Decision 8-I-18R adopted at the First Session of the Assembly held on 12-13 November 2018 in Seoul.

2. Background and Objectives

2.1. Rationale

The world's forest cover had a total of 4,128 million hectares in the year 1990 which decreased to 3,999 million hectares by the year CY 2015. Most of the forest cover comprises of natural forest with a total of 3.7 billion hectares as of the year CY 2015 (FAO 2015).

Asia's natural resources are among the richest and most diverse in the planet. The region holds 20% of the world's biodiversity, 14% of the world's tropical forests, and 34% of global coral resources, including the greatest number of marine species in the world.[1]

Natural resources are the basis of livelihoods and economies of every nation in Asia. Given the rich cultural, social, political, and biophysical diversity across Asia, the professionals working in natural resources management need a strong working knowledge of several interrelated sciences. [2]

For 25 years there had been a significant decrease in global carbon stocks in forest biomass by almost 17.4 gigatons mainly caused by forest conversion and degradation (FAO 2015). It was hypothesized that those in the countries with abundant resources tend to over exploit such resources.

[1] http://www.adb.org/features/natural-resources-conservation-asia-adbs-take
[2] http://www.serd.ait.ac.th/wpserd/natural-resources-management/

Several approaches have been developed to improve natural resources management. Review of these approaches reveal that despite being applied in various degrees and context, said approaches share basic development principles that aims to address the social, economic and environmental objectives.

The Ridge to Reef (R2R) approach is scalable, in that it allows for a wide range of interventions and system-wide analysis (Guiang and Aragon, June 2014). Ecosystem-based management is an environmental management approach that recognizes the full array of interactions within an ecosystem, including humans, rather than considering single issues, species, or ecosystem services in isolation (Christensen et al. 1996, McLeod et al. 2005). The Integrated Ecosystem Management (IEM) approach is based on the ecosystem approach which aims at integrating land, water and living resources management to promote conservation and sustainable use in an equitable way.[3] Landscape approaches seek to provide tools and concepts for allocating and managing land to achieve social, economic, and environmental objectives in areas where agriculture, mining, and other productive land uses compete with environmental and biodiversity goals.

The evolution of integrated conservation and development projects and ecosystem approaches toward landscape approaches has been incremental. The main substantive innovations have been the recognition of the need to address the complex interactions between different spatial scales, and the need to embrace the full complexity of human institutions and behaviors (Sayer et. al, 2012).

Landscapes are multifunctional as they provide various services to human such as food, water, shelter, livelihood which contributes to economic growth and human well-being. Moreover, they provide balance environment amongst diverse species helpful for biodiversity conservation. The ecological balance of landscape is more influenced by human intervention operating as external agents. Through landscape we can visualize the advantages of combined natural resources, environmental and livelihood management.[4]

More recently, the landscape concept had been central to some major international conservation initiatives. For instance, the Congo Basin Forest Partnership articulates its programs around 12 priority landscapes.[5] The Worldwide Fund for Nature has advocated the conservation of forests in a landscape context since at least 2003, and has configured a significant part of its conservation portfolio into a series of Global Initiatives, several of which work at landscape scales and address social and institutional issues. The World Bank is building partnerships both globally and through country-specific programs to promote integrated landscape solutions to agriculture, rural development and broader ecosystems management challenges. For example, the Program on Forests (PROFOR), a multi-donor partnership housed at the Bank, is working to mobilize additional investment in trees and landscape restoration in Africa, among many other projects (Sayer et.al, 2012).

[3] https://www.thegef.org/gef/knowledge_series/land_degradation/India
[4] http://www.forestlandscaperestoration.org/tool/our-approach-landscape approach
[5] http://carpe.umd.edu/works/landscape

Landscape approach can provide a practical solution to achieve goals of biodiversity conservation, rural development and food security (Kusters, 2014). The variety and complexity of available approaches to natural resources management, the need to increase the capacities of natural resources managers and technicians are still evident. Majority of learning experiences are project driven and sustainability of knowledge gain remains in question vis-à-vis application and integration to the actual development plans of the subject landscape.

This cooperation Project primarily aimed to strengthen trans-boundary cooperation of respective forestry sector within ASEAN countries through the application of landscape approach in natural resources management.

Brunei Darussalam, Indonesia, Philippines and Singapore (BIPS) as the implementing AFoCO Member Countries is expected to render active and sustained participation in the Project with the Republic of Korea (ROK) as an important partner for the exchange of technologies, knowledge and experiences in landscape approach as a whole. Specific to each BIPS country, the Project was implemented within the context of differentiated environmental and development concerns which cut across the different ecosystems:

a. In Brunei Darussalam, certain beach forest, particularly in Berakas Forest Reserve categorized also as a recreational and rehabilitation forest area, can be found 18 kilometers from the capital with a total area of about 348 hectares inclusive of park. Said beach forest is being threatened due to soil erosion and forest fires.

b. The Indonesian Peat Swamp Forests (PSF) were excessively logged and opened for establishment of oil palm and pulpwood plantations. This have caused catastrophic effects on environment and society, such as increasing greenhouse gasses emission, haze pollution, drought, flooding, biodiversity loss, poorer local livelihood and worse community health.

c. Over the years, the massive change in Philippine landscape can be gleaned in relation to the changes in forest areas, with rapid decrease by nearly 50% in forest cover from 1970 to 2000.

   One of the unique features of forest resources is that multiple stakeholders are associated with its multiple uses and represent local to global interests. Efforts towards sustainable forest management need to consider these varying interests, without marginalizing the concerns of the local communities, especially those whose lives depend on these resources for survival. This calls for the development and institutionalization of social processes that will ensure that the local communities and other legitimate stakeholders are able to participate meaningfully in decision making concerning forest management and benefit sharing from forests.

d. Singapore is known to be one of the most densely populated countries in the world. The natural forest area in Singapore has reduced to cater for rapid housing, infrastructural, economic and industrial development since the 19th and 20th

centuries. To aid in the enhancement of quality of life in Singapore, efforts in Singapore's management towards urban forest(ry) are increasingly tailored towards habitat enhancement, restoration and rehabilitation of degraded ecosystems with greater emphasis on the use of native species. Nature Reserves, as well as public parks, park connectors and roadside greenery enhance the human and natural environment.

2.2. Objectives

In pursuit of the overall project goal, three major objectives and several support activities were identified as follows:

a. Recognize and contribute in addressing wide range of natural resources management issues and concerns across different ecosystems in the implementing AFoCO Member Countries as follows:

   a.1 Soil erosion and forest fires in established forest reserve (beach forest);

   a.2 Conversion of peatland forest in favor of the establishment of oil palm and pulpwood plantations;

   a.3 Impending loss of selected commercially important tree species within natural forest;

   a.4 Varying interests on the management of natural forest; and

   a.5 The natural forest has reduced to cater for rapid housing, infrastructural, economic and industrial development.

b. Assess the management compatibilities of communities/stakeholders within a specific landscape and its interrelationships (pros and cons) between and among landscapes in a Ridge to Reef horizon.

c. Capacitate respective forestry sector technicians through formal and experiential learning on Restoration, Rehabilitation and Reclamation of Degraded Forest Ecosystem (RRR-DFE) following the landscape approach.

2.3. Outputs and Deliverables

Given aforesaid objectives, the Project was expected to come up with the following outputs/deliverables:

h. Establishment of model/demonstration site for future replication/adoption;

i. Demonstration plots/learning areas in various landscapes within implementing AFoCO Member Countries properly maintained and protected by the concerned

stakeholder;

j. Capacity building activities and its corresponding training modules relative to the application of landscape approach to RRR-DFE among implementing AFoCO Member Countries;

k. Regional workshop and cross-country visits as venue for sharing of experiences between and among implementing AFoCO Member Countries on Project learning and future directions;

l. Documentation reports relative to the lessons and experiences of the Project that will serve as reference in the development of future policy directions by the implementing AFoCO Member Countries;

m. Comparative assessment of management capabilities across communities/ stakeholders and landscapes; and

n. Experiential learning modules (focus is on knowledge and skills acquisition within an established/existing learning sites)

2.4. Assumptions and Risk

2.4.1. Assumptions

Taking note of the need to sustain project gains, project activities were determined and implemented with due reference to the following assumptions vis-à-vis institutional and social aspects of Project implementation:

a. **Collaboration among the Implementing Countries in the field of Landscape Approach and Sustainable Natural Resources Management is sustained**. Established demonstration sites/plots among implementing AFoCO Member Countries will be maintained and protected as stipulated in their respective Sustainability Plans and shall serve as the binding agreement and formal arrangement between the tenure holder/forest manager and the respective implementing institution. Having these model sites, it shall encourage others to replicate/adopt the application and processes done by the Project through experiential learnings in capacity building activities.

b. **Knowledge gained through the Project relative to the overall implementation of sustainable natural resources management are mainstreamed**. Documentation reports and knowledge products shall be developed to collate experiences, good practices, and lessons learned during project implementation.

c. Implementation of current forestry and environmental policies of each AFoCO Member Countries is sustained. It is assumed that the Project remained to be relevant provided that there will be no sudden change of policy directions by the implementing AFoCO Member Countries .

d. **Cooperation and support of the institutions, local and national government units, and communities are sustained.** Social acceptance and ownership were seen as one of the major ingredients for project success and sustainability.

2.4.2. Risks

Risks were identified and corresponding mitigating measures were formulated to ensure smooth implementation of project activities leading to the attainment of project goals and project objectives. Considering that the Project primarily used Community Based Forest Management (CBFM) as the main strategy, risk identified were more on the social aspect of project implementation.

a. **Inadequate participation among the stakeholders in the respective Implementing Countries**. The landscape approach in restoring degraded forest ecosystems requires the active participation of all concerned stakeholders to be successful. Considering the various ecosystems within the ridge to reef horizon usually being managed by various groups of stakeholders, restoration efforts must be planned and implemented at the landscape level, hence, initiatives of each group of stakeholders must be complementary to each other.

b. Differences on socio-political condition of project sites among the Implementing Countries (i.e. peace and order situations, inconsistent land uses, conflict of interests, land tenure and claims). Given that the project is regional in nature, the difficulty of associating project activities among the implementing AFoCO member countries vis-à-vis regional context was also foreseen to be a risk. This is on top of the expected difficulty in consolidating project results and outcomes.

c. Occurrence of natural disasters and hazards. Under the project, Brunei Darussalam, Indonesia and Philippines have a target of establishing their respective demonstration sites to showcase their restoration technologies and initiatives within their chosen forest ecosystem. Given the unpredictable in weather brought about by climate change, the possibility that these demonstration sites/plots will be damaged by natural disasters and hazards were already considered as project risks.

Identified risks were mitigated through strengthened project supervision and coordination both at the regional and country levels. Limitations and gaps among implementing countries were addressed through the conduct of project coordination meetings, regional workshops, cross-country visits and other relevant project activities.

3. Project Management

3.1. Management structure

The Project was led by the Philippines through the Department of Environment and Natural Resources – Forest Management Bureau (DENR-FMB). The ASOF leader took the responsibility of the project in each implementing AFoCO Member Countries. Each of the implementing countries was responsible for the implementation of the Project at the country level. AFoCO provided support to project implementation through its able contribution in the conduct of various project management activities such as the Project Coordination Committee (PCC) meetings and regional workshop.

To oversee project implementation at the regional level, a PCC was created composed of the AFoCO Focal Persons and Country Project Coordinators/Managers in each implementing AFoCO member country, headed by the ASOF Leader of the Philippines. The PCC had a meeting of at least once a year or as necessary, to ensure that domestic needs and priorities of each implementing AFoCO Member Countries were considered in project implementation.

Moreover, the Project likewise involved international and national researchers and experts, as well as local communities and other concerned stakeholders, including government agencies and non-government organizations especially those within the vicinity of the established demonstration plots/learning areas.

3.1.1. Regional Project Level Management

At the regional level, a Regional Project Coordinator and its technical and administrative support staff complement were assigned from the pool of DENR-FMB staff to supervise, monitor and evaluate country project outputs towards regional-level outcomes, including implementation of the project. The Regional Project Coordinator also act as the Country Project Coordinator for the Philippines. His roles and responsibilities are as follows:

a. Management of project office, staff and financial matters to ensure the operation of the Project and delivery of service at the highest possible standard and quality;

b. Coordination with the relevant officials and focal points from the implementing countries for efficient operation of the Project;

c. Ensure timely implementation of the activities at the national and regional levels identified in the Project document;

d. Provide guidance and assistance in organizing activities, workshops and training courses of the Project;

e. Review and submit regular and special reports of the project through AFoCO

Secretariat to the AFoCO Assembly;

f. Prepare and submit financial report including itemized statement of expenditures to the AFoCO Secretariat in a timely manner as required in the implementation of the Project;

g. Maintain record of activities implemented and accomplished including technical documents, recommendations and consultancy reports;

h. Ensure managerial and financial accountability in accordance with the Project criteria and existing operational guidelines of the AFoCO Agreement;

i. Facilitate the provision of financial support to implementing AFoCO Member Countries upon submission of their respective budget requests for approval of the RPMO and eventual release of fund thru the AFoCO Secretariat; and

j. Perform other duties as may be assigned as appropriate in implementing the Project.

3.1.2. Country Project Level Management

At the level of the implementing AFoCO Member Countries, existing forestry organizations were utilized to ensure the smooth implementation of the project activities and submission of reportorial requirements. A Country Project Coordinator and project site coordinator including its support staff were designated by the concerned forestry organization with the duties and responsibilities stated below (a-b).

Implementing countries also had the option to create their dedicated project organization to be drawn-up from their existing forestry organization or financed through its own resources which were considered as counterpart (in-kind) contribution to the project, whenever feasible or as necessary.

a. Overall supervision and management of project office, staff and financial matters to ensure timely, efficient and effective implementation of project activities in their respective countries;

b. Ensure the timely implementation of the activities identified in the Project document in their respective countries;

c. Provide guidance and assistance in the implementation of project activities in their respective countries;

d. Review and submit periodic accomplishment reports of the project to the Regional Project Coordinator and AFoCO Secretariat;

e. Maintain record of activities implemented and accomplished including technical documents, recommendations and consultancy reports;

f. Ensure managerial and financial accountability in accordance with the Project criteria and existing operational guidelines of the AFoCO Agreement;

g. Submit budget request, financial reports and liquidations based on the approved Work and Financial Plan (WFP); and

h. Perform other duties and responsibilities as may be deemed as appropriate

3.2. Work Plan and Budget

The AFoCO BIPS Project had a total allocation of US$ 539,726.00 for the implementation of nine (9) major components, as follows:

a. Inception Meeting
b. Establishment of demonstration plots/learning sites;
c. Capacity building activities;
d. Trainers Training on Urban Forestry and Biodiversity Conservation;
e. Regional Workshop for the sharing of experiences and lessons learned among implementing AFoCO Member Countries;
f. Visit to selected implementing AFoCO Member Countries;
g. Project Management Supervision;
h. External Financial Audit; and
i. Contingency

Table 1. Budget Plan

Output and Activity No.	Outputs/Key Activities	Budget Allocation (USD)				
		BRUNEI DARUSSALAM	INDONESIA	PHILIPPINES	SINGAPORE	GRAND TOTAL
A.	**Inception Meeting among implementing countries**	**-**	**-**	**9,940.00**	**-**	**9,940.00**
B.	**Establishment and maintenance of demonstration plots/learning sites**	**81,030.00**	**64,999.00**	**55,770.00**	**-**	**201,799.00**
B.1	Site Identification, surveying, mapping and planning	-	2,625.00	5,400.00	-	8,025.00
B.2	Vegetation Assessment	-	7,374.00	4,600.00	-	11,974.00
B.3	Procurement of Demo Site/Training Equipment or tools	1,030.00	12,000.00	12,000.00	-	25,030.00
B.4	Infrastructure facilities and fixtures	-	16,200.00	16,100.00	-	32,300.00
B.4	Demonstration Plot Establishment	80,000.00	-	-	-	80,000.00
B.5	Actual Establishment and maintenance of demonstration plots	-	20,000.00	13,470.00	-	33,470.00
B.6	Field monitoring and evaluation by project personnel (USD35/man day on a weekly basis)	-	-	4,200.00	-	4,200.00
B.6	Protection and maintenance	-	800.00	-	-	800.00
B.7	Field monitoring and evaluation by project personnel (USD35/man day on a weekly basis)	-	6,000.00	-	-	6,000.00
C.	**Capacity Building Activities (4 batches: phase 1 - beneficiary level; phases 2-3-4; DENR staff level as trainors training)**	**100.00**	**10,780.00**	**21,500.00**	**-**	**32,380.00**

Output and Activity No.	Outputs/Key Activities	Budget Allocation (USD)				
		BRUNEI DARUSSALAM	INDONESIA	PHILIPPINES	SINGAPORE	GRAND TOTAL
D.	**Trainers Training on Urban Forestry and Biodiversity Conservation (Singapore Activity)**	**-**	**-**	**-**	**62,340.00**	**62,340.00**
E.	**Regional Workshop for the sharing of experiences and lessons learned among implementing AFoCO Member Countries**	**-**	**-**	**53,180.00**	**-**	**53,180.00**
F	**Visit to selected Participating AFoCO Member Countries ***	**13,400.00**	**15,200.00**	**15,050.00**	**15,200.00**	**58,850.00**
G	**Project Management and Supervision**	**14,640.00**	**18,480.00**	**54,620.00**	**19,260.00**	**107,000.00**
G.1	Staff Resources (Allowance /Honorarium of Project Staff)	14,640.00	11,880.00	28,080.00	12,960.00	67,560.00
G.2	Management Support for Operations	-	6,600.00	6,660.00	6,300.00	19,560.00
G.3	Project Coordination Committee Meeting	-	-	19,880.00	-	19,880.00
H	**External Audit**	**2,500.00**	**2,000.00**	**2,000.00**	**2,000.00**	**8,500.00**
I	**Contingency**	**1,076.00**	**1,287.00**	**2,088.00**	**1,286.00**	**5,737.00**
	GRAND TOTAL	**112,746.00**	**112,746.00**	**214,148.00**	**100,086.00**	**539,726.00**

4. Performance

4.1. Planned vs. actual implementation

The performance assessment under this chapter is limited to the activities undertaken by the Implementing Countries, in line with the implementation of their respective In-country Projects. The detailed reports of Brunei Darussalam, Indonesia, Philippines and Singapore are attached as **Annexes 1,2,3 and 4**, respectively.

Activity	Target	Status	Timeline		Remarks
			Planned	Actual	
A. Inception Meeting among Implementing Countries	1 meeting	Completed	Y1-Q2	Y1-Q2	Held on 9 June 2016 at Manila, Philippines
B. Establishment and Maintenance of Demonstration Plots					
B.1 Site Identification, Surveying and Mapping					
• Brunei Darussalam	Not applicable	Not applicable	Not applicable	Not applicable	Located inside the Berakas Forest Reserve
• Indonesia	4 has-peat swamp	Completed	Y1-Q1	Y1-Q2	Located inside Tumbang Nusa Forest Research Station & Sebangau National Park, Central Kalimantan, Indonesia
• Philippines	30 has demonstration plot & 30 has control plot	Completed	Y1-Q3	Y1-Q4	Located inside the CBFM area of MALATAPI in Candelaria, Masinloc, Zambales. Accessibility of the proposed site for the Assisted Natural Regeneration (ANR) demonstration plot had been a major concern in site selection considering that the demonstration plot

Activity	Target	Status	Timeline		Remarks
			Planned	Actual	
					will be used for capacity building and workshop activities, among others.
• Singapore	Not Applicable				
B.2 Vegetation Assessment (VA)					VA is necessary activity to assess condition and feasibility of the sites as demonstration plots using the corresponding FLR approaches per country.
• Brunei Darussalam	Not applicable	Not applicable	Not applicable	Not applicable	
• Indonesia	One (1) pass of survey	Completed	Y1-Q4	Y1-Q4	Scientists from the FERDI conducted the said survey. The result was used as reference to achieve biodiversity and ecosystem equilibrium and ideal PSF ecosystem that may be reach through restoration activity at Tumbang Nusa.
• Philippines	Three (3) passes (before, during and after ANR)	Completed	Y1-Q3	Y2-Q1	The procurement of the Consultancy Service for the conduct of VA needed for the application of ANR was done in accordance with the domestic procedure or RA No. 9184 with the Philippines Government Electronic Procurement Service (PhilGEPS). However, it was declared a failure bidding as there were no interested applicant for the work. Hence, adjustments to the Terms of Reference (TOR) in terms of activities and deliverables (VA and ANR training was combined in the consultancy service) was done to encourage consultants. Accordingly, a consultant was selected and

Activity	Target	Status	Timeline		Remarks
			Planned	Actual	
					became on-board on Y2-Q1.
• Singapore	Not applicable				
B.3 Procurement of Demo Site/ Equipment or tools					Necessary equipment or tools were procured for trainings purposes and establishment of the demonstration plots.
• Brunei Darussalam	Not applicable	cancelled	Y2	--	Allotted fund was realigned/reprogrammed to activity B. Establishment of Demo plots
• Indonesia	GPS, camera, tape meter, internet modem, laptop, LCD projector and camera zoom 2 drilled wheel pumps; 1 fire extinguisher	Completed	Y1-Q4	Y1-Q4	Equipment were used by the management staff and community for the maintenance of the demonstration plots.
• Philippines	1 unit of desktop with printer; 2 units laptop, projector and GPS; 1 generator unit; 2 sets firefighting equipment and fire suits and 4 jet shooters	Completed	Y1-Q3	Y2-Q1	Bidding for the procurement of equipment and tools failed when it was first posted with the PhilGEPS, hence, reposted. Eventually, the procurement of all training equipment/tools were completed and turned over to DENR field offices and PO partners on 3rd Qtr. CY 2017.

Activity	Target	Status	Timeline		Remarks
			Planned	Actual	
• Singapore	Not applicable				
B.4 Infrastructure facilities and fixtures					
• Brunei Darussalam	Not applicable	Not applicable	Not applicable	Not applicable	
• Indonesia	One (1) unit facility	Completed	Y1-Q4	Y1-Q4	Indonesia accomplished the activity on schedule.
• Philippines	One (1) unit facility	Completed	Y1-Q4	Y2-Q1	Originally, the facility was supposed to be within the Community Based Forest Management (CBFM) Area of the partner Peoples Organization (PO). However, after further consultation with the PO, it was later decided to be constructed in the compound of the CENR Office near the community in consideration of better accessibility, connectivity to electricity and safety. The facility was inaugurated last 16 March 2018.
• Singapore	Not applicable				
B.5 Establishment and Maintenance of Demonstration Plots					

Activity	Target	Status	Timeline		Remarks
			Planned	Actual	
• Brunei Darussalam	0.5 has	Completed	Y2-Q4	Y4-Q1	Delays were caused by the delays in securing permission from the Ministry to use their Departments' Account for Country Budget Transfer and approval for the awarding to contractor.
• Indonesia	4 has. peat swamp forest	Completed	Y1-Q4	Y2-Q1	Indonesia accomplished the activity on schedule. Additional activity (i.e. B.6.Protection and maintenance) was added.
• Philippines	Thirty (30) has demo plot	Completed	Y2	Y3-Q2&Q3	Following the finalization of the site for demonstration plot, the signing of contract/MOU with partner PO and DENR Region3 has been initiated and was perfected on 3 April 2017. Accordingly, preparatory activities such as rectification of the POs Land Tenure Instrument (LTI), final survey of the demonstration plots and installation of monuments/markers has been done before proceeding with the application of ANR activities. The established ANR demonstration plot is currently being maintained by the partner PO in accordance with the contract/MOU.
• Singapore	Not applicable				
B.6 Field Monitoring and Evaluation by Project Personnel					
• Brunei Darussalam	Not applicable Not Applicable	Not applicable	Not applicable	Not applicable	

Activity	Target	Status	Timeline		Remarks
			Planned	Actual	
• Indonesia	Regular activity	Completed	Y1-Q4	Y3-Q4	To ensure implementation of project activities, field monitoring and evaluation activities were regularly conducted by the respective AFoCO Technical Working Group (TWG) / management staff of Indonesia and Philippines.
• Philippines	Regular activity	Completed	Y1-Q4	Y3-Q4	
• Singapore	Not Applicable				
B.7 Utilization of microbes to decompose the wood waste in peatland					
• Indonesia	One (1) study	Completed	Y2-Q1	Y2- Q1 &Q2	Additional activity was proposed by Indonesia for the development and application of Soil Microbe to decompose peatland waste as organic fertilizer from the incurred savings under Activity B.
B.8 Publication					
• Indonesia	One (1) knowledge product	Completed	Y3-Q1	Y3-Q1	Additional activity was proposed by Indonesia for the publication of book on FLR in PSF ecosystem from the incurred savings under Activity B.

Activity	Target	Status	Timeline		Remarks
			Planned	Actual	
• Philippines	One (1) knowledge product	Completed	Y4-Q1	Y4-Q3	The Philippines caused the development and printing of the training module on the application of ANR approach and conduct of vegetation assessment
C. Capacity Building Activities					Capacity building activities with corresponding training modules were conducted to share the lessons and application of landscape approach to RRR-DFE among implementing AFoCO Member Countries.
• Brunei Darussalam	One (1) training activity	Cancelled	Y4-Q1	--	Allotted fund was realigned/reprogrammed to activity B. Establishment of Demonstration plot
• Indonesia	Three (3) course training	Completed	Y1-Q3 to Y2-Q3,	Y3	Additional training was pursued using incurred savings from the activity
• Philippines	Four (4) batches of training activities	Completed	Y2-Q1	Y3-Q2	Four (4) batches of trainings were conducted under the Project. Said training activities were participated by PO members and DENR staff from Regional/field Offices. Rescheduling of the trainings became necessary to give time for the establishment of the demonstration learning sites.
• Singapore	Not applicable				

Activity	Target	Status	Timeline		Remarks
			Planned	Actual	
D. Trainer's Training on Urban Forestry and Biodiversity Conservation • Singapore	One (1) Workshop/training	Completed	Y2-Q1	Y2- Q1	The training was held on 14-16 February 2017. Participants were able to exchange experiences from their countries/cities while Singapore shared their experience in dealing with nature reserves, urban parks and streetscapes.
E. Regional Workshop for the sharing of experiences and lessons learned among implementing AFoCO Member Countries	One (1) workshop	Completed	Y2-Q1	Y3-Q1	Hosted by the Philippines last 19-22 March 2019 at Manila, Philippines, the activity was participated by (20) representatives from ASEAN member countries (BIPS implementing countries and non-implementing countries: Thailand, Cambodia, Vietnam, Malaysia and Myanmar, including the AFoCO Secretariat from Republic of Korea) to share experiences and lessons learned in relation to the implementation of their In-country project activities and respective landscape approach in restoring/developing the degraded forests all aimed at supporting the Sustainable Natural Resources Management in the ASEAN region.

Activity	Target	Status	Timeline		Remarks
			Planned	Actual	
F. Visit to Selected Participating AFoCO Member Countries					Cross-country Visit are venues for sharing of lessons and experiences between and among implementing AFoCO Member Countries on Project learning and future directions
• Brunei Darussalam		Completed	Y3-Q3	Y4-Q1	Held on 12-15 March 2019 at Berakas Forest Reserve.
• Indonesia	One (1) Cross Country Visit (CCV) per country	Completed	Y3-Q3	Y3-Q4	Held on 25-26 September 2018 at Palangkaraya and Kalimantan.
• Philippines		Completed	Y3-Q3	Y3-4	Held on 21-22 November 2019 in Candelaria, Zambales which became the venue for sharing the Philippines experiences and lessons learned in its implementation of ANR in restoring degraded forest ecosystems.
• Singapore		Completed	Y3-Q4	Y4-Q1	Held on 26-27 February 2019 at Various N'parks managed areas in Singapore.

Activity	Target	Status	Timeline		Remarks
			Planned	Actual	
G. Project Management and Supervision					
• Brunei Darussalam	Continuing Activity	Completed	Y1 – Y3	Y1-Y3	Allotted fund was realigned/reprogrammed to activity B. Establishment of Demonstration plots
• Indonesia	Continuing activity	Completed	Y1 – Y3	Y1 – Y3	Project Management staff continuously conducting supervision on the activities conducted including report writing.
• Philippines	Continuing activity		Y1 – Y3	Y1 – Y3	Project management and supervision activities were done by the TWG all throughout the duration of project implementation. Coordination meetings, field monitoring, and workshops were done to identify implementation issues and concerns and formulate strategies on how the same could be addressed.
• Singapore	Not Applicable				
H. Contingency					
I. External Audit					
• Brunei Darussalam	One (1) audit per country	On- going	Y4- Q2&Q3		Consistent with the agreements reached during the SPCC meeting held in Singapore, a separate audit

Activity	Target	Status	Timeline		Remarks
			Planned	Actual	
• Indonesia		On- going	Y4- Q2&Q3		report shall be submitted by the implementing countries to the AFoCO Secretariat. The audit shall be conducted by a third party auditor (whether from government or private auditing body) and shall follow the protocols and template developed by the Philippines as the lead implementing Country, as approved by the AFoCO Secretariat.
• Philippines		On- going	Y4- Q2&Q3		
• Singapore		On- going	Y4- Q2&Q3		Singapore informed the AFoCO Secretariat that they did not allocated fund for External Audit as they have regular internal government audits and external audits conducted by private companies.

4.2. Planned vs. revised budget

Consistent with the agreements during the Project Coordination Committee (PCC) meetings, the Work and Budget Plans (WBP) of the respective implementing countries were revised in an annual basis to consider actual activities accomplished in the previous year, and projected requirements for the ensuing year. While such revisions have been made, report on the actual fund utilization of the respective implementing countries are yet to be finalized based on the results of the third party audit conducted for the purpose. As agreed, a separate financial report will be submitted by the implementing AFoCO Member Countries for the purpose.

Activity No.	Outputs/Key Activities	Budget Allocation (USD)									
		PLANNED (2016)					REVISED (2019)				
		Brunei	Indonesia	Philippines	Singapore	Total	Brunei	Indonesia	Philippines	Singapore	TOTAL
A.	Inception Meeting among implementing countries	-	-	9,940.00	-	9,940.00	-	-	8,555.00	-	8,555.00
B.	Establishment and maintenance of demonstration plots/learning sites	81,030.00	64,999.00	55,770.00	-	201,799.00	107,386.00	48,698.00	52,535.00	-	208,619.00
B.1	Site Identification, surveying, mapping and planning	-	2,625.00	5,400.00	-	8,025.00	-	1,889.00	5,398.00	-	7,287.00
B.2	Vegetation Assessment	-	7,374.00	4,600.00	-	11,974.00	-	3,265.00	4,134.00	-	7,399.00
B.3	Procurement of Demo Site/Training Equipment or tools	1,030.00	12,000.00	12,000.00	-	25,030.00	-	6,465.00	10,988.00	-	17,453.00
B.4	Infrastructure facilities and fixtures	-	16,200.00	16,100.00	-	32,300.00	-	5,222.00	15,880.00	-	21,102.00
B.5	Actual Establishment and maintenance of demonstration plots	80,000.00	20,800.00	13,470.00	-	114,270.00	107,386.00	5,946.00 2758.00 (maintenance and protection)	12,177.00	-	128,267.00

Activity No.	Outputs/Key Activities	Budget Allocation (USD)									
		PLANNED (2016)					REVISED (2019)				
B.6	Field monitoring and evaluation by project personnel (USD35/man day on a weekly basis)	-	6,000.00	4,200.00	-	10,200.00	-	11,160.00	3,958.00	-	15,118.00
B.7	Utilization of microbes to decompose the wood waste in peatland	-	-	-	-	-	-	9,993.00		-	9,993.00
B.8	Publication	-	-	-	-	-	-	2,000.00		-	2,000.00
C.	Capacity Building Activities	100.00	10,780.00	21,500.00	-	32,380.00	-	18,250.00	21,318.00	-	39,568.00
D.	Trainers Training on Urban Forestry and Biodiversity Conservation (Singapore Activity)	-	-	-	62,340.00	62,340.00	-	-	-	38,809.00	38,809.00
E.	Regional Workshop for the sharing of experiences and lessons learned among implementing AFoCO Member Countries	-	-	53,180.00	-	53,180.00	-	-	53,180.00	-	53,180.00
F	Visit to selected implementing AFoCO Member Countries *	13,400.00	15,200.00	15,050.00	15,200.00	58,850.00	4,320.00	19,275.00	21,417.00	34,484.00	79,496.00
G	Project Management and Supervision	14,640.00	18,480.00	54,620.00	19,260.00	107,000.00	-	24,094.00	55,143.00	-	79,237.00
G.1	Staff Resources (Allowance /Honorarium of Project Staff)	14,640.00	11,880.00	28,080.00	12,960.00	67,560.00	-	11,880.00	28,589.00	-	40,469.00
G.2	Management Support for Operations	-	6,600.00	6,660.00	6,300.00	19,560.00	-	12,214.00	9,380.00	-	21,594.00

Activity No.	Outputs/Key Activities	Budget Allocation (USD)									
		PLANNED (2016)					REVISED (2019)				
G.3	Project Coordination Committee Meeting	-	-	19,880.00	-	19,880.00	-		17,174.00	-	17,174.00
H	External Audit	2,500.00	2,000.00	2,000.00	2,000.00	8,500.00	-	2,000.00	2,000.00	-	4,000.00
I	Contingency	1,076.00	1,287.00	2,088.00	1,286.00	5,737.00	1,040.00	429.00	-	1,724.00	3,193.00
	GRAND TOTAL	**112,746.00**	**112,746.00**	**214,148.00**	**100,086.00**	**539,726.00**	**112,746.00**	**112,746.00**	**214,148.00**	**75,017.00**	**514,657.00**

4.3. Implementation issues and constraints

During the time of implementation, the Project faced both administrative and operational issues and constraints that somehow affected the smooth delivery of its deliverables.

At the regional level, the execution of Memorandum of Understanding (MOU)/ Project Implementation Agreement (PIA) by and between the Philippines (as the lead country) and the implementing AFoCO Member Countries took some time to be completed, which affected the early implementation of activities under the In-country projects. Likewise, administrative concerns on the preparation and submission of progress reports by the implementing AFoCO Member Countries and consolidation by the lead country, which is a requirement for the release of fund, affected the timely implementation of activities (to some extent) programmed by the respective implementing AFoCO Member Countries. This is because delay in the submission of one (1) implementing AFoCO Member Countries would cause the delay in the submission of the consolidated report.

On the other hand, the implementing AFoCO Member Countries reported the following specific operational concerns:

- **Brunei Darussalam**- After the Project Implementation Agreement (PIA) was concluded between the Forestry Department of Brunei Darussalam and FMB of the Philippines (lead country) in November 2016, it took about five (5) months for internal process to secure a project bank account before receiving the fund from the Secretariat.

  A major budget revision was implemented for the rehabilitation and restoration of degraded coastal forest area since the original budget was underestimated based on the 2006 cost norms. The revision included the cancellation and reallocation of budget for Activities C, G and F to Activity B. Establishment of Demonstration plots, registering a substantial increase from the original estimate of about 71% to 92% of the total budget.

- **Indonesia**- FLR of degraded PSF actively asks human intervention in order to realize the recovery of damaged PSF ecosystem. In relation to FLR as a long-term process of regaining ecological functionality and enhancing human well-being across deforested or degraded landscapes, the policy makers and FLR managers have to make sure the sustainability of the activities, pre-disturbance states of the PSF as a reference of ecological functionality and benefits of PSF to community. Therefore, there are technical, social, economic issues in conducting FLR.

  - Technical issues - appropriate forest restoration models and technologies, correct tree species selection and pre-disturbance (or climax) forest as a reference for stable forest ecosystem shall be identified.

    - paludiculture with promoting native tree species and improving water level in restoring degraded PSF.

- commercial plantations in the PSF.

➢ Social issues- reluctance of local farmers to apply eco-friendly agroforestry practice, less perseverance to apply the materials of the trainings, existing forest land use system, value system of local community that focus on extractive activities and less empowerment of community development.

➢ Economic issues- related to FLR are the involvement of stakeholders to create green economies in restoration activities, direct benefits of restoration activities in providing jobs and cash income, incentive and subsidies systems in conducting restoration activities and production and marketing systems of restoration activities, especially for Non Timber Forest Products (NTFP). The local community, in this regard, are allowed to capture the benefits from FLR activities.

Moreover, Indonesia reported several constraints, namely:

a. less participation of key stakeholders from related Central Kalimantan offices due to their tight schedule;
b. limited number of field workers to maintain demonstration plots;
c. low survival rate of gemor (*Notaphoebe coriaceae*) due to limited knowledge and technology to plant this tree species in open area;
d. pineapple plants are destroyed wild animals for getting its ripe fruits;
e. limited access to enter demonstration plots during rainy season;
f. slow progress to submit papers of the book; and
g. poor performance of wood decomposers when they transferred from laboratory to the field.

- **Philippines** - Delays in site selection lead to subsequent delays in the implementation of project activities. Following the termination of the Project in March 2019, the project is faced with the following concerns:

  ➢ Implementation of Year 2 and 3 Maintenance and Protection activities of the established ANR Demonstration Site will spill over-after the end of project life in March 2019, up to March 2020. Correspondingly, release of fund to the partner Peoples Organization (POs) shall be made up to March 2020 based on the “progress billing scheme.”

  ➢ The conduct of 3rd pass (final) data gathering for the Vegetation Assessment (VA) originally scheduled on March 2019 was not pursued due to early the onset of the dry season because of the possibility that new measurements will not reveal significant difference in terms of growth of regenerants. The activity was only completed in August 2019. Correspondingly, release of payment to the consultant was carried-out once the activity has been completed.

- **Singapore** - Singapore’s position in the BIPS Project is rather unique and differ from that of the other Implementing Countries. Unlike the case of Brunei Darussalam,

Indonesia and the Philippines, Singapore had no demonstration plots, and their main role was that of capacity building and showcasing Singapore's experience on forest rehabilitation and restoration mainly through habitat enhancement efforts.

5. Impact Analysis

5.1. Outputs and outcomes

In accordance with their respective Work and Budget Plan (WBP), the implementation of various activities under Regional Project yielded several outputs/deliverables which are considered success indicators for the achievement of its goals and objectives:

5.1.1 Established model/demonstration sites for future replication/adoption;

Brunei Darussalam, Indonesia and Philippines have successfully completed the establishment of their model/demonstration plot. These plots showcase the restoration/rehabilitation technology of various types of degraded ecosystems within the ridge to reef horizon, primarily for the purpose of capacity building local communities and concerned government officials and personnel involved in forest restoration activities.

In particular, Brunei Darussalam facilitated the restoration of a half hectare demonstration plot inside a beach forest reserve which are now being used for recreational and educational purposes. Likewise, Indonesia and Philippines developed four (4) hectares of peat swamp forest (PSF) and thirty (30) hectares of natural forest, respectively, which served as laboratory/facility for research and various capacity building activities under the Project.

Ancillary to the capacity building activities of Indonesia and Philippines, both country conducted Vegetation Assessment (VA) of their demonstration plots to determine the effects of the restoration technologies applied in their respective a project sites.

Particular to the Philippines, the results of the VA were used as inputs in enhancing the country's existing restoration practices and technologies, specifically the enhancement of the Technical Bulletin/Guide on ANR.

For Indonesia, the results of the VA were used as reference to achieve biodiversity and ecosystem equilibrium and ideal PSF ecosystem that may reach through restoration activity at Tumbang Nusa. The full blown discussion of the aforesaid VA results can be found in the respective country report of Indonesia and Philippines attached to this document.

5.1.2 Demonstration plots/learning areas in various landscapes within implementing AFoCO Member Countries properly maintained and protected by the concerned

stakeholder;

Corollary to the establishment of demonstration plots, the implementing countries formulated/are formulating several arrangements for its maintenance and protection to ensure sustainability even after project termination. At the outset, Brunei Darussalam intends that its demonstration plot be maintained by the staff from the Unit of Rehabilitation under the Department of Forestry. Indonesia, on the other hand, is working on scaling-up its demonstration plot and promoting Liberika coffee as an agro-forestry crop and further proposing that the area be part of the collaborative Forest Landscape Restoration on Degraded PSF, among others. Specific for the Philippines, the establishment of the ANR demonstration plots was incorporated in the Community Resources Management Framework (CRMF) to ensure sustainability and consistency with the over-all plans, programs and activities of the PO for the development of their CBFM area. Moreover, the project site has been declared as the official learning site for the Assisted Natural Regeneration (ANR) technology of Department of Environment and Natural Resources (DENR) Region 3, where the capacity building activities of the Region will be conducted.

5.1.3 Capacity building activities and its corresponding training modules relative to the application of landscape approach to RRR-DFE among implementing AFoCO Member Countries;

Except for Brunei Darussalam, the implementing AFoCO Member Countries conducted several capacity building activities to community members and other stakeholders relative to the application of landscape approach in the restoration of degraded forest ecosystems. It should be noted that originally, Brunei Darussalam also had a target for capacity building, but the budget was later reallocated to establishment of demonstration plot to augment the budgetary requirement for said activity.

Consistent with its work plan, Indonesia conducted three (3) sets of training on PSF agroforestry and Community Livelihood and Rural Economy Development. Said training activity was attended by participants coming from various stakeholders.

Meanwhile, Philippines conducted four batches of training on the application of ANR technology and Vegetation Assessment (VA) in natural forest. Said activity that was attended by at least 94 stakeholders, comprised of members of the partner PO and staff of the forestry sector (i.e. DENR Region 1-13 and CAR), was designed to be a trainers' training to further cascade learnings to other members of the community and colleagues of the participants from the DENR.

As their main activity under the Project, Singapore provided training on urban forestry and biodiversity conservation to 24 officials and personnel of the implementing AFoCO Member Countries, to include non-implementing AFoCO Member Countries: Cambodia, Lao PDR, Malaysia, Myanmar, Thailand, and

Vietnam. The activity involved sharing by Singapore of their urban forest management, with the intension of transforming Singapore to a biophilic city.

To account, more than one hundred (100) participants comprised of local communities and government practitioners from the implementing AFoCO Member Countries were capacitated under the project in concerns related to peat swamp, natural and urban forest ecosystems.

5.1.4 **Regional workshop and cross country visits as venue for sharing of experiences between and among implementing AFoCO Member Countries on Project learning and future directions**;

To foster achievement of project goals and objectives, particularly on fostering forest cooperation, Cross Country Visits (CCVs) were facilitated and conducted among the implementing AFoCO Member Countries to discuss and exchange ideas, good practices, lessons and experiences on the implementation of restoration initiatives and technologies in their respective project sites. Participants to the CCVs are members of the local communities and officials and personnel of the implementing AFoCO Member Countries who had direct involvement in actual project implementation. The hosting of the respective CCVs were consecutively facilitated by Indonesia, Philippines, Singapore and Brunei Darussalam September 2018, October 2018, February 2019 and March 2019 respectively.

As the culminating activity for the Project and in pursuit of its goal to strengthen trans-boundary cooperation of respective forestry sector within ASEAN countries through the application of landscape approach in natural resources management, a regional workshop was conducted on 19-22 March 2019 in the Philippines. The activity likewise served as an avenue for the sharing of experiences and lessons learned among implementing AFoCO Member Countries with respect to the implementation of their In-Country project activities. It highlighted good practices, technologies and success stories of the respective implementing AFoCO Member Countries that can be adopted/replicated by other countries, for the improvement of their domestic policies, guidelines and procedures vis-à-vis application of landscape approach in NRM management.

The activity was participated by the project implementing AFoCO Member Countries (except Brunei Darussalam), including non-implementing AFoCO Member Countries: Cambodia, Myanmar, Malaysia, Thailand and Vietnam, and the representative from the AFoCO Secretariat, to promote discussion in a wider perspective or at the ASEAN context.

At the end of the activity, the group was able to assess project outputs and outcomes in relation to its objectives at the regional and in-country level. Likewise, documentations were made with respect to the good practices, technologies and success stories of the BIPS countries and other AFoCO Member Countries, including potential policy recommendations with regards to the improvement of

landscape approach at the in-country level. The presentation of the country participants focused on the following topics:

Brunei Darussalam	-	Restoration of degraded beach forest
Indonesia	-	Restoration of degraded peat swamp forest
Philippines	-	Restoration of degraded natural forest thru Assisted Natural Regeneration
Singapore	-	Urban Forestry and Biodiversity Conservation
Cambodia	-	Forest and Landscape Restoration Activities in Cambodia
Malaysia	-	Implementation Activities Using The Landscape Approach To Restoration In Peninsular Malaysia
Myanmar	-	Forest Landscape Restoration in Myanmar
Thailand	-	Forest Land Management in Watershed
Vietnam	-	PFES in Support for the Sustainable Forest Resources

Attached as **Annex 5** is the proceedings of the Regional Workshop.

5.1.5 Documentation reports relative to the lessons and experiences of the Project

In the course of project implementation, the implementing AFoCO Member Countries were able to document a number of lessons and experiences gained with regards to various aspects of forest restoration. In particular, Indonesia and the Philippines underscored the importance of proper identification of applicable approaches and technologies (management prescriptions) vis-à-vis site condition, involvement and participation of local communities and other stakeholders and collaborative & comprehensive planning for the restoration of the project area, among others. These lessons learned and experiences are described in the respective progress reports of the implementing AFoCO Member Countries, and was further discussed in the project Regional Workshop.

5.1.6 Comparative assessment of management capabilities across communities/ stakeholders and landscapes;

Common to Indonesia and Philippines is the presence of communities within the project, in which, concerns and peculiarities must be given prime consideration in all aspects of the restoration initiative, from planning to implementation and finally up until the monitoring stage. For an effective restoration intervention, the social aspect of project implementation must be set in place to ensure cooperation and participation from the community. With this situation, the actual engagement of community members in the implementation of project activities was seen as a crucial ingredient to promote ownership of the Project, thus ensuring sustainability.

In the case of Brunei Darussalam, considering that the demonstration plot is located inside a forest reserve, its management was vested with the Unit of rehabilitation under the Department of Forestry, thus continuity in terms of

monitoring and allocation of financial requirements for maintenance and protection is expected.

5.1.7 Experiential learning modules (focus is on knowledge and skills acquisition within an established/existing learning sites)

In line with the implementation of various capacity building activities under the Project, learning modules were developed/improved by the respective implementing AFoCO Member Countries to facilitate transfer of knowledge, which may be used in succeeding training programs by the implementing AFoCO Member Countries or even shared to the other AFoCO Member Countries through the AFoCO Secretariat. For Indonesia, learning modules developed were on topics such as PSF agroforestry and Community Livelihood and Rural Economy Development; for the Philippines, ANR technology and Vegetation Assessment (VA) in natural forest; and for Singapore, urban forestry and biodiversity conservation.

5.2. Internal & external impacts

The implementation of various capacity building programs under the Project primarily resulted to the increase in the capacity of community members and government officials & personnel directly involved in the implementation of the project vis-à-vis restoration technologies and approaches.

To optimize opportunity, lessons learned in the course of project implementation and training activities are expected to be cascaded to external stakeholders such as other members of the community, other relevant agency and academe/research institutions, among others. In the instant case, the demonstration sites may serve as laboratory for students and institutions seeking to conduct research on scientific, technology, environmental, social and economic aspects of forest restoration.

In terms of impacts to the project sites, the restoration efforts initiated by the project were expected to facilitate the improvement and conservation of the biodiversity, water quantity and quality, soil amelioration, carbon storage, provision of wood and non-timber forest products and even food security for the local community.

Provided that the project sites will be sustainably managed, these changes/impacts are likewise expected to naturally transcend to adjacent/neighboring areas, with the proper intervention from the concerned agency/stakeholders.

5.3. Local and Regional applicability

The respective in-country projects of the implementing AFoCO Member Countries were developed with due reference to the peculiarities of the site condition/ecosystems to where the demonstration sites were established. As such, technologies and approaches used by the implementing AFoCO Member Countries to restore the area are expected to be likewise applicable to neighboring/adjacent areas or even far, but similarly situated areas.

Moreover, locally conducted trainings may be replicated to other group of stakeholders that are potential partners of the government in its restoration efforts. This is an indicator of the applicability of Regional Project in the local context of each implementing AFoCO Member Countries.

In the regional context, technologies and approaches adopted by the AFoCO Member Countries in the restoration of their project sites may likewise be adopted by the rest of the ASEAN countries, subject to modifications to fit local conditions. Moreover, best practices, lessons and experiences gained by the implementing AFoCO Member Countries may be used as reference of other AFoCO Member Countries in developing/improving their own restoration efforts. In the instant case, the ANR technology applied by the Philippines in the restoration of its natural forest can likewise be used by Brunei Darussalam and Indonesia considering that common to said countries is the presence of natural forest ecosystem. The same is true with the technologies applied by Brunei Darussalam in beach forest, Indonesia in peat swamp forest and Singapore in urban forest.

5.4. Sustainability

The project strengthened the trans-boundary cooperation of four (4) countries in their respective forestry sector through the application of landscape approach in natural resources management by capacitating the communities, government partners and other stakeholders on restoration/ rehabilitation approaches, providing them with appropriate tools, equipment and materials, needed in restoring ecological ecosystem. These activities were financially supported by the project with co-financing input from the government in terms of project staff, salaries, office facilities and utilities, vehicles, etc.

Generally, the established demonstration sites will be protected, maintained and monitored by communities and/or government partners. Further, scientific way of collecting data and analysis will be pushed through to come up with baseline data/information. Mainstreaming or adoption of improved restoration/rehabilitation approaches, either or both capacity building activities and area development, will be effectively carried out with the aid of knowledge products developed during the project life.

Policy recommendations will be developed following the successful implementation of the project with government co-financing.

6. Challenges and Lesson Learned

The respective implementing countries of the project encountered different challenges in the aspect of project formulation, operational, administrative, and external factors in the project implementation. Likewise, the implementing countries documented lessons learned in the implementation of their respective project activities on the designated forest ecosystem.

6.1. Project formulation aspect

Due to the wide coverage and different range of forest ecosystem/landscape of the project, limited budget allocation for the project implementation and difficulty of the participating/implementing countries to cover all types of forest ecosystem/landscape, the development of the project considered different forest ecosystems located in the implementing countries such as mangrove forest, peatland swamp forest and degraded tropical forest and urban forest to cover the total forest ecosystem/landscape and to address the objective of the project.

Consistent with the over-all objectives of the Regional Project, one of the expected outputs from the implementing countries (Brunei Darussalam, Indonesia and Philippines except Singapore) is the establishment of respective demonstration plots which will serve as learning area/s for the concerned stakeholders. Singapore was unable to propose any demonstration plots due to its size and land constraints that would greatly limit its scope. As such, they maintained its role and participation solely on the provision of capacity building.

The project dealt more on the capacity building and documentation of best practices and lessons learned in the implementation of project activities in the respective implementing countries that served as inputs to the enhancement of existing guidelines and technologies.

Selection of project sites in terms of accessibility, suitability and presence and involvement of cooperative government institutions, local stakeholders/peoples organizations as partner in the project implementation were also considered in the project preparation/formulation.

6.2. Operational aspect

The implementing countries encountered different operational and administrative concerns in the implementation of their respective project activities.

In Brunei Darussalam, delayed establishment of the demonstration site was reported by the External Monitoring Team which recommended to complete the construction before the project ends and applied close monitoring and intensive supervision and management.

In Indonesia, the operational issues encountered in the implementation of project activities were the accessibility and mobility of the partner implementers to the project area, condition of the heavily degraded PSF demonstration site, and selection of adaptable local tree species and the weather condition of the project area.

For the Philippines, one challenge encountered during the project implementation

was the delayed transfer/downloading of funds from DENR-FMB to their local DENR regional and provincial counterparts due to the domestic bureaucratic procedures. However, the project was successfully implemented because of the proper and close coordination and working relationships among the partner PO, local DENR, LGUs and other government agencies.

While in Singapore, stringent financial and administrative procedures/processes were seen to affect limitations in terms of planning and execution of project activities.

6.3. External factors

The project likewise faced challenges caused by factors external to the implementing agency and the project site. Indonesia reported that PSF ecosystem are very complex and to achieve strong sustainability, FLR initiatives need integration of ecosystem integrity, social cohesion and economic benefit.

Moreover, considering that the Project is Regional in nature that is being implemented by four (4) different ASEAN Countries, the process provides that consolidated reports and corresponding budget requests will only be submitted to the AFoCO Secretariat once the submission of BIPS Implementing countries were completed. Therefore, late submission of one of the implementing countries may result to delays in the submission of consolidate report and subsequent delays in the release of funds.

7. Conclusions and Recommendations

The implementation of the Regional Project resulted to a number of positive impacts both internal and external to the respective implementing AFoCO Member Countries. Following the conclusion of its activities, the results thereof underscores the practicality of the FLR approach to restoration.

Moreover, the project resulted to outcomes and outputs which are valuable references in enhancing/updating existing policies, guidelines and practices with regards to the application and mainstreaming of the landscape approach to the over-all initiative of the government on the restoration/rehabilitation of the country's forestland areas.

The conduct of PCCs, CCVs and Regional Workshop became a good opportunity for the Implementing AFoCO Member Countries to share experiences on Project learning and future directions to foster achievement of project goals and objectives. Taking off from such initiatives, it is imperative that documentations of lessons gained, including knowledge products be shared to the other AFoCO Member Countries, through the AFoCO Secretariat.

8. Photo records

Highlights of Accomplishments

INCEPTION MEETING

Inception meeting among implementing countries which took place in 2016.

Highlights of Accomplishments

3 PROJECT COORDINATION COMMITTEE (PCC) MEETINGS

the PCC meeting convened project implementers to discuss status and updates of project implementation as well as addressing arising problems.

Manila, Philippines – Oct 2017
Manila, Philippines – Dec 2018
Singapore - Feb 2019

Highlights of Accomplishments

4 batches of CROSS COUNTRY VISITS

- To discuss and exchange ideas, good practices, lessons and experiences of the Philippines on the implementation of ANR that will serve as reference in the development of future policy directions by the implementing AMS countries; and
- To share experiential learning modules (focus is on knowledge and skills acquisition within an established/existing learning sites).

Indonesia - Sept 2018
Philippines - Oct 2018
Singapore - Feb 2019
Brunei Darussalam – Mar 2019

Highlights of Accomplishments

Regional Workshop

- Culminating activity for the Project
- avenue for the sharing of experiences and lessons learned among implementing countries, including other ASEAN countries
- Expected to complete documentation of the good practices, technologies and success stories of the BIPS countries and other non-implementing AMS

9. References

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10. Appendices

Appendix 1	-	Project Completion Report of Brunei Darussalam
Appendix 2	-	Project Completion Report of Indonesia
Appendix 3	-	Project Completion Report of the Philippines
Appendix 4	-	Project Completion Report of Singapore
Appendix 5	-	Proceedings of the Regional Workshop

PROJECT COMPLETION REPORT

Project Profile

Project Code	AFoCo/011/2016
Project Title	Capacity Building on the Application of Landscape Approach to Support the Sustainable Natural Resources Management in Brunei Darussalam, Indonesia, Philippines and Singapore.
Project Duration	Start date: 14th November 2016 End date: 31st March 2019
Implementing Agency	Department of Forestry Ministry of Primary Resources and Tourism
Participating Countries	Brunei Darussalam, Indonesia, Philippines (Lead), and Singapore
Project Site	Area of 0.5 hectares at Berakas Forest Reserve
Target Area	Primary Target Area: - Secondary Target Area: -
Budget and Source of Finance	Total: US$112,746.00 AFoCO: US$112,746.00

Implementing Agency Profile

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Project Staff	Mr. Mohd Rozizan Mohd Maslin	Field Officer
	Mr. Sufri Piut	Field Officer
	Mr. Liming Daman	Field Officer
	Mr. Mohd Zukrina Haji Daimun	Field Officer

Notes to the Authors & Readers

The project completion report is a formal document, which presents all the relevant information about the project implementation. The report should be written in an accessible language, avoiding very technical terms. The use of graphical information, such as maps, tables and graphs, is an effective way of improving communication.

The following table of contents presents a sample list of items to be included in the completion report; however, the addition or revision of those items is recommended in pursuit of more effective and transparent delivery of the project results.

Draft of this completion report should be presented at the Final Coordination and Evaluation Meeting. The final version of this completion report should be submitted to the Secretariat within 3 months from the completion the date of the project together with the financial audit report.

Contents

Summary

Brunei Darussalam, which lies between longitudes 114°4'E and 115°22'E, and latitudes 4°2'N and 5°3'N, is a small country with a land area of about 5,765 km². Due to its constant high relative humidity and high temperature, the tropical rain forests of the country have developed on fertile soils on bedrock of tertiary age which consists of sandstone, shale and clays.

The project site is located within the Berakas Forest Reserve with a total area of about 0.5 hectares. The goal of this project is to strengthen the co-operation between the BIPS countries by sharing the best practices learning in the forestry field and with the objectives to rehabilitate and restore the project site and also to enhance the capacity building of the officer and staff concerned.

The project implementation is led by the Philippines and supported by other ASEAN Member countries such as Brunei Darussalam, Indonesia and Singapore. In Brunei, Forestry Department, Ministry of Primary Resources and Tourism, is the facilitator for this in-country project.

By the end of this project, the expected output are achieved such as the establishment of a demonstration/model plot for education purpose like research; highly-trained and competent officer and staff; documentation of database and report; greening area to attract more visitors; and ecosystem services contributions in tackling climate change. In addition, the site can be rehabilitated and regreen as the site had severe erosion and endured several forest fire, and has been left to regenerate with pioneering species.

1. Introduction

According to the National Forestry Policy of Brunei Darussalam, in pursuance of national development objectives and consistent with global strategies on biogeoecology in which the forests play a vital role, the Government of Brunei Darussalam commits itself to conserve, develop and manage its forests resources for the preservation and upliftment of the quality of life; the promotion of social, political and economic well-being of the people, and technological progress of the country; and for bringing about environmental amenity and ecological equilibrium over a time continuum.

On the environmental forestry context, Brunei is committed to rehabilitate wastelands in the country through revegetation for the protection of the site from further deterioration, and for the restoration of the ecological stability. Furthermore, Brunei has a commitment with both Convention Biological Diversity (CBD) and Sustainable Development Goals *(*SDG) in implementing greening program by 2020 and 2030 respectively.

2. Background and Objectives

2.1. Project rationale

The project site is located within the Berakas Forest Reserve, close to the Biodiversity Park, with a total area of about 0.5 hectares (**Appendix A**). It is aimed that with this project, the site can be rehabilitated and regreen as the site had severe erosion and endured several forest fire, and has been left to regenerate with pioneering species.

Berakas Forest Reserve is 18 kilometers from the capital city with an attractive feature of a beach and Kerangas Forests. The total area of forest reserve is about 348 hectares.

Berakas Forest Reserve is categorized as a recreational forest area, where some degraded areas are undergoing rehabilitation process. The forest reserve consists mainly of Kerangas Forest (the local name for tropical heath forest which means “land which cannot grow rice”, came from Iban language) resulting in a number of unique and interesting species of trees such as the Ru Runang (*Casuarina* sp.), Sindok-Sindok (*Endospermum* sp.) and Selunsor (*Tristania* sp.). Stands of trees such as *Acacia mangium*, Jagus (*Anacardium occidentale)*, Klinkii Pine (*Araucaria hunsteinii),* and Kapur Bukit (*Dryobalanops* sp.) can also be found.

Biodiversity Park with an area of 3.5 hectares is a new recreational park which was opened to the public in 2010. The park is used to be a degraded area and the government has made an initiative to rehabilitate the area. The facilities provided in this park are resting huts, exercise equipment, children playground, toilet, and pathway. Activities that can be done include jogging, brisk-walking and for education purposes like tree-identification.

2.2. Project objectives

The objectives of the project are:

- To rehabilitate and restore the project site;
- To establish of a demonstration/model plot for education purpose such as research;
- To enhance the capacity of the officer and staff concerned;
- To green the area for recreational purpose; and
- To enhance the ecosystem services contributions in addressing climate change like carbon sequestration.

2.3. Assumption and risks

The project has gone through a very dry season and high temperature during the implementation period especially in January until March 2019 and there is an assumption of high risk for forest fire to occur.

3. Project Management

3.1. Management structure

The project implementation is led by the Philippines and supported by other ASEAN Member countries such as Brunei Darussalam, Indonesia and Singapore. In Brunei, Forestry Department, Ministry of Primary Resources and Tourism, is the facilitator for this in-country project.

In order to achieve a successful implementation of the project, Forestry Department cooperates with other stakeholders including local government agencies, relevant non-government organizations, private sectors, and local institutions. The roles of these stakeholders and institutions are summarize in Table 1 below.

Stakeholder	Roles	Institutions
Local government agencies	Provision of support for the management and protection of natural resources.	Other relevant government agencies at various levels. For e xample: - Tourism Development Department - Environment, Parks and Recreation Department - Brunei Climate Change Secretariat
Civil Society Organizations	Provision of information development of sustainable forest management systems, capacity building and encouragement for communities.	Non-Government Organizations s uch as Green Brunei and etc.
Private sectors	Provision of information development of sustainable forest management systems.	Private companies such as Hengyi Industries Sdn Bhd and etc.
Academic Institutions and Research agencies	Analysis of programs and provision o f information on all aspects of programs. Provision of information development of sustainable forest management systems	University of Brunei Darussalam (UBD) and etc.

Table 1. Roles of cooperated institutions and other stakeholders.

3.2. Work plan and schedule

The project has major activities implemented for a duration of 3 years as below:

- Establishment of a demonstration/model plot such as site preparation, irrigation and drainage, planting, and maintenance;
- Capacity building of respective technicians;
- Sharing of experiences on project learning and future direction during the Cross Country Visit (CCV) to other participating countries; and
- Documentation and packaging of lessons and experiences of the project.

To ensure the smooth implementation of the project activities, a country facilitator has such roles and responsibilities as follows:

- Overall supervision and management of project office, staff and financial matters to ensure timely, efficient and effective implementation of project activities;
- Coordinate with relevant officials and stakeholders for efficient operation of the project;
- Provide guidance and assistance to staff involved in the project implementation;
- Review and submit periodic accomplishment reports of the project to the AFoCo through the lead country;
- Prepare and submit financial report including itemized statement of expenditures to the AFoCo through the lead country; and
- Maintain record of activities implemented and accomplished including technical documents and recommendations.

4. Performance

4.1. Planned vs. actual implementation

Table 2 shows the planned implementation for the project:

Output/ Activity No.	Key Activity	Progress Description	Timeline
B.	Establishment and Maintenance of Demonstration Plots/Learning Sites.	The tender document is being assessed.	Original: Y2-Q4 Revise: Y3-Q3
C.	Capacity Building Activities.	Future activities.	Original: Y4-Q1 Revise: Cancel
F.	Visit Selected Participating AMS.	Future activities.	Original: Y3-Q3 Revise: Y4-Q1
G.	Project Management Supervision.	Continuous activities.	Original: Y2-Q4 Revise: Cancel
H.	External Audit.	Future activities.	Original: Y3-Q4 Revise: Cancel
I.	Contingency.	Future activities.	Original: Y3-Q4 Revise: Y4-Q1

Table 2. The planned project implementation.

Table 3 shows the actual implementation of the project:

Output/ Activity No.	Key Activity	Progress Description	Timeline
B.	Establishment and Maintenance of Demonstration Plots/Learning Sites.	Implementation on site started on 19 November 2018.	Original: Y3-Q3 Revise: Y3-Q4
C.	Capacity Building Activities.	Future activities.	Original: Y4-Q1 Revise: Cancel
F.	Visit Selected Participating AMS.	Future activities.	Original: Y4-Q1

G.	Project Management Supervision.	Continuous activities.	Original: Y2-Q4 Revise: Cancel
H.	External Audit.	Future activities.	Original: Y3-Q4 Revise: Cancel
I.	Contingency.	Future activities.	Original: Y3-Q4 Revise: Y4-Q1

Table 3. The actual project implementation.

4.2. Implementation issues and constraints

After a Project Implementation Agreement (PIA) was concluded between the Forestry Department of Brunei Darussalam and FMB of the Philippines (lead country) in November 2016, it has taken about five (5) months for internal process to secure a project bank account before receiving the fund from the Secretariat. It was also observed that a major budget revision was needed for the rehabilitation and restoration of degraded coastal forest area since the original budget was underestimated based on the 2006 cost norms. After this budget revision, the restoration work would take about 92% of total budget, a substantial increase from the original estimate of 71%. Therefore, budget for Activities C, G and F are canceled and reallocated for Activity B.

5. Impact Analysis

5.1. Outputs and outcomes

From this project, Brunei managed to achieve the main objectives and expected output of the project as follows:

- The rehabilitation and restoration of the project site;
- The establishment of a demonstration/model plot for education purpose such as research;
- The enhancement of the officers' capacity and staff concerned;
- The green area becomes an add-value for the recreational purpose where there will be an increase number of visitors to the park; and
- The enhancement of the ecosystem services contributions in addressing climate change like carbon sequestration.

5.2. Internal and external impacts

At the moment, Brunei is highly focusing on the forest rehabilitation programs which may lead to tackling the impact of climate change. Brunei is also closely cooperates with Brunei Climate Change Secretariat (BCCS), Ministry of Energy, Manpower and Industry (MEMI). This Unit is mandated to develop, implement, monitor and evaluate Brunei's climate change policies, strategies and action plans.

It drives the strategic coordination, implementation and alignment of workplans in addressing climate change issues at a national level and to develop policies and programs to mitigate emissions of greenhouse gases (GHGs) and enhance sinks of all GHGs.

Thus, by having the project demonstration plot, the area could be used as a pilot project in compiling data for carbon sequestration. Currently, the Department is working together with the undergraduate students from local higher institutions and international in findings the proper procedures to calculate the carbon traps in trees (**Appendix C**).

In addition, the project site also aimed for education purpose whereby the local and international researchers and expert can use the area to study the native species in Brunei specifically for certain type of forest and the forest management in tackling forest fire occurrence including the mitigation and adaptation methods.

5.3. Local applicability

In May 2019, Hengyi Industries Sdn Bhd organized a tree planting event at the project site as part of their pledged to plant a total of 200 hectares reforestation project with 500 saplings were planted (**Appendix D**). The reforestation project is also part of their Corporate Social Responsibility (CSR) as the company specializes in downstream industry developing a world class refinery and integrated petrochemical complex in Brunei.

5.4. Sustainability

The project site will be managed and maintained by the staff from the Unit of Rehabilitation under the Department of Forestry. The purpose of the demonstration plot will continually serve its functions for today and future generations.

6. Conclusion and Recommendations

In conclusion, the project entitled: Rehabilitation and Restoration of Coastal Degraded Ecosystems in Brunei Darussalam, despite for being small for its total area of only 0.5 hectares, the project site is believed to contribute a significant impact for Brunei Darussalam especially in achieving the National Forestry Policy of Brunei Darussalam on the environmental forestry context where Brunei is committed to rehabilitate wastelands in the country through revegetation for the protection of the site from further deterioration, and for the restoration of the ecological stability. Furthermore, Brunei could attain the current commitment with both Convention Biological Diversity (CBD) and Sustainable Development Goals *(*SDG) in implementing greening program by 2020 and 2030 respectively.

As a way forward, Brunei welcome Republic of Korea and other ASEAN countries to visit the project site and to share the best practices from each country in accomplishing the similar project nature.

7. Appendices

- Appendix A. Map of the Project Site
- Appendix B. Progression Photos of the Project Site
- Appendix C. Undergraduate Students Compiling Data for Carbon Sequestration
- Appendix D. Hengyi Industries Sdn Bhd Tree Planting Event

Appendix A

Map of Project Site

Appendix B

The site before project started

Establishment of the demonstration plot progress

Levelling and backfilling

Materials used

Slope Protection (Gabion Wall)

Topsoil

Project Supervision and Monitoring

Slope and Gabion Wall

Process of Turfing

The Project's Demonstration Plot

Appendix C

Undergraduate Students Compiling Data for Carbon Sequestration

Appendix D

Hengyi Industries Sdn Bhd Tree Planting Event

The participants are including the personnel from Hengyi Industries Sdn Bhd and invited Government Agencies and Non-Government Organizations

A group photo before planting

PROJECT COMPLETION REPORT

<Project Profile>

Project Code	
Project Title	Capacity Building on the Application of Landscape Approach to Support the Sustainable Natural Resources Management in Brunei Darussalam, Indonesia, Philippines and Singapore
Project Duration	Start date: June 1, 2016 End date : May 31, 2019
Implementing Agency	Forest Research and Development Center (FRDC), Forestry and Environment Research, Development and Innovation Agency (FOERDIA)
Participating Countries	Brunei Darussalam, Indonesia, Philippines and Singapore
Project Site	Tumbang Nusa, Central Kalimantan, Indonesia
Target Area	Primary target area:Tumbang Nusa Forest Research Station Secondary target area: Peatland in Central Kalimantan
Budget and Source of Finance	Total: US$ 112,746.00 AFoCO: US$ 112,746.00 National budget: US$ ___-_____ Others: US$ ___-_____ (to be specified)

<Implementing Agency Profile>

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Project Staff	Dr. I.Wayan S. Dharmawan	[Program Officer]
	Mr. Purwanto Budi Santosa	[Field Officer]
	Ms. Ening Fauziah	[Financial Officer]
	-	-

Notes to the Authors & Readers

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Contents

Summary

Multi-functional landscape based on Peatland Hydrological Unit can be proposed to restore degraded Peat Swamp Forests (PSF) in Central Kalimantan with supporting capacity building of local community. The whole area of Sungai Kahayan-Sungai Sebangau and Sungai Katingan-Sungai Sebangau Peatland Hydrological Unit was chosen as the landscape of Forest Landscape Restoration (FLR) of degraded PSF. Also, on-site PSF restoration is chosen at Tumbang Nusa Forest Research Station. With applying improvement of water level of the site through canal blocking, reforestation of the heavily degraded site with planting four local tree species (*Shorea balangeran, Dyera poliphylla, Gonistylus bancanus* and *Notaphoebe coriaceae*) and revitalization of local community roles through trainings of agroforestry and restoration economy activities can succeed multi-functional landscape objectives, namely sharing the land for Forests, Trees and Agroforestry that may improve local community livelihood, social welfare, accommodating multiple interests for the existence of PSF and multiple stakeholder needs for better environment.

The objectives of AFoCO-BIPS Indonesia are to intend and to contribute management prescriptions of PSF and to produce technology packages of PSF restoration. Outputs of the project are 2 training activities (agroforestry and community business), 1 workshop (FLR design), AFoCO Cross Country Visit, 4-ha demonstration plots (consisting 4 tree species, balangeran (*S. balangeran*), jelutung rawa (*D. poliphylla*), ramin (*G. bancanus*) and gemor (*N. coriacea*)), 1 unit bunk house, 2 units drilled wheel pumps, 1 unit fire extinguisher equipment, 1 unit canal blocking,1 PSF vegetation/ecology survey,1 microbial decomposer trial, 1 book; and 1 poster/banner. The outcomes of the project are the establishment of Agroforestry Kalampangan Peatland Farmer Group and Agroforestry Tumbang Nusa Peatland Farmer Group, increasing PSF restoration and management collaboration, increasing visit to Tumbang Nusa AFoCO-BIPS Demonstration Plots and Banjarbaru FERDI plots, increasing demand on PSF planting stocks by local community and increasing PSF productivity and environment quality. The impacts of the project are big opportunities to conduct research on the site, improve forest fire control technology packages, improve silviculture techniques of FLR, social interaction between villages around Tumbang Nusa Forest Research Station and social acceptance of the FLR activities. Actions to be taken after the project are: a. ex-post evaluation; b. scaling-up the demonstration plots and agroforestry model; c. maintenance of demonstration plots and promoting Liberika coffee agroforestry; d. Developing local community capacity; e. Increasing networking with BRG, ITPC, Paludifor and other key stakeholders; f. Empowering Peatland Agroforestry Farmer Groups; g. Conducting institutional development of the groups; h. Proposing Collaborative Forest Landscape Restoration; and i. Proposing Eco-edu Science Park at Tumbang Nusa.

1. Introduction

Most ASEAN Member States (AMS) are highly dependent on their natural resources for supporting the development. Even the ASEAN region has only 3% of the world's total land area, the region is gifted with very rich biodiversity. However, the natural resources, especially the forests, are quickly depleted. Obviously, natural resources depletion can be avoided if the AMS apply strong integration ecosystem integrity, social cohesion and economic benefits in multi-functional landscape approach.

Tropical peatlands in Southeast Asia, including peat swamp forests (PSF) are facing crisis of disappearance due to human impacts. The Indonesian PSF were excessively logged and opened for establishment of oil palm and pulpwood plantations. Deforestation and PSF degradation have catastrophic effects on environment and society, such as greenhouse gasses emission, trans-boundary haze pollution, drought, flooding, biodiversity loss, poorer local livelihood and worse community health.

In order to resolve the above problems, Government of Indonesia issued several policies and regulations, namely Government Regulations on License Moratorium in Peatlands; Designation of deep peatlands for conservation, and, recently, the establishment of Peatland Restoration Agency. Nevertheless, there is still inadequate knowledge and best practices of PSF restoration in Indonesia. Through the AFoCO-BIPS Project, these limitations can be resolved.

2. Background and Objectives

2.1. Project rationale

As located in tropical region, the AMS have very rich and diverse natural resources. The resources are the basis of livelihoods and economies of the AMS. In this context, ASEAN forest resources are renewable resources that can support sustainable development. The ASEAN forests harbor more than 20 percent of the global biodiversity. However, the forests are prone to rapid degradation mainly due to human interventions.

Indonesia is well known as a mega biodiversity country even it has only 1.3% of the globe terrestrial area. One of the Indonesian terrestrial ecosystems is peatland, including peat swamp forest (PSF). Around 14.9 million hectares of peatlands occurs in Indonesia. The peatlands and PSF provide benefits for water supply, flood control, carbon storage and biodiversity conservation. However, several problems have been identified, namely wildfires, haze pollution, over-exploitation, excessive drainage, floods and biodiversity loss (ASEAN

Secretariat, 2014). The worst PSF degradation in Indonesia occurred when the Mega Rice Project was failed and ceased in 1999 as a result of technical failure, social entropy and peak economic crisis (Mulyanto, 2000; Tampubolon 2007).

In order to restore degraded PSF in Indonesia, we have to apply forest landscape restoration (FLR) through multi-functional landscape, capacity building and restoration economy approaches. Kusters (2014) mentioned that landscape approach can provide a practical solution to achieve goals of biodiversity conservation, rural development and food security. Sharing the land instead of sparing the land is the key approach to realize this approach. Agroforestry can fulfill sharing the land concept and improve community livelihood. Furthermore, increasing capacity of local community is a necessity to realize FLR in degraded PSF in Indonesia.

2.2. Project objectives

The objectives of AFoCO-BIPS Indonesia are as follows: 1. It intends and contributes management prescriptions of PSF restoration as a part of natural resource management issues and concerns across BIPS countries; and 2. It produces technology packages of PSF restoration that increase community livelihood.

2.3. Assumptions and risks

The assumptions of the project to be fulfilled are full supports by FOERDIA, provincial government, district government and local community and realistic FLR programs that fit to local community's needs, target areas and available budget.

Potential risks that may arise are as follows: inconsistent land use; conflict of interests; land tenure and claims; extreme climate that may cause wildfires; reluctance of local community to the activities; and technical limitations associated with tree species selection and FLR technologies.

3. Project Management

3.1. Management structure

The AFoCO-BIPS Project at the regional level was led by the Philippines through the Department of Environment and Natural Resources-Forest Management Bureau (DENR-FMB). The FMB Director/ ASOF Leader of Philippine took responsibility to coordinate the AFoCO-BIPS project. He was helped by an AFoCO Focal Person, a Regional Project Coordinator and several technical and administrative support staff. Indonesia, as an

implementing country, had a responsibility to implement the project at the country level. Director General of FOERDIA as the Indonesian ASOF leader took the responsibility of the project in Indonesia. He was assisted by Director of Forest Research and Development Centre (FRDC) as the Indonesian Focal Person.

A Country Project Coordinator was assigned based on Decree of Director of FRDC. The coordinator was help three persons, namely one Program Officer, one Field Officer and one Financial Officer. The duties and responsibilities of the Country Project Coordinator were. as follows: 1. Overall supervision and management of the project activities; 2. Ensure the timely implementation of the activities; 3. Provide guidance and assistance in the implementation of the project; 4. Review and submit periodic accomplishment reports; 5. Maintain record of activities; 6. Ensure managerial and financial accountability; 7. Submit budget request and financial reports; and 8. Perform other duties and responsibilities as may be deemed as appropriate.

3.2. Work plan and schedule

Table 1. Work plan and time schedule of AFoCO BIP-S Indonesia, 2016-2019

Activity	2016		2017				2018				2019
	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
Establishment and maintenance of demonstration plots/learning sites		x	x	x	x	x	x	x	x	x	x
Site Identification, surveying, mapping and planning		x									
Vegetation Assessment		x									
Procurement of Demo Site/Training Equipment or tools		x									
Infrastructure facilities and fixtures				x							
Actual Establishment and maintenance of demonstration plots		x	x								
Protection and Maintenance			x		x		x	x	x	x	x
Field monitoring and supervision by project personnel			x	x		x	x	x	x	x	x
Utilization of microbes to decompose the wood waste in peatland			x	x							
Publication									x		
Capacity Building Activities		x				x		x			
Visit to selected Participating AMS										x	
Project Management and Supervision		x	x	x	x	x	x	x	x	x	x
Staff Resources (Allowance /Honorarium of Project Staff)		x	x	x	x	x	x	x	x	x	x
Management Support for Operations		x	x	x	x	x	x	x	x	x	x
External Audit											x
Contingency										x	

4. Performance

4.1. Planned vs. actual implementation

Table 2. Planned activities of AFoCO BIPS Indonesia and its implementation, 2016-2019

Act No	Activity	Revision of Activity	Year 2016	Year 2017	Year 2018	Year 2019
B.	Establishment and maintenance of demonstration plots/learning sites	B. Establishment and maintenance of demonstration plots/learning sites	x	x	x	x
B.1	Site Identification, surveying, mapping and planning	B.1 Site Identification, surveying, mapping and planning	x			
B.2	Vegetation Assessment	B.2 Vegetation Assessment	x			
B.3	Procurement of Demo Site/Training Equipment or tools	B.3 Procurement of Demo Site/Training Equipment or tools	x			
B.4	Infrastructure facilities and fixtures	B.4 Infrastructure facilities and fixtures		x		
B.5	Actual Establishment and maintenance of demonstration plots	B.5 Actual Establishment and maintenance of demonstration plots	x	x		
B.6	Protection and Maintenance	B.6 Protection and Maintenance	x	x	x	x
B.7	Field monitoring and supervision by project personnel	B.7 Field monitoring and supervision by project personnel		x	x	x
		B.8 Utilization of microbes to decompose the wood waste in peatland		x		
		B.9 Publication			x	
C.	Capacity Building Activities	C. Capacity Building Activities	x	x	x	
		C.6 Workshop on Forest Landscape Restoration of Degraded Peat Swamp Forest			x	
F.	Visit to selected Participating AMS	F. Visit to selected Participating AMS			x	
G.	Project Management and Supervision	G. Project Management and Supervision	x	x	x	x
G.1	Staff Resources (Allowance /Honorarium of Project Staff)	G.1 Staff Resources (Allowance /Honorarium of Project Staff)	x	x	x	x
G.2	Management Support for Operations	G.2 Management Support for Operations	x	x	x	x
H	External Audit	H. External Audit				x
I	Contingency	I. Contingency			x	

4.2. Planned vs actual budget

Table 3. Planned activities of AFoCO BIPS Indonesia and its actual budget, 2016-2019

Activity		Planned					Actual Budget				
		Year 1	Year 2	Year 3	Year 4	Grand Total	Year 1	Year 2	Year 3	Year 4	Grand Total
B.	**Establishment and maintenance of demonstration plots/learning sites**	**46.799**	**14.700**	**2.800**	**700**	**64.999**	**15.306**	**23.767**	**5.552**	**3.964**	**48.589**
B.1	Site Identification, surveying, mapping and planning	2.625	-	-	-	2.625	1.889	-	-	-	1.889
B.2	Vegetation Assessment	7.374	-	-	-	7.374	3.265	-	-	-	3.265
B.3	Procurement of Demo Site/Training Equipment or tools	12.000	-	-	-	12.000	6.465	-	-	-	6.465
B.4	Infrastructure facilities and fixtures	6.200	10.000	-	-	16.200	-	5.222	-	-	5.222
B.5	Actual Establishment and maintenance of demonstration plots	18.000	2.000	-	-	20.000	3.687	2.260	-	-	5.946
B.6	Protection and Maintenance	-	300	400	100	800	-	298	1.189	1.260	2.747
B.7	Field monitoring and supervision by project personnel	600	2.400	2.400	600	6.000	-	5.995	2.367	2.704	11.066
B.8	Utilization of microbes to decompose the wood waste in peatland	-	-	-	-	-	-	9.993	-	-	9.993
B.9	Publication	-	-	-	-	-	-	-	1.996	-	1.996
C.	**Capacity Building Activities**	**5.390**	**5.390**	**-**	**-**	**10.780**	**5.247**	**5.340**	**7.554**	**-**	**18.141**
F	**Visit to selected Participating AMS**	**-**	**-**	**15.200**	**-**	**15.200**	**-**	**-**	**19.275**	**-**	**19.275**
G	**Project Management and Supervision**	**3.360**	**6.720**	**6.720**	**1.680**	**18.480**	**2.980**	**12.713**	**6.614**	**1.680**	**23.987**
G.1	Staff Resources (Allowance /Honorarium of Project Staff)	2.160	4.320	4.320	1.080	11.880	2.160	4.320	4.320	1.080	11.880
G.2	Management Support for Operations	1.200	2.400	2.400	600	6.600	820	8.393	2.294	600	12.107
H	**External Audit**	**-**	**-**	**-**	**2.000**	**2.000**	**-**	**-**	**-**	**2.000**	**2.000**
I	**Contingency**	**429**	**429**	**429**		**1.287**	**-**	**-**	**429**	**-**	**429**
	Others/Bank Charge	-	-	-	-	-	1	20	-	-	22
		-	-	-	-	-	20	15	2	-	37
	TOTAL					**112.746**	**23.554**	**41.856**	**39.426**	**7.644**	**112.480**

4.3. Implementation issues and constraints

FLR of degraded PSF actively asks human intervention in order to realize the recovery of damaged PSF ecosystem. In relation to FLR as a long-term process of regaining ecological functionality and enhancing human well-being across deforested or degraded landscapes, the policy makers and FLR managers have to make sure the sustainability of the activities, pre-disturbance states of the PSF as a reference of ecological functionality and benefits of PSF to community. Therefore, there are technical, social, economic issues in conducting FLR. From technical standpoint, we have to exactly know chosen forest restoration models and technologies, correct tree species selection and pre-disturbance (or climax) forest as a reference for stable forest ecosystem. Nowadays, some practitioners pay strong attention to apply paludiculture with promoting native tree species and improving water level in restoring degraded PSF. Meanwhile, the others establish commercial plantations in the PSF. Several social issues that occurred in the project implementation are the reluctance of local farmers to apply eco-friendly agroforestry practice, less perseverance to apply the materials of the trainings, existing forest land use system, value system of local community that focus on extractive activities and less empowerment of community development. Several economic issues related to FLR are the involvement of stakeholders to create green economies in restoration activities, direct benefits of restoration activities in providing jobs and cash income, incentive and subsidies systems in conducting restoration activities and production and marketing systems of restoration activities, especially for Non Timber Forest Products (NTFP). The local community, in this regard, are allowed to capture the benefits from FLR activities.

The project had several constraints, namely: a. less participation of key stakeholders from related Central Kalimantan offices due to their tight schedule; b. limited number of field workers to maintain demonstration plots; c. low survival rate of gemor (*Notaphoebe coriaceae*) due to limited knowledge and technology to plant this tree species in open area; d. pineapple plants are destroyed wild animals for getting its ripe fruits; e. limited access to enter demonstration plots during rainy season; e. slow progress to submit papers of the book; f. poor performance of wood decomposers when they transferred from laboratory to the field.

5. Impact Analysis

5.1. Outputs and outcomes

The outputs of the AFoCO-BIPS Indonesia Project are, as follows: a. training activities, 2 times (PSF Agroforestry Training Course on 27-28 December 2016; Community Livelihood and Rural Economy Development Training Course on 8-10 December 2017); b. Workshop How to Design FLR on Degraded PSF on May 15, 2018; c. Cross Country Visit to Palangka

Raya and Tumbang Nusa, Demonstration Sites on September 25-28, 2018; d. 4-ha plantation for restoration demonstration plots (4 plots, each plot 1 ha, consisting 4 tree species, balangeran (*Shorea balangeran*), jelutung rawa (*Dyera poliphylla*), ramin (*Gonistylus bancanus*) and gemor (*Notaphoebe coriacea*)); e. pineapple and rambutan plants grown at the border of the plots and along the inspection road; f. raising several local fish in the canal; g. 1 unit bunk house; h. 2 units drilled wheel pumps; i. 1 unit fire extinguisher equipment; j. 1 unit canal blocking; k.1 PSF vegetation/ecology survey; l. 1 microbial decomposer trial; m. 1 book; and n. 1 poster/banner.

The objectives of the project, to some extent, were achieved, namely management prescriptions of PSF restoration and technology packages of PSF restoration. Management prescriptions, briefly, cover several steps and hints, namely: a. increase capacity of local communities who directly involve in on-site FLR through Prior Informed Consent (PIF) mechanism with conducting social approach, forest extension to explain benefits of FLR for the people and their involvement and then after PIF conducting several training courses that are relevant to the objectives of FLR and community needs; b. increase capacity of key stakeholders on landscape level (related institutions in provincial level, environmental NGOs, farmer leaders) through workshop and FGD with closely related to the FLR activities; c. decide FLR activities based on workshop/FGD covering technical aspects, social aspects and economic aspects; d. promote adaptive management system in planning, execution, monitoring and evaluation and planning revision processes; e. conduct rewetting activities through development of canal blocking with using local materials and employing local community; f. conduct monitoring of water level; g. built deep wheel pumps on the site that can be used during forest fire suppression; h. apply appropriate forest restoration technology with promoting paludiculture (planting local tree species and maintain water table); i. accommodate community needs with applying agroforestry on FLR activities; j. support community to develop social and economic institutions related to FLR; and k. help local community to provide market information and market chain of agroforestry products.

For technological packages, the project improved technology packages that already existed at FERDI, comprising flying nursery technology to produce quality planting stocks; planting techniques (time, seedling characteristics, shade, mounding); plantation tending (weed control using manual weeding/cutting the weeds and chemical application using environmental friendly herbicide); establishment of agroforestry combining commercial local tree species with cash crops (hot chilli, vegetables, cassava, pineapple, etc.).

In order to get information on PSF dynamic in the landscape level, the FERDI scientist conducted vegetation and soil macro-fauna study on both Sebangau National Park and Tumbang Nusa Forest Research Station. The results of this study can be used for reference

to achieve biodiversity and ecosystem equilibrium and ideal PSF ecosystem that may reach through restoration activity at Tumbang Nusa. The plant species abundant curve at Sebangau National Park followed logarithmic series and normal logarithmic curve model. Plant species diversity on deep peat forest was the highest compared to medium peat depth and thin peat depth forest. The number of plant species on deep peat depth forest may reach 55 plant species. The plant species abundance curve of non-burnt PSF at Tumbang Nusa was normal logarithmic curve model. The plant species diversity on the PSF was very high. The plant species abundance curve for shrubs (4-8 months after fire), secondary forest (1-2 months after fire) and shrubs (1-2 months after fire) followed geometric curve model. The plant species diversity on shrubs 4-8 months after fire was higher than that of the secondary forest and 1-2 month burnt shrubs but they are lower than that of PSF. The undergrowth cover percentage at shrub was consistently higher than that of secondary forest both in 4-8 m peat soil depth and 1-2 m peat soil depth. The undergrowth cover of shrub at 4-8 m and 1-2 m peat soil depth was 76% and 55%, respectively whereas at secondary forest was 60% and 47%, respectively.

Soil macro-fauna on medium-depth peat forest of Sebangau National Park was the richest and the most abundant individual compared to deep peat soil, thin peat soil and at Tumbang Nusa site. The number of soil macro-fauna genus on the medium peat soil was 9 genus dominated by genus Aranaeda. At thin and deep peat soil, the genus number was 8 genus and 5 genus, respectively. At Tumbang Nusa, the highest population of soil macro-fauna found on deep peat secondary forest. The number of genus on this site was 6 genus dominated by Hymenoptera. The abundance of the soil macro-fauna then was followed by deep peat secondary forest, thin peat secondary forest and thin peat shrubs with number of genus 4, 8 and 6 genus respectively dominated by Hymenoptera.

The restoration of after burnt PSF is one of the ways to overcome degraded PSF. The success of planting activities was influenced by tree species selection and site manipulation. Planting on the PSF after fire should consider adaptive tree species and can be seen from their survival rates. In the 4-ha plantation demonstration plots, the best performance of the plantings up to 2 years is balangeran (*S. balangeran*) with 87% survival rate with around 1 meter seedling height. It was followed by jelutung rawa (*D. poliphylla*), ramin (*G. bancanus*) and gemor (*N. coriacea*) with survival rates 78%, 63% and 27%, respectively and seedling height 60 cm, 40 cm and 30 cm, respectively. Gemor has low adaptation to degraded PSF. This tree species is actually a tolerant species that grows under the shade at initial tree stage. Even though the project made sharlon shade for every seedling, the species showed poor performance. In order to achieve full stock of plantation, dead gemor seedlings were replaced by balangeran and jelutung rawa. In order to increase the performance of the

plantation, the project continued to do weed control. Weed control aims to provide a better growing space for the seedlings by eradicating disturbing plants. Major weed species that has already been controlled is kelakai/local fern (*Stenochlaena palustris*).

During an initial survey conducted on a post-fire peatland area in Central Kalimantan, we found some macro-fungi sporocarps of family *Polyporaceae* and micro-fungi which isolated from decayed litters and woody debris (Table 4). The survey was carried out in a sunny day of dry season (ambient temperature was about 40°C) in open area of burnt peatland, which seems to be un-supported for fungal growth but these fungi proved that they still be able to find favorable ecological niches, such as at the bottom side of a wood log, woody debris under shrubs' shade, *etc*. The presence of fungal sporocarps seems to be associated to aerobic condition of the degraded peatlands after peat fire which affected to the lowering water table. It is well known that fungi has important roles in carbon (C) metabolism through the activation of their enzyme systems. For example, phenol oxidase and β-glucosidase that are involved in the degradation of phenolic compound (i.e. lignin and its derivative) and cellulosic material are active in high-oxygen conditions (Mishra *et al*, 2014).

Table 4. Biodiversity of micro-fungi isolated from decayed woody logs in a burnt PSF at Tumbang Nusa based on DNA sequences of ITS-1 and ITS-4 regions

No.	Isolate Code	Identification	Sequence Similiraty	GenBank Accession No.
1.	TbN.11.1	*Pestalotiopsis theae*	99%	EU833970.1
2.	TbN.11.2	*Pestalotiopsis theae*	99%	EU833970.1
3.	TbN.11.3	*Pseudopestaliopsis* sp.	100%	KU252222.1
4.	TbN.12.2	*Hypoxylon* sp.	99%	MF187625.1
5.	TbN.12.3	*Trichoderma ghanense*	99%	MF197628.1
6.	TbN.14.1	*Penicillium* sp.	99%	GU809210.1
7.	TbN.14.2	*Paecilomyces formosus*	100%	MF671952.1
8.	TbN.16.3	*Hypoxylon fragiforme*	97%	KM013463.1
9.	TbN.16.4	*Penicillium glaucoroseum*	99%	NR138338.1
10.	TbN.17.1	*Penicillium penarojense*	99%	GU981569.1
11.	TbN.17.2	*Hypoxylon fragiforme*	96%	KM013463.1
12.	TbN.17.3	*Hypoxylon investiens*	99%	KC968925.1
13.	TbN.17.4	*Biscogniauxia* sp.	98%	JQ327868.1
14.	TbN.17.6	*Hypoxylon fragiforme*	97%	KM013463.1
15.	TbN.17.7	*Penicillium pimiteouiense*	100%	KC344973.1

The AFoCO-BIPS Indonesia Project noted several outcomes during the implementation of the project, as follows: a. establishment of Agroforestry Kalampangan Peatland Farmer Group and Agroforestry Tumbang Nusa Peatland Farmer Group after completion of two short-term training courses, namely training on agroforestry and training on community livelihood and rural economy development; b. increasing PSF restoration and management

collaboration with Banjarbaru Forestry and Environment Research and Development Institute (FERDI); c. Increasing visit to Tumbang Nusa AFoCO-BIPS Demonstration Plots and Banjarbaru FERDI plots; d. Increasing demand on PSF planting stocks by local community where Kahayan Watershed Management and Protection Forest Institute as the planting stock producer and technically helped by Banjarbaru FERDI researchers/field officers of AFoCO-BIPS Indonesia; and e. Increasing PSF productivity and environment quality.

5.2. Internal & external impacts

The outputs and outcomes of the AFoCO-BIPS Indonesia Project may increase the performance of FERDI, local community and other key stakeholders. From internal impact standpoint, researchers of FERDI who involved in the AFoCO-BIPS project got some opportunities to increase their scientific capability in conducting FLR activities and FERDI as an institution developed networking and collaborations with AFoCO and other related institutions. Through this project, FERDI also improve their technology package in controlling peat forest fire using deep wheel pump and fire extinguisher equipment and also improve their silvicultural technology in restoring degraded PSF. FRDC Bogor, as implementing agency, also got opportunities to increase their performance and capacity through networking, coordination and collaboration with AFoCO and other related institutions.

From external impact standpoint, the project noted several scientific, technology, environmental, social and economic impacts. Demonstration plots provided field laboratory for university students and researchers to conduct research. Land preparation, water level management through canal blocking, planting techniques, quality seedlings, plantation tending, forest fire control and the performance of 4 local tree species are interesting subjects for research. This project also motivated researchers to improve FLR technology, especially in nursery, land preparation, plantation tending and agroforestry. Social impact of this project is to create social interaction between villages around Tumbang Nusa Research Station and social acceptance of the FLR activities. Economic and financial impact of the project is to support local community to practice productive agroforestry model that regenerate income for them. The environmental impact of the project is better peatland and PSF condition and no forest fire.

5.3. Local applicability

Although FLR is a long-term process of regaining ecological integrity and enhancing human well-being across degraded PSF, the short-term activity can produce benefits to stakeholders. For AFoCO-BIPS Indonesia project, there were several activities that can be easily applied in local context, namely capacity building through training course with high practicability, agroforestry system without slash and burning practices, production of local

planting stocks and canal blocking using local materials.

The two training courses can be applied by trainees (local community) because the materials are easily adopted. Training agroforestry on PSF can be repeated in their respective land. The farmers can grow local tree species like jelutung rawa (*D. poliphylla*) with spacing 5x3 m and between the rows, farmers can grow vegetables, hot chili and cassava. The farmers can apply topsoil and organic fertilizer to the planting holes.

For the second training, the farmers can grow agricultural crops, raising local fish with beje system (pond), animal husbandry (chicken, goat and cow), producing edible mush room and charcoal. The farmers can utilize local materials and the products are really needed the consumers in Palangka Raya city.

Practicing eco-friendly agroforestry in degraded PSF is bit expensive at initial stage because the farmers expense some money to buy mineral soil, manure and inorganic fertilizers and to pay labor cost for land preparation and planting. Avoiding slash and burning practice in one hand and put ameliorant and fertilizer to the planting holes of seedlings and agricultural crops increase the productivity of the land and maintain the sustainability of agroforestry system in the long run. If the local materials are available surrounding the farm, the farmers can do it by themselves without spending money.

During National Movement of Forest and Land Rehabilitation from 1993 to 1998, local nurseries developed in Tumbang Nusa village to support the requirement of planting stocks. The villagers grew local PSF species easily because they have already acquired skills in producing the seedlings. The AFoCO-BIPS Project, in this regard, may create new initiatives to restore degraded PSF and the villagers will be ready to produce the planting stocks.

Development of canal blocking is not a complicated one. For the tertiary canal (1-3 m width), local people can build canal blocking using local material, such as poles, plank and sand, and some materials may buy, such as plastic sheets, sand bags and nail.

5.4. Sustainability

The sustainability of AFoCO-BIPS Project should be well prepared because the outputs of the project can support the implementation of PSF restoration both on site scale and landscape scale. The idea of increasing capacity of local community and primary stakeholders, putting FLR as key natural resource management and restoration economy is in line with the concept of multi-functional landscape (van Noordwijk and Sunderland, 2014) and ROAM (Restoration Opportunities Assessment Methodology) published by IUCN 2014.

As AFoCO-BIPS ended on May 31, 2019, exit strategy as a part of sustainability mechanism should be set up clearly. Several activities will be conducted, namely: a. ex-post

evaluation of the FLR of AFoCO-BIPS Project; b. scaling-up the demonstration plots and agroforestry model; c. maintenance of demonstration plots and promoting Liberika coffee agroforestry; 4. Developing capacity of local community to control PSF fire and may provide sufficient fire extinguisher equipment; 5. Increasing networking with BRG, ITPC. Paludifor and other key stakeholders; 6. Empowering Peatland Agroforestry Farmer Group; 7. Conducting institutional development of the new peatland Agroforestry farmers; 8. Proposing Collaborative Forest Landscape Restoration on Degraded PSF; and 9. Proposing Eco-edu Science Park in Tumbang Nusa.

6. Challenges and Lesson Learned

6.1. Project formulation aspect

When Indonesia, as an implementing country of AFoCO-BIPS Project, formulated the project document, FRDC was bit confuse to choose the strategic issue related to the topic of application of landscape approach to support the sustainable natural resources management. Indonesia has several forest ecosystem types and having serious problems of forest degradation. Due to international concerns on contribution of forest land use change on climate change, Indonesia chose degraded PSF as the topic of the AFoCO-BIPS Project. How to succeed good forest restoration through capacity building, landscape approach and incorporated with natural resources management issues. So, AFoCO-BIPS Indonesia Project focusses in Peat Swamp FLR at Tumbang Nusa Research Forest, Central Kalimantan. FLR focusses in developing “multi-functional landscapes” that ensures achieved diverse management objectives. Here, landscape approach provide tools and concepts for allocating and managing land to achieve social, economic and environmental objectives in areas where agriculture and other productive land uses compete with environmental and biodiversity goals. Van Noordwijk and Sunderland (2014) highlighted multiple interests in productive landscapes and then proposed Forests, Tree and Agroforestry (FTA) programme to response forest transition curve. For on-site forest restoration, we chose Tumbang Nusa Research station with developing 4-ha demonstration plots. Regarding the landscape approach, we chose Sungai Kahayan-Sungai Sebangau and Sungai Katingan-Sungai Sebangau Peatland Hydrological Unit. For capacity building we decided to conduct human resources development through training courses and workshop.

6.2. Operational aspect

The demonstration plots of AFoCO-BIPS are located at Tumbang Nusa Research Station which is managed by FERDI. Therefore, FERDI is the strategic partner of FRDC in conducting the project. FERDI office is located in Banjarbaru, South Kalimantan, around 200 km from the demonstration site (4-hour drive). So, it is bit hard to mobilize the FERDI

researchers to the project.

This research station was badly burnt out in 2015. Around a half of the 5,000 ha Tumbang Nusa Research Station was heavily degraded and needed to restore. The problem is how to choose adaptable local tree species to plant on heavily degraded PSF. Usually, peat soil was broken after underground fire. The fire burnt organic materials and soil so that physical properties of peat soil became poorer. Water holding capacity of peat soil sharply decrease so that young seedlings do not grow well and survival rate is usually low. Through this project, canal blocking was conducted and then water level of the site was improved.

Also, the location is bit hard to enter during rainy season due to flooding. During dry season, the soil is very dry and easy to burn. The project decided no field work during rainy season. The project conducted field work such as plantation tending and fire control during dry season even the weather is very hot.

6.3. External factors

The FLR project at Tumbang Nusa was merely based on individual works, namely involvement of FRDC and FERDI. Actually, FLR is an approach to managing the dynamic and often complex interactions between people, natural resources and land uses that comprise a landscape (Maginnis *et al* 2005). Ideally, FLR is a collaborative process. From this circumstances, we got lesson learned how to transform FLR to Collaborative Forest Landscape Restoration (CFLR). Some parties have interests in restoring degraded PSF so that it is necessary to develop CFLR in Central Kalimantan, especially to involve private sectors.

The other external factors and lesson learned from AFoCO-BIPS Indonesia project are as follows:

a. PSF ecosystem are very complex. To achieve strong sustainability in FLR need integration of ecosystem integrity, social cohesion and economic benefit;
b. Reluctance of local farmers to apply friendly environmental agroforestry practices should be overcome by government subsidies (seed money scheme) and high guarantee of land ownership; and
c. Capacity building through training courses of local business opportunities should be followed by incentive schemes and development of market place.

7. Conclusions and Recommendations

1. FLR as a critical part of natural resource management of degraded PSF has strategic values and benefits for community livelihood, green economy, quality environment and biodiversity conservation.

2. Multi-functional landscape approach in applying FLR is intended to accommodate sharing the land for multiple objectives, multiple interests and multiple stakeholders. The landscape of FLR at Tumbang Nusa is the whole area of Sungai Kahayan-Sungai Sebangau and Sungai Katingan-Sungai Sebangau Peatland Hydrological Unit.

3. The immediate impacts of the AFoCO-BIPS Project are: a. big opportunities to conduct research on the site; b. improve forest fire control technology packages; c. improve silvicultural technology of FLR; d. create social interaction between villages around Tumbang Nusa Research Station and social acceptance of the FLR activities; and d. strong motivation of the farmers around the site to practice productive agroforestry model that may regenerate income for them.

4. The immediate outcomes to support the impacts are: a. the establishment of Agroforestry Kalampangan Peatland Farmer Group and Agroforestry Tumbang Nusa Peatland Farmer Group; b. increasing PSF restoration and management collaboration with FERDI; c. Increasing visit to Tumbang Nusa AFoCO-BIPS Demonstration Plots and Banjarbaru FERDI plots; d. Increasing demand on PSF planting stocks by local community; and e. Increasing PSF productivity and environment quality.

4. The limitations of the project are: a. low mobilization of scientists involved in the project; b. badly degraded demonstration site causing by big fire in 2015; and c. limited accessibility to work during rainy season. .

5. Suggested actions should be taken after the project, as follows: a. ex-post evaluation of AFoCO-BIPS Project; b. scaling-up the demonstration plots and agroforestry model; c. maintenance of demonstration plots and promoting Liberika coffee agroforestry; 4. Developing capacity of local community to control PSF fire; 5. Increasing networking with BRG, ITPC, Paludifor and other key stakeholders; 6. Empowering Peatland Agroforestry Farmer Group; 7. Conducting institutional development of the new peatland Agroforestry farmers; 8. Proposing Collaborative Forest Landscape Restoration on Degraded PSF; and 9. Proposing Eco-edu Science Park in Tumbang Nusa.

8. Photo records

Figure 1 (a) Raising corn in the PSF agroforestry training; (b) Participants of the training

Figure 2 (a) Preparing substrate for edible mushroom in the training of community livelihood and rural economy development; (b) Participants of the training

Figure 3 (a) Plenary session of workshop How to Design FLR on Degraded PSF; (b) Some participants of the workshop

Figure 4 (a) Cross Country Visit to Tumbang Nusa secondary PSF; (b) Participants watching birds; (c) Walking to Demonstration Plots of AFoCO-BIPS; (d) Participants at Tumbang Nusa Gate

Figure 5 (a) Demonstration plot of gemor; (b) Demonstration plot of balangeran

Figure 6 (a) Canal blocking was established during rainy season; (b) Construction of the canal blocking

Figure 7 (a) AFoCO-BIPS Bunkhouse; (b) The bunkhouse was used for opening CCV

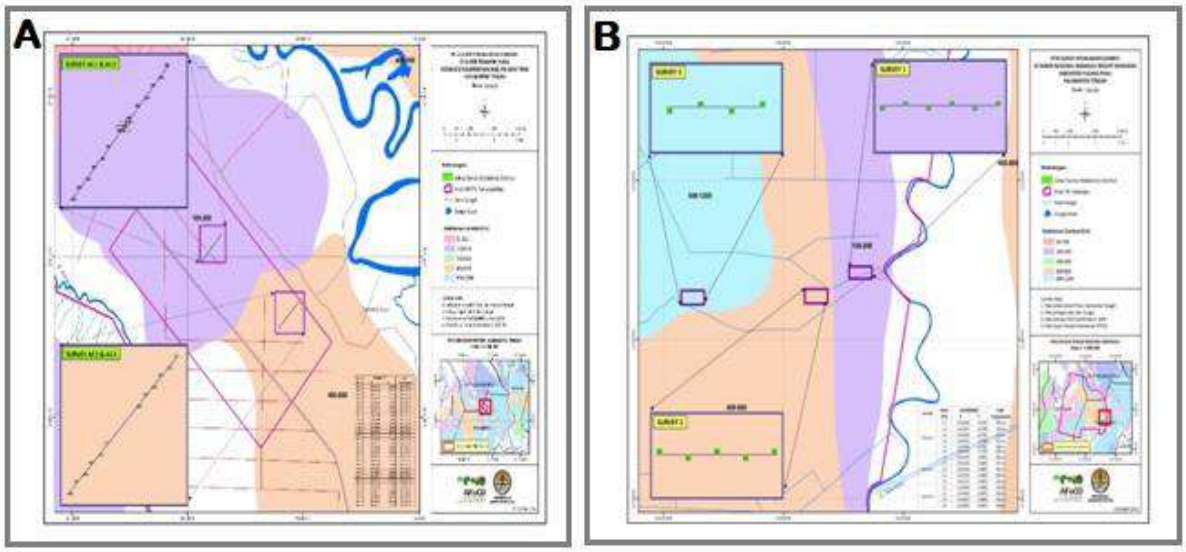


Figure 8 (a) Plots on Tumbang Nusa Forest Research Station; (b) Plots on Sebangau NP

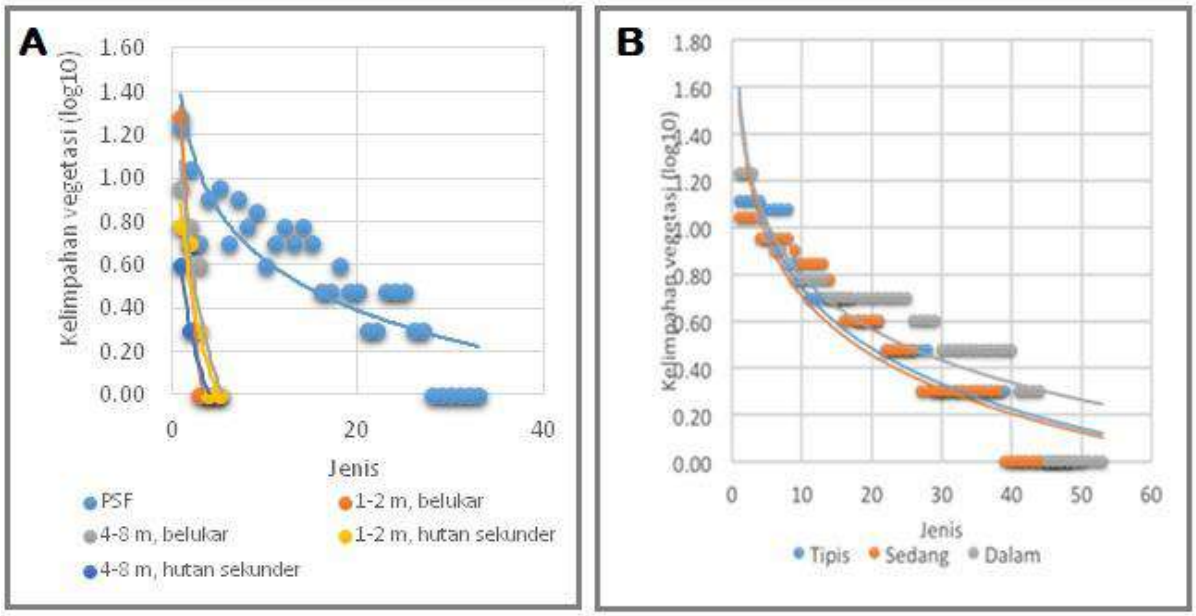


Figure 9 (a) Number of vegetation at Tumbang Nusa; (b) number of vegetation at Sebangau National Park

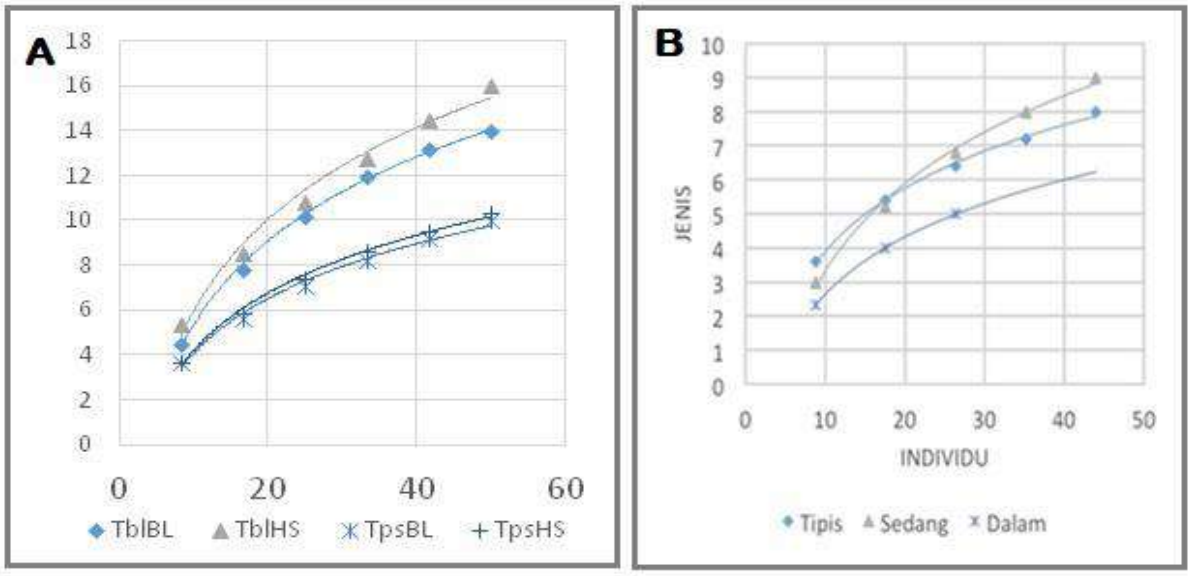
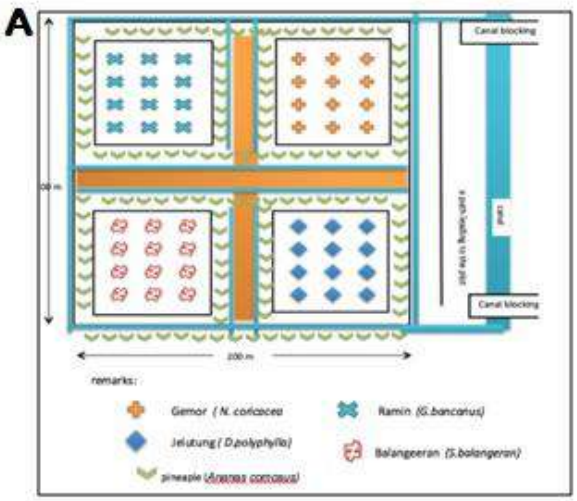


Figure 10 (a) Number of soil macrofauna species at Tumbang Nusa; (b) Number of soil macrofauna species at Sebangau National Park

A



B

No	Plot	Planting Area (Ha)	species	Dinstance of plating (m)	Number of plantation /ha	keterangan
1	1	1	Gemor (*Notaphoebe coriacea*)	3 x 2	1666	
2	2	1	Jelutung (*Dyera polyphylla*)	5x 3	666	
3	3	1	Ramin (*Gonistylus bancanus*)	5 x 3	666	
4	4	1	Balagneran (*Shorea balangeran*)	5 x 3	666	
			Total		4498	

Figure 11 (a) Layout of 4-ha demonstration plot; (b) Species and planting distance of demonstration plot

Figure 12 (a) Operating deep wheel pump; (b) fire extinguisher equipment

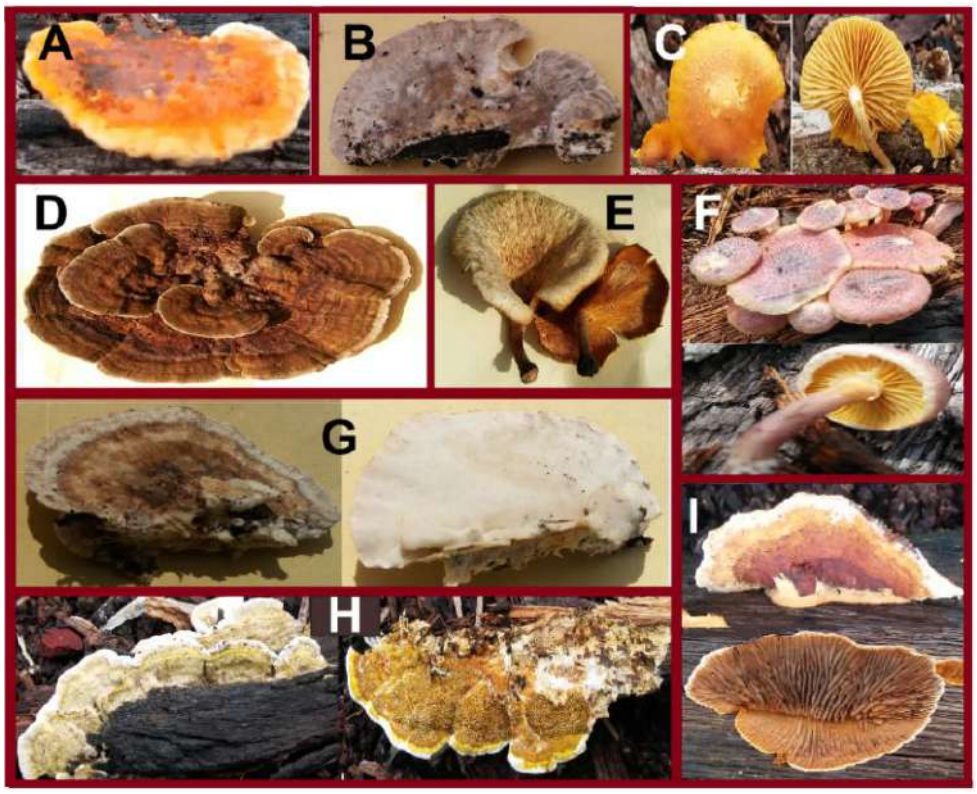


Figure 13. Fungal sporocarps grown on the woody debris in a burnt peatland at Tumbang Nusa, *Pycnoporus sanguineus* (**A**); *Trametes lactinea* (**B**); *Gymnopus trogioides* (**C**); *Rigidoporus microporus* (**D**); *Lentinus* sp. (**E**); *Gymnopilus dilepsis* (**F**); *Fomiptosis nivosa* (**G**); *Flavodon* sp. (**H**); *Gloeophyllus* sp. (**I**).

Figure 14. Field condition of burnt peatland at Tumbang Nusa. *Inserts:* fungal sporocarps grown at their appropriate niches.

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10. Appendices

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Department of Environment and Natural Resources
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MR. CHENCHO NORBU
Executive Director
Secretariat for the Asian Forest Cooperation Organization
8th Fl., 9 Gukhoe-daero 62-gil, Yeongdeungpo-gu,
Seoul, Republic of Korea, 07236

Subject : **Philippines' Project Completion Report for the Implementation of the AFoCo Regional Project entitled "Capacity Building on the Application of Landscape Approach to Support the Sustainable Natural Resources Management in Brunei Darussalam, Indonesia, Philippines and Singapore"**

Dear **Director Norbu:**

Greetings from the Philippines!

Consistent with the provisions of the Memorandum of Understanding (MOU) between the Korea Forest Service (KFS) and DENR- Forest Management Bureau (DENR-FMB) for the implementation of the aforesaid Regional Project under the ASEAN-KOREA Forest Cooperation (AFoCo) Agreement, we are submitting herewith the Project Completion Report for the In-country Project of the Philippines, for your information and reference.

Said report was prepared following the prescribed template/ format provided under AFoCO's project development manual. Accordingly, it highlights discussion on project impacts, outcomes and outputs, to include challenges and sustainability mechanisms, among others.

We note that the financial report contained herein are still partial/initial as the final audit for the project is yet to be implemented by a third party auditor. Consistent with the agreements reached during the Special PCC meeting in Singapore held on 28 February 2019, a separate financial report shall be submitted by the Project along with the audit report by the 4th Qtr. of CY 2019.

Thank you for your continued support and kind cooperation.

Very truly yours,

NONITO M. TAMAYO, *CESO IV*
Director
and ASOF Leader, Philippines

PROJECT COMPLETION REPORT

<Project Profile>

Project Code	
Project Title	Restoration of Degraded Forest Ecosystem Through Assisted Natural Regeneration in Natural Forest Areas in the Philippines - under the Regional Project: Capacity Building on the Application of Landscape Approach to Support the Sustainable Natural Resources Management in Brunei Darussalam, Indonesia, Philippines and Singapore (BIPS Project)
Project Duration	Start date: March 30, 2016 End date : March 29, 2019
Implementing Country	Philippines
Implementing Agency	Department of Environment and Natural Resources – Forest Management Bureau
Project Site	Barangays Malabon and Taposo, Candelaria, Zambales, Central Luzon, Philippines
Target Area	Primary target area: 30 hectares degraded natural forest inside Community-Based Forest Management (CBFM) Area of MALATAPI Community Livelihood Center, Inc. Secondary target area: N/A
Budget and Source of Finance	Total: US$ - AFoCO : US$ 214,148.00 - National budget : US$ 68,855.00 (attribution) - Others : US$ N/A

<Implementing Agency Profile>

Name	Department of Environment and Natural Resources – Forest Management Bureau	
Address	Visayas Avenue, Diliman, Quezon City, Philippines	
Project Manager	ASOF Leader : Mr. Nonito M. Tamayo AFoCo Focal Person : Mr. Orlando A. Panganiban Project Manager/Coordinator : Mr. Marlon M. Atienza	
Contact	Tel : (02) 928-0425 Fax :(02) 928-0425 Email : mma3025@yahoo.com	
Project Staff	Mr. Rogelio C. Gibe	Head, Technical Support Staff
	Ms. Lisette G. Monteno	Head, Administrative and Finance Support Staff

Contents

1. Introduction

For the last 25 years, there had been a significant decrease in global carbon stocks in forest biomass by almost 17.4 giga tons mainly caused by forest conversion and degradation (FAO 2015). It was hypothesized that those in the countries with abundant resources tend to over exploit such resources.

Several approaches have been developed to improve natural resources management. Review of these approaches revealed that despite being applied in various degrees and context, said approaches share basic development principles that aim to address the social, economic and environmental objectives.

With the increasing number of populations, realities would dictate that different ecosystems, especially the upland areas, are inhabited by indigenous peoples and upland migrants. This situation calls for a strategy to incorporate the natural resources dependent communities as partners in ecosystems' restoration, rehabilitation and protection. As such, there is a need to apply a comprehensive approach such as the landscape approach or strategy to restore the forests.

Over the years, the massive change in Philippine landscape can be gleaned in relation to the changes in forest areas. The country suffers from severe deforestation which resulted to rapid decrease by nearly 50% in forest cover from 1970 to 2000 (Aquino et al, 2014). One of the unique features of forest resources is that multiple stakeholders are associated with its multiple uses and represent local to global interests. Efforts towards sustainable forest management need to consider these varying interests, without marginalizing the concerns of the local communities, especially those whose lives depend on these resources for survival. This calls for the development and institutionalization of social processes that will ensure that the local communities and other legitimate stakeholders are able to participate meaningfully in decision making concerning forest management and benefit sharing from forests (Rebugio et. al, 2010).

2. Background and Objectives

2.1. Rationale

In the Philippines, changing landscape can be attributed to changes in forest areas. This is due to massive forest deforestation and degradation from the past years and even until now. Varying interests among multi-stakeholders is also one of the main reasons why forest cover declined. In order to overcome the adverse effects of this situation, application of Assisted Natural Regeneration (ANR) has been a great opportunity to fulfill the country's commitment to sustainable natural resources management.

ANR is considered one of the most viable methods to restore degraded tropical forestlands and transform them into more productive forests (Carandang et al, 2007; Shono et al, 2007). The aim of ANR is to accelerate the trajectory of natural successional processes by reducing or removing barriers to natural forest regeneration such as competition to available resources by weed

species; recurring disturbances like grazing, fire and wood harvesting; and marginal soil condition (Shono et al, 2007). ANR is most suited for areas where protection functions of forests are critical such as areas which are ecologically vulnerable, areas where conservation of biological diversity and soil and water are highly needed, among others (Sajise, 2003). Unlike to the conventional restoration methods that involve planting of nursery grown seedlings, ANR is said to offer significant cost advantages due to reduced costs associated with seedling propagation and transplanting (Shono et al, 2007). However, despite of its advantages, ANR techniques are still vastly under-appreciated and under-utilized in the Philippines (Ganz & Durst, 2003) perhaps for lack of effective promotion, government support, and/or published quantitative data to support its effectiveness. Although there are policies and guidelines already issued to prioritize application of ANR, published data of ANR effectiveness and extent of its application in the country are still limited (DENR 1989; cited by Carandang et al, 2007). Its continued implementation including documentation of restoration results and ecological requirements of natural regeneration should have provided opportunities to improve the application of ANR technology.

Awareness regarding the advantages and effectiveness in the application of ANR is a very crucial factor for its application. It can be more applicable if learning and experiential motivations can be attained especially on a landscape scale. With this, ANR strategy can balance trade-offs and plays an important role in landscape restoration approach.

2.2. Objectives

This Project aimed to facilitate the restoration of degraded forestland thru ANR by capacitating the concerned stakeholders within the identified Project Area. Specifically, it intended to achieve the following objectives, to wit;

a. Contribute to the restoration of degraded forestlands inside and adjacent to identified Project area;
b. Establish thirty (30) hectares of demonstration plots for Assisted Natural Regeneration inside the identified Project area;
c. Capacitate stakeholders to enhance technical capability on Assisted Natural Regeneration; and
d. Document the initial findings and lessons learned from the activities using Assisted Natural Regeneration as approach to forest restoration.

2.3. Outputs and Deliverables

Given aforesaid objectives, the Project was expected to come up with the following:

a. Demonstration plots in the Project area properly maintained and protected by the concerned stakeholders;
b. Capacity building activities and its corresponding training modules relative to the application of ANR;
c. Sustainability plan developed in collaboration with the community;

d. Knowledge product on good practices developed as reference in the implementation of related projects; and
e. Documentation reports relative to the lessons and experiences of the Project that will serve as reference in the development of future policy directions at the country level.

2.4. Assumptions and Risk

Assumptions

Taking note of the need to sustain project gains, project activities were determined and implemented with due reference to the following assumptions vis-à-vis institutional and social aspects of Project implementation:

1. Implementation of current forest policies of the Philippine government are sustained.

    - Executive Order No. 263 issued in 1995 declares CBFM as the national strategy in the implementation of Sustainable Forest Management (SFM). While CBFM remains as the strategy for SFM, greater assurance of meeting the objectives of the Project was expected, more particularly in terms of capacity building and technology transfer which employs CBFM approaches.

    - Executive Order No. 23 issued in year 2011 which bans the harvesting of trees within natural and residual forests. The prohibition of logging within natural forests was expected to create positive impacts to the over-all management of the project area, particularly in the aspect of minimizing (if not totally eradicating) illegal logging activities.

2. Cooperation and support of the partner Peoples Organization (PO) are sustained. With CBFM as the main strategy used for the Project, social acceptance and ownership of the Project was seen as one of the major elements for project success and sustainability. These aspects were considered in the selection of Project's partner PO.

Risks

1. Unstable peace and order situation was also considered as part of the risks considering that the project was implemented in the upland areas. Such situation was seen to infuse possible potential delays in implementing project activities, particularly the establishment of demonstration plot.

2. Natural disasters and forest fires were also viewed as threat to the sustained protection and maintenance of the ANR demonstration site established under the Project. To address such concerns, strategies and arrangements with the partner POs were made to ensure that the project area was protected, with continuous monitoring through patrol works.

3. Project Management

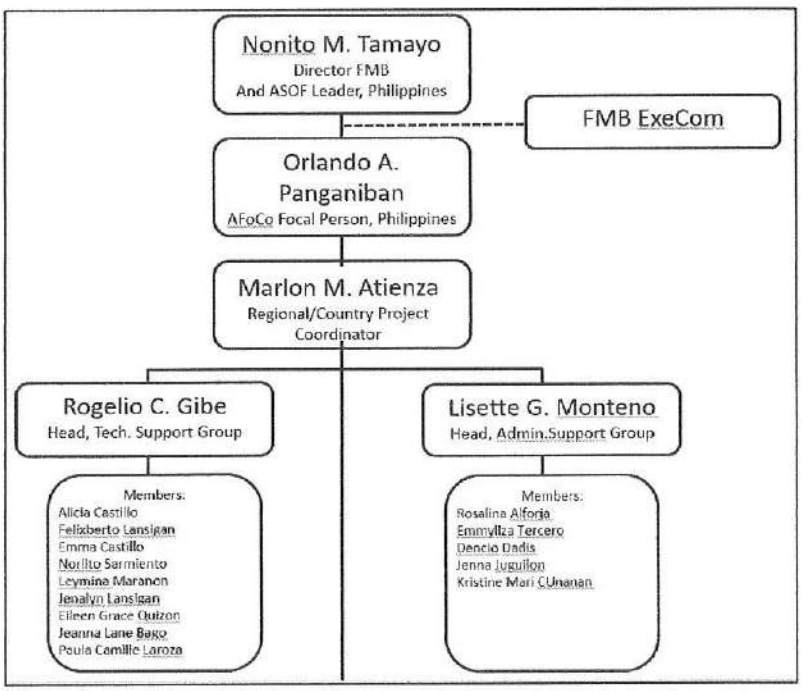
3.1. Management structure

The Project was implemented with the lead of the Forest Management Bureau (DENR-FMB) in coordination with DENR Region 3. To ensure the smooth implementation of the project activities and submission of reportorial requirements, a Country Project Coordinator was designated by the FMB Director to undertake the following duties and responsibilities:

- Overall supervision and management of project office, staff and financial matters to ensure timely, efficient and effective implementation of project activities in their respective countries;
- Ensure the timely implementation of the activities identified in the Project document in their respective countries;
- Provide guidance and assistance in the implementation of project activities in their respective countries;
- Review and submit periodic accomplishment reports of the project to the Regional Project Coordinator and AFoCo Secretariat;
- Maintain record of activities implemented and accomplished including technical documents, recommendations and consultancy reports;
- Ensure managerial and financial accountability in accordance with the Project criteria and existing operational guidelines of the AFoCo Agreement;
- Submit budget request, financial reports and liquidations based on the approved Work and Financial Plan (WFP); and
- Perform other duties and responsibilities as may be deemed as appropriate.

In the performance of his duties and responsibilities under the Project, the project coordinator was supported by a technical support group and admin & finance support group.

In support to the FMB-TWG, project focal persons from the Regional, Provincial, and Community level ENR Offices were designated by DENR Region 3, to assist and monitor the activities of the Partner PO in the implementation of the project.



3.2. *Work and Budget Plan*

The Philippines had a total allocation of 214,148 USD under the Project. As the lead implementing country, the Philippines' Work and Budget Plan (WBP) includes activities for the facilitation of the Regional Project activities i.e. Inception Meeting, two (2) Project Coordination Committee (PCC) Meetings and a Regional Workshop. The rest of the activities were intended for the implementation of the In-country Project.

Output and Activity No.	Outputs/Key Activities	Budget Allocation (USD)				
		2016	2017	2018	2019	Grand Total
A.	**Inception Meeting among implementing countries**	8,555	-	-	-	8,555
B.	**Establishment and maintenance of demonstration plots/learning sites**	10,346	32,870	6,766	2,553	52,535
B.1	Site Identification, surveying, mapping and planning (30 hectares demo plot and 30 hectares control)	2,231	1,866	1,301	-	5,398
B.2	Vegetation Assessment (before, during and after ANR)	-	1,029	1,276	1,829	4,134
B.3	Procurement of Demo Site/Training Equipment or tools (varied)	8,115	2,873	-	-	10,988
B.4	Infrastructure facilities and fixtures (1 unit multipurpose hall, including fixtures)	-	14,871	1,009	-	15,880
B.5	Actual Establishment and maintenance of demonstration plots (through direct contracting with the concerned PO, please see cost assumptions in separate sheet); another 30 hectares will be identified and demarcated on the ground as control	-	12,177	-	-	12,177
B.6	Field monitoring and evaluation by project personnel (USD35/man day on a weekly basis)	-	54	3,180	724	3,958

Output and Activity No.	Outputs/Key Activities	Budget Allocation (USD)				
		2016	2017	2018	2019	Grand Total
C.	**Capacity Building Activities** (4 batches: phase 1 - beneficiary level; phases 2-3-4; DENR staff level as trainers training)	-	3,474	17,844	-	21,318
D.	**Trainers Training on Urban Forestry and Biodiversity Conservation** (Singapore Activity)	-	-	-	-	-
E.	**Regional Workshop for the sharing of experiences and lessons learned among implementing AMS countries**	-	-	-	53,180	53,180
F	**Visit to selected Participating AMS**	-	-	18,387	3,030	21,417
G	**Project Management and Supervision**	7,568	21,140	15,926	10,509	55,143
G.1	Staff Resources (Allowance /Honorarium of Project Staff)	7,011	9,878	7,616	4,084	28,589
G.2	Management Support for Operations	557	3,048	2,113	3,662	9,380
G.3	Project Coordination Committee Meeting (2 meetings)	-	8,214	6,197	2,763	17,174
H	**External Audit**	-	-	-	2,000	2,000
I	**Contingency**	-	-	-	-	-
TOTAL		26,469	57,484	58,923	71,272	214,148

4. Performance

4.1. Planned vs. actual implementation

As discussed above, the Philippines' WBP includes Regional activities. However, for purposes of discussion, performance assessment under this chapter shall be limited to activities undertaken in line with the implementation of the In-country Project.

Activity	Target	Status	Timeline	Remarks
B. Establishment and Maintenance of Demonstration Plots				
B.1 Site Identification, Surveying and Mapping	30 has demonstration plot & 30 has control plot	Completed	Original: Y1-Q3 Revised: Y1-Q4	Accessibility of the proposed site for the Assisted Natural Regeneration (ANR) demonstration plot had been a major concern in site selection. The initially identified site in the Central Visayas Region was found to be inaccessible from major road networks, as such difficulty was determined in conducting capacity building and workshop activities, among others. Correspondingly, the Project's Technical working Group (TWG) considered alternative sites located in Central Luzon. These accounts/developments resulted minor delays in the implementation of Project activities.
B.2 Vegetation Assessment	Three (3) passes (before, during and after ANR)	Completed	Original: Y1-Q3 Revised: Y2-Q1	Procurement of the Consultancy Service for the conduct of Vegetation Assessment (VA) needed for the application of ANR was done in accordance with the domestic procedure or RA No. 9184 with the Philippines Government Electronic Procurement Service (PhilGEPS). However, it was declared a failure bidding as there was no interested applicant for the work. In response, adjustments to the Terms of Reference (TOR) in terms of activities and deliverables (VA and ANR training was combined in the consultancy service) was done to encourage applicants. Accordingly, a consultant was selected and became on-board on Q1, Y2. It should be noted that the

				conduct of VA involves three (3) passes of data gathering and analysis i.e before, during and after ANR, which was scheduled periodically within the project implementation.
B.3 Procurement of Demo Site/ Equipment or tools	1 unit of desktop with printer; 2 units of laptop, projector and GPS; 1 generator unit; firefighting equipment and suit	Completed	Original: Y1-Q3 Revised: Y2-Q1	Same with the Consultant for the VA, the bidding for the procurement of equipment and tools failed when it was first posted with the PhilGEPS. Hence, reposted for bidding. Eventually, the procurement of all training equipment/tools (i.e. GPS, Laptop, generator and firefighting tools) were completed and turned over to DENR field offices and PO partners on 3rd Qtr. CY 2017.
B.4 Infrastructure facilities and fixtures	One (1) Unit facility	Completed	Original: Y1-Q4 Revised: Y2-Q1	Originally, the facility was supposed to be constructed within the Community Based Forest Management (CBFM) Area of the partner PO. However, after further consultation with the PO, it was later decided to be constructed in the compound of the CENR Office near the community in consideration of better accessibility, connectivity to electricity and safety. The facility was inaugurated last 16 March 2018.
B.5 Establishment and Maintenance of Demonstration Plots	Thirty (30) hectares demonstration plot	Completed	Original: Y2 Revised: Y3-Q2&Q3	Following the finalization of the site for demonstration plot, the signing of contract/MOU with partner PO and DENR Region3 has been initiated and was perfected on 3 April 2017. Accordingly, preparatory activities such as rectification of the POs Land Tenure Instrument (LTI), final survey of the demonstration plots and installation of monuments/markers has been done before proceeding with the application of ANR activities. The established ANR demonstration plot is currently being maintained by the partner PO in accordance with the contract/MOU.

B.6 Field Monitoring and Evaluation by Project Personnel	Continuing activity	Completed	Original: Starts at Y1-Q4 Revised: Starts at Y2-Q1	To ensure conduct of project activities, field monitoring activities were done by the TWG members at various levels, from the FMB, Regional Office and Field Office. The establishment of the ANR demonstration plot by the partner PO was supervised by a designated personnel from the CENR Office.
C. Capacity Building Activities Visit to Selected Participating AMS	Four (4) batches of training activities	Completed	Original: Y2-Q1 Revised: Y3-Q2	Four (4) batches of trainings were conducted under the Project. Said training activities were participated by PO members and DENR staff from Regional/field Offices. Rescheduling of the trainings became necessary to give time for the establishment of the demonstration learning sites.
F. Visit to Selected Participating AMS	One (1) Cross Country Visit (CCV) hosted by the Philippines	Completed	Original: Y2 Revised: Y3	The Philippines' hosting of the Cross Country Visit (CCV) was facilitated on 21-22 November 2019. Said activity which was attended and participated by 16 participants from the implementing countries became the venue for sharing the Philippines experiences and lessons learned in its implementation of ANR in restoring degraded forest ecosystems.
G. Project Management and Supervision	Continuing activity	Completed	Original: Y1-Q2 to Y4-Q1 Revised: Y1-Q2 to Y4-Q1	Project management and supervision activities were done by the TWG all throughout the duration of project implementation. Coordination meetings, field monitoring, and workshops were done to identify implementation issues and concerns and formulate strategies on how the same could be addressed.

4.2. *Planned vs. actual budget*

Consistent with the agreements during the Project Coordination Committee (PCC) meetings, the project's Work and Budget Plan (WBP) was revised in an annual basis to consider actual activities accomplished in the previous year, and projected requirements for the ensuing year. It may be noted that while the project has revised its WBP, actual utilization as of August 2019 amounts to only **194,392 USD**, leaving a balance of **19,756 USD** or **9%.** The balance accounts for the savings incurred majority from the conduct of regional workshop and the gains from foreign exchange. To note, the original WBP in CY 2016 was computed using the 45 pesos to a dollar exchange rate. However, actual exchange rate as of March 2019 is already 51.436 pesos per USD. Consistent with the project MOU, the unutilized amount shall accordingly be returned to the AFoCO secretariat. The detailed financial report is attached as **Annex 1.** To note, the financial report contained herein is only preliminary as a third-party audit is yet to be conducted for the Project.

Output and Activity No.	Outputs/Key Activities	Budget Allocation (USD)										
		ORIGINAL (2016)				REVISED (2019)					UTILIZATION	Balance
		2016	2017	2018	Grand Total	2016 (actual)	2017 (actual)	2018 (actual)	2019 (actual)	Grand Total		
A.	**Inception Meeting among implementing countries**	**9,940**	**-**	**-**	**9,940**	**8,555**	**-**	**-**	**-**	**8,555**	**8,555**	**-**
B.	**Establishment and maintenance of demonstration plots/learning sites**	**36,540**	**16,350**	**2,880**	**55,770**	**10,346**	**32,870**	**6,766**	**2,553**	**52,535**	**52,333**	**202**
B.1	Site Identification, surveying, mapping and planning	5,400	-	-	5,400	2,231	1,866	1,301	-	5,398	5,398	-
B.2	Vegetation Assessment	2,200	1,200	1,200	4,600	-	1,029	1,276	1,829	4,134	4,134	-
B.3	Procurement of Demo Site/Training Equipment or tools	12,000	-	-	12,000	8,115	2,873	-	-	10,988	10,988	-

Output and Activity No.	Outputs/Key Activities	Budget Allocation (USD)										
		ORIGINAL (2016)				REVISED (2019)					UTILIZATION	Balance
		2016	2017	2018	Grand Total	2016 (actual)	2017 (actual)	2018 (actual)	2019 (actual)	Grand Total		
B.4	Infrastructure facilities and fixtures	16,100	-	-	16,100	-	14,871	1,009	-	15,880	15,880	-
B.5	Actual Establishment and maintenance of demonstration plots		13,470		13,470		12,177			12,177	12,177	-
B.6	Field monitoring and evaluation by project personnel (USD35/man day on a weekly basis)	840	1,680	1,680	4,200		54	3,180	724	3,958	3,756	202
C.	**Capacity Building Activities** (4 batches: phase 1 - beneficiary level; phases 2-3-4; DENR staff level as trainors training)	**5,375**	**5,375**	**10,750**	**21,500**	**-**	**3,474**	**17,844**	**-**	**21,318**	**21,318**	**-**
D.	**Trainers Training on Urban Forestry and Biodiversity Conservation (Singapore Activity)**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
E.	**Regional Workshop for the sharing of experiences and lessons learned among**	**-**	**53,180**	**-**	**53,180**	**-**	**-**	**-**	**53,180**	**53,180**	**38,087**	**15,093**

Output and Activity No.	Outputs/Key Activities	Budget Allocation (USD)										
		ORIGINAL (2016)				REVISED (2019)					UTILIZATION	Balance
		2016	2017	2018	Grand Total	2016 (actual)	2017 (actual)	2018 (actual)	2019 (actual)	Grand Total		
	implementing AMS countries											
F	**Visit to selected Participating AMS***	-	-	15,050	15,050	-	-	18,387	3,030	21,417	21,306	111
G	**Project Management and Supervision**	11,580	21,520	21,520	54,620	7,568	21,140	15,926	10,509	55,143	52,793	2,350
G.1	Staff Resources (Allowance /Honorarium of Project Staff)	9,360	9,360	9,360	28,080	7,011	9,878	7,616	4,084	28,589	28,589	0
G.2	Management Support for Operations	2,220	2,220	2,220	6,660	557	3,048	2,113	3,662	9,380	8,580	800
G.3	Project Coordination Committee Meeting	-	9,940	9,940	19,880	-	8,214	6,197	2,763	17,174	15,624	1,550
H	**External Audit**			2,000	2,000				2,000	2,000	-	2,000
I	**Contingency**			2,088	2,088					-	-	-
TOTAL		63,435	96,425	54,288	214,148	26,469	57,484	58,923	71,272	214,148	194,392	19,756

4.3. Implementation issues and constraints

Delays in site selection lead to subsequent delays in the implementation of project activities. Following the termination of the Project in March 2019, the project is faced with the following concerns:

4.3.1. Implementation of Year 2 and 3 Maintenance and Protection activities of the established ANR Demonstration Site will spill over-after the end of project life in March 2019, up to March 2020. Correspondingly, release of fund to the partner Peoples Organization (POs) shall be made up to March 2020 based on the "progress billing scheme."

4.3.2. The conduct of 3rd pass (final) data gathering for the Vegetation Assessment (VA) originally scheduled on March 2019 was not pursued due to early the onset of the dry season because of the possibility that new measurements will not reveal significant difference in terms of growth of regenerants. The activity was only completed in August 2019. Correspondingly, release of payment to the consultant was carried-out once the activity has been completed.

As discussed during the Special PCC Meeting held on 28 February 2019 in Singapore, such arrangement may be considered as long as the subject expenditure items has already been reported as "accrued" or "committed" funds in the financial reports. The Meeting likewise agreed on the recommendation of the Philippines to continuously submit financial report to the AFoCO Secretariat on a quarterly basis, until all remaining budget has been released to the PO.

5. Impact Analysis

5.1. Outcomes and outputs

It can be said that the Project has contributed to the restoration of degraded forestlands inside and adjacent to identified Project area with the achievement of the following outcomes, outputs and deliverables:

5.1.1 Through a Memorandum of Agreement (MOA) with the DENR, the 30-hectare demonstration plot/learning site, including the 30-hectare control plot was established, operationalized and currently being maintained and protected by the partner PO:

a. Following the final selection of the site, the perimeter of the sixty (60) hectare project area was mapped, surveyed and demarcated on the ground in 2017 by the partner PO with the assistance of the DENR. Map and some photographs are attached as **Annex 2**;

b. Thru the partner PO, the thirty (30) hectare demonstration site was developed and maintained using the ANR technology, while the thirty (30) hectare control plot was protected and maintained starting CY 2018. The work plan for the implementation of ANR within the 30-hectare demonstration plot is attached as **Annex 3**.

c. To have comparative assessment between areas with and without ANR application, Vegetation Assessment (VA) "before, during and after" ANR was conducted by the Project. The VA included measurements of the parameters such as; presence of regenerants, their population, density, species composition/diversity and frequency and physical conditions of the site: climate, physiography, geology, soil and others.

The data "before VA" indicated that there were twenty (20) families represented by 32 genera and 35 species of the regenerants identified in control plot, while 23 families, 34 genera and 49 species were found in the plot to be applied with ANR.

In terms of species recruitment, results indicated that (1) year period is not enough to enhance new species to regenerate the area since the site has not yet been transformed into conditions suitable to new species. It was observed however that species of regenerants similar to the dominant regenerant species with remnants in the area like salingogon, bitaoi bakil, tagpo, salagong liitan are the ones regenerating in the area. The with ANR in both sites were found to have more new regenerants than in the without ANR plots.

Moreover, the assessment concluded that the 1 year period may not really be enough to show the effects of ANR on the success of restoring the degraded forest ecosystems. However, the results show the potentials of ANR particularly if this is combined with protection of the area from human activities and also from fire or burning. Moreover, ANR is showing its potentials in restoring and converting degraded forest ecosystems into protective, ameliorative, bio-diverse, productive and ecologically stable at low cost.

The comprehensive result of the VA is attached as **Annex 4**.

5.1.2 Stakeholder's technical capability on ANR including VA were enhanced:

a. The completion of 4 batches of trainings programmed under the Project lead to the enhancement of capacities towards ANR of at least 94 stakeholders, comprised of members of the partner PO and staff of the forestry sector (i.e. DENR Region 1-13 and CAR). The training discussed the methodology on how to conduct vegetation assessment, specifically the establishment of sampling plots, tagging and labeling of regeneration, chart mapping, collation of data and analysis. It also provided knowledge and skills in the application of ANR based on the results of VA, and;

b. Training modules on ANR and VA and documentation reports has been developed and packaged. The documentation report with regards to the conduct of training activities is attached **as Annex 5**.

5.1.3 Use of ANR technology promoted through the documentation of best practices and lessons learned, and dissemination thereof:

a. The Project initiated the development of knowledge product re: "Training module on ANR and VA as an approach to restoration of degraded forestland" **(Annex 6).** The module discusses the ANR concepts, principles and step by step application procedures; and

b. The lessons and experiences gained during project implementation, particularly on the implementation of ANR technology has been incorporated in the draft Technical Bulletin formulated/developed by the Forest Management Bureau (FMB). Once issued, its application shall be adopted by DENR field offices, including other concerned stakeholders.

c. A cross country visit was hosted by the Philippines to showcase project achievements and discuss and exchange ideas, good practices, lessons and experiences of the Philippines on the implementation of ANR with the other implementing countries. Each of the participating countries having five (5) delegates were represented in the CCV i.e. Brunei Darussalam, Indonesia, Singapore and one (1) from the AFoCo Secretariat. Participants from the host country, Philippines came from Regional, Provincial, and Community field offices of DENR including staff from the Forest Management Bureau. Documentation with regards to the CCV is attached as **Annex 7**.

5.1.4 Project gains sustained through the implementation of activities under the Project Sustainability Plan duly adopted by the Partner PO.

a. To ensure sustainability of project gains, the project TWG initiated the formulation of sustainability plan with the partner POs. The plan outlays the long term strategies and activities that are needed to be done both by the DENR and the partner PO to ensure that gains from the project are optimized even beyond project termination. Said plan is discussed in details under item 5.4 of this document.

5.2. Internal & external impacts

The restoration of the project site inside the CBFMA area of MALATAPI Community Livelihood Center Inc., was expected to facilitate the improvement and conservation of the biodiversity, water quantity and quality, soil amelioration, carbon storage, provision of wood and non-timber forest products and even food security for the community. To attain this, capacity buildings on VA and ANR were provided to the community to ensure identification and implementation of appropriate strategies for the site and the community. This resulted to the enhanced management mechanism in the area, particularly in the aspects of forest protection and community awareness that ANR methodology is cost-effective restoration strategy.

To cascade project outcomes beyond the boundaries of the project site and the CBFM area of MALATAPI, continuous coordination with the Barangay and Municipal Local Government Unit (B/MLGU) shall be facilitated by the members of Technical Working Group (TWG) of the DENR. This aims to involve the said B/MLGU in the conduct of the Information and Education Campaign (IEC) activities relative to the restoration of the degraded forestlands in their area of jurisdiction.

In terms of stakeholders' involvement, the capacitated staff (from other DENR Field offices) were expected to share knowledge, lessons learned and best practices with their respective offices as well as with their partner POs.

5.3. Local applicability

The MALATAPI Community Livelihood Center Inc. is a People's Organization issued with Community-based Forest Management Agreement in Masinloc, Zambales. The PO is an active partner organization of the DENR-Region 3 in various projects such as National Greening Program (NGP) and CBFM-CARP.

Their CBFMA area is 1,447.85 hectares located within the Barangays of Malabon, Malimanga, Taposo and Pinagrealan, Candelaria, Zambales. The grassland area is more or less 1,102 hectares which contains sufficient number of regenerants (600-800 wildlings/ saplings per ha., 15-200 cm. tall) and existing patches of forests which will provide additional source of regenerants that makes it suitable for the application of Assisted Natural Regeneration (ANR).

Correspondingly, remaining patches of degraded areas within the CBFM area may continuously be developed using the ANR approach. Forest cover map of the CBFM Area attached as **Annex 8**.

5.4. Sustainability

The project recognizes the need to ensure sustainability of project gains. As such, even during the time of implementation, applicable sustainability mechanisms were set in place, as follows;

5.4.1 To ensure sustainability and consistency with the over-all plans, programs and activities of the PO for the development of their CBFM area, the establishment of the ANR demonstration plots was incorporated in the Community Resources Management Framework (CRMF) which is a plan for the development of their tenure area;

5.4.2 A VA team from the members of the PO assigned to monitor the learning/ demonstration plot was created;

5.4.3 A composite team consisting of staff from the DENR Region 3 (CENRO-Regional Office) and FMB were organized to be responsible for the annual gathering of Vegetation Assessment (VA) data and maintaining

of database which will be serve as baseline data for future learning researches.

5.4.4 DENR Region 3 has officially adopted the learning demonstration plots as ANR Model Site through the memorandum dated 14 May 2019 **(Annex 9),** where capacity building and other related activities of the forestry sector can be conducted, taking reference of the best practices and lessons learned during implementation of the Project.

5.4.5 Accordingly, the 3-year contract duration/ effectivity will be continued even after project completion through mainstreaming protection and maintenance activities of the demonstration site in the regular budget of DENR Region 3;

Further to the sustainability mechanism already set in place, the project team is likewise considering the following possible future actions to ensure sustainability:

5.4.6 Renewal of the CBFMA area shall be pursued by the PO upon expiration of the tenure by CY 2024;

5.4.7 Adoption by President Ramon Magsaysay State University (PRMSU) of the ANR Site as learning station for the students of Forestry and other related courses through a tripartite MOA (PO, PENRO and PRMSU);

5.4.8 Adoption of the ANR demonstration Site by the Ecosystem and Research Development Bureau (ERDB) as their research area;

5.4.9 Provision of funds for maintenance and protection of the ANR demonstration by a mining company, as part of their Corporate Social Responsibility (CSR);

5.4.10 Adoption of the ANR demonstration site by MLGU through the issuance of a Resolution, or possibly, inclusion in the Forest Land Use Plan (FLUP);

With regards to the multi-purpose hall/bunkhouse that was constructed under the Project, the same was expected to be jointly maintained by the DENR and the PO, to be utilized particularly for the following uses/functions:

1. Facility for ASIAN regional trainings/workshop;
2. Training center for national trainings/workshop;
3. PO office of MALATAPI;
4. Activity center of other POs within CENRO Masinloc; and
5. Extension of the CENR Office.

6. Challenges and Lesson Learned

6.1. Project formulation aspect

Consistent with the over-all objectives of the Regional Project, one of the major output expected from the In-country Project is the establishment of demonstration plot to serve as learning site of the community and DENR technical personnel relative to ANR technology. Given that the project deals more on the capacity building and documentation of lessons learned and best practices as inputs to the enhancement of existing technologies and guidelines, site selection in terms of suitability, accessibility and presence of cooperative partner PO was seen to be crucial even at the stage of project preparation/formulation. Taking note of the project experience, site selection was made only after project approval consistent with its approved work plan. However, difficulties were faced in identifying potential sites that suits the aforesaid criteria which caused delays in the implementation of project activities.

6.2. Operational aspect

During project implementation, one challenge encountered was the facilitation of the downloading of funds from the DENR-FMB, to the DENR Region 3 and PENRO Zambales due to bureaucratic procedures that usually results to lengthy processing time.

On another note, smooth project implementation became possible because of the proper and close coordination and working relationships among the partner PO, DENR, LGUs and other government agencies. It is also worth to mention that the partner PO, MALATAPI Community Livelihood Center Inc., was one of the classified empowered POs in DENR Region 3 thus the project was implemented effectively and efficiently, despite aforesaid challenges.

7. Conclusion and Recommendations

The implementation of the project resulted to a number of positive impacts both internal and external to the community.

At the outset, the implementation of the project strengthened the management, not just of the demonstration site, but the entire CBFM area. The project was mainstreamed with the partner PO's Community Management Framework (CRMF) which became one of the catalyst for the POs protection and conservation initiatives.

Moreover, the implementation of the project produced several outcomes and outputs which are valuable references in enhancing/updating existing policies, guidelines and practices with regards to the application and mainstreaming of the ANR technology to the over-all initiative of the government on the restoration/rehabilitation of the country's forestland areas. With these, the following specific recommendations are being forwarded:

1. Actual site experience in terms of procedural steps in ANR implementation revealed the need to update the existing technical bulletin on ANR, particularly on the aspects of silvi-cultural practices (e.g. pressing, weeding and implementation timelines) vis-à-vis specific site condition and requirements.

2. The unit cost prescribed for the implementation of ANR on a per hectare basis should likewise be revisited to consider proximity and accessibility of the target areas for rehabilitation. Apparently, the unit cost for the ANR activity was derived using the no. of man-days an activity is expected to be completed, without reference to the distance of the target areas for rehabilitation.

3. Given that the key element for the success of the ANR approach is protection of the target area from disturbance, especially from fire, the social aspect of ANR implementation should likewise strengthened as the community is in the better position to protect the area from such disturbances. It should be noted that part of their responsibilities under the CBFM agreement is the protection of the CBFM area.

4. Results of the Vegetation Assessment (VA) conducted in the demonstration site revealed a the feasibility of ANR technology as restoration/reforestation modality. Investing on these results, it is recommended that the application of ANR technology be mainstreamed in the over-all reforestation program of the government.

5. The project implementation likewise resulted to best practices and lessons learned which were documented and highlighted in the knowledge products developed for the purpose. In the ASEAN context, consistent with the Implementation Agreement (IA), copies of these knowledge products is recommended to be submitted and deposited with the AFoCO Secretariat for access of the AFoCO member states as references in the implementation of their restoration initiatives, whenever applicable.

8. Photo records

Figure 1. Official launching of the AFoCO BIPS Project with MOA Signing in Candelaria, Zambales, conducted on April 3, 2017

Fig 2: Turnover of several items of firefighting tools and equipment to combat forest/bush fires

Fig.3 Inauguration of the constructed multipurpose hall/ bunkhouse on 16 March 2018. The building also functions as a multi-purpose hall to host meetings and trainings of the PO.

Fig.4 Photos during the collection of data on VA and training on ANR which participated by DENR Staff and PO members

Fig.5 Participants of the Cross Country Visit hosted by the Philippines

9. References

FMB Technical Working Group, 2016. A Project Document for the AFoCO Regional Project entitled "Capacity Building on the Application of Landscape Approach to Support the Sustainable Natural Resources Management in Brunei Darussalam, Indonesia, Philippines and Singapore (BIPS Project)."

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Aquino, A.P., Ani, P.A.B, and Pestejo, M.A. (2014). Achieving Sustainable and Inclusive Green Growth.

Guiang and Aragon, June 2014. Forest Restoration at Landscape Level in the Philippines.

Rebugio L.L. et. al, (2010) Promoting Sustainable Forest Management through Community Forestry in the Philippines. Forest and Society – Responding to Global Drivers of Change. pp. 355-356.

Sayer et al., 2012. Ten principles for a landscape approach to reconciling agriculture, conservation and other competing land uses.

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- https://www.thegef.org/gef/knowledge_series/land_degradation/India
- https://espace.library.uq.edu.au/view/UQ:73850/SFEMP3_3Stakeholders.pdf

10. Appendices

Annex 1	-	*Detailed Financial Report as of August 2019*
Annex 2	-	*Map of the 60-hectare Project Area*
Annex 3	-	*Work Plan for the establishment of 30-hectare demonstration site*
Annex 4	-	*VA report*
Annex 5	-	*Capacity Building documentation report*
Annex 6	-	*Knowledge product of ANR and VA training module*
Annex 7	-	*Cross country visit documentation report*
Annex 8	-	*Map of the CBFM Area of Malatapi*
Annex 9	-	*Memorandum dated May 14, 2019 re: Adoption of AFoCO ANR demonstration site*

ANNEX 1

ASEAN-Republic of Korea (AFoCo) Regional Project

CAPACITY BUILDING ON THE APPLICATION OF LANDSCAPE APPROACH TO SUPPORT THE SUSTAINABLE NATURAL RESOURCES MANAGEMENT IN BRUNEI DARUSSALAM, INDONESIA, PHILIPPINES AND SINGAPORE

Project Cash Flow Statement

Implementing Country : **Philippines** **Timeline** : **Year 4**

Planned Budget for the Reporting Quarte : **2,898** **Period Ending On** : **31 October 2019**

Particulars	Amount	Remarks
1. CASH IN	**71,272**	
Balance from previous Qtr.	68,374	
Funds received for the Qtr.	2,898	
Others		
2. CASH OUT	**51,516**	
Expenditure for the Qtr.	51,516	
Others		
3. BALANCE	**19,756**	

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AFoCo Regional Project-BIPS

Date:

Noted by:

ORLANDO A. PANGANIBAN
AFoCo Focal Person
Philippines

Date:

Approved by:

NONITO M. TAMAYO, *CESO IV*
Director, FMB and ASOF Leader
Philippines

Date:

ASEAN-Republic of Korea (AFoCo) Regional Project

CAPACITY BUILDING ON THE APPLICATION OF LANDSCAPE APPROACH TO SUPPORT THE SUSTAINABLE NATURAL RESOURCES MANAGEMENT IN BRUNEI DARUSSALAM, INDONESIA, PHILIPPINES AND SINGAPORE

Summary of Budget Received and Expenditures

Implementing Country : Philippines
Planned Budget for the Reporting Quarter : 2,898

Timeline : Year 4
Period Ending On : As of 31 October 2019

Output and Activity No.	Outputs/Key Activities	Total Original Budget	Received Budget			Expenditures			Balance	Remarks
			Total	Sum of Previous Quarters	As of 31 August 2019	Total	Sum of Previous Quarters	As of 31 August 2019		
A.	Inception Meeting among implementing countries	8,555	8,555	8,555		8,555	8,555		-	Completed
B.	Establishment and maintenance of demonstration plots/learning sites	52,535	52,535	52,535		52,333	49,982	2,351	202	On-going activities
C.	Capacity Building Activities (4 batches: phase 1 - beneficiary level; phases 2-3-4; DENR staff level as trainors training)	21,318	21,318	21,318		21,318	21,318		-	Completed
D.	Trainers Training on Urban Forestry and Biodiversity Conservation (Singapore Activity)		-			-			-	

Output and Activity No.	Outputs/Key Activities	Total Original Budget	Received Budget			Expenditures			Balance	Remarks
			Total	Sum of Previous Quarters	As of 31 August 2019	Total	Sum of Previous Quarters	As of 31 August 2019		
E.	Regional Workshop for the sharing of experiences and lessons learned among implementing AMS countries	53,180	53,180	53,180		38,087		38,087	**15,093**	Completed
F	Visit to selected Participating AMS	21,417	21,417	21,417		21,306	18,387	2,919	**111**	Completed
G	Project Management and Supervision	55,143	55,143	52,245	2,898	52,793	44,634	8,159	**2,350**	On-going activities
H	External Audit	2,000	2,000	2,000		-	-	-	**2,000**	On-going activities
I	Contingency		-			-	-		-	
TOTAL		**214,148**	**214,148**	**211,250**	**2,898**	**194,392**	**142,876**	**51,516**	**19,756**	

-

100.00%

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AFoCo Regional Project-BIPS

Date:

Noted by:

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AFoCo Focal Person
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Date:

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Philippines

Date:

ASEAN-Republic of Korea (AFoCo) Regional Project

CAPACITY BUILDING ON THE APPLICATION OF LANDSCAPE APPROACH TO SUPPORT THE SUSTAINABLE NATURAL RESOURCES MANAGEMENT IN BRUNEI DARUSSALAM, INDONESIA, PHILIPPINES AND SINGAPORE

DETAILED STATEMENT OF EXPENDITURE
Year 4

Implementing Country	:	Philippines	Timeline	:	Year 4
Planned Budget for the Reporting Quarter	:	2,898	Period Ending On	:	31 October 2019

Output and Activity No.	Date	Description of Activity	Amount in USD	Reference no. of receipts/checks
B.		**Establishment and maintenance of demonstration plots/learning sites**	**2,351**	
B.2		**Vegetation Assessment**	**1,829**	
	Accrued Expenses	Payment for the Vegetation Assessment Report of the Local Consultant	1,829	Payment on process
B.6		**Field monitoring and evaluation by project personnel**	**522**	
	26/02/2019	Payment of travelling expenses while on official travel in Region 3 on 1-3 May 2019	16	Check No. 777004
	04/03/2019	Payment of travelling expenses while on official travel in Region 3 on 24-25 January 2019 as per travel order no. 091 dtd 1/23/19	25	Check No. 381089
	04/03/2019	Payment of travelling expenses while on official travel in Region 3 on 24-25 January 2019 as per travel order no. 092 dtd 1/23/19	25	Check No. 381088
	04/03/2019	Payment of travelling expenses while on official travel in Region 3 on 24-25 January 2019 as per travel order no. 094 dtd 1/23/19	25	Check No. 381092
	04/03/2019	Payment of travelling expenses while on official travel in Region 3 on 24-25 January 2019 as per travel order no. 093 dtd 1/23/19	25	Check No. 381091
	28/05/2019	Payment of travelling expenses while on official travel in Region 3 on 1-3 May 2019 as per travel order no. 1144 dtd 4/16/19	12	Check No. 422210
	30/05/2019	Payment of travelling expenses while on official travel in Region 3 on 1-3 May 2019 as per travel order no. 1143 dtd 4/16/19	16	Check No. 422213
	04/06/2019	Payment of travelling expenses while on official travel in Region 3 on 1-3 May 2019 as per travel order no. 1141 dtd 4/16/19	16	Check No. 422215
	30/05/2019	Payment of travelling expenses while on official travel in Region 3 on 1-3 May 2019 as per travel order no. 1142 dtd 4/16/19	17	Check No. 422214
	04/06/2019	Payment of travelling expenses while on official travel in Region 3 on 1-3 May 2019 as per travel order no. 1146 dtd 4/16/19	12	Check No. 422217

Output and Activity No.	Date	Description of Activity	Amount in USD	Reference no. of receipts/checks
	19/06/2019	Payment of travelling expenses while on official travel in Region 3 on 1-3 May 2019 as per travel order no. 1145 dtd 4/16/19	12	Check No. 422218
	14/01/2019	Payment of travelling expenses while on official travel in Region 3 on December 18-21, 2018 as per travel order no. 528	54	Check No. 45943
	14/01/2019	Payment of travelling expenses while on official travel in Region 3 on December 18-21, 2018 as per travel order no. 526	54	Check No. 45944
	14/01/2019	Payment of travelling expenses while on official travel in Region 3 on December 18-21, 2018 as per travel order no. 527	54	Check No. 45945
	21/02/2019	Payment of travelling expenses while on official travel in Region 3 on January 25-29, 2019 as per travel order no. 167	39	Check No. 45954
	21/02/2019	Payment of travelling expenses while on official travel in Region 3 on January 25-29, 2019 as per travel order no. 168	39	Check No. 45955
	25/04/2019	Payment of travelling expenses while on official travel in Region 3 on March 7-8, 2019 as per travel order no. 107	23	Check No. 45965
	25/04/2019	Payment of travelling expenses while on official travel in Region 3 on March 7-8, 2019 as per travel order no. 105	23	Check No. 45966
	23/06/2018	Payment of travelling expenses while on official travel in Region 3 on June 5-8, 2018 as per travel order no. 1821 dtd 5/30/18.	19	Check No. 381024
	14/12/2018	Payment of travelling expenses while on official travel in Region 3 on November 20-23, 2018 as per travel order no. 3830 dtd 11/20/19	16	Check No. 381073
E.		**Regional Workshop for the sharing of experiences and lessons learned among implementing AMS countries**	**38,087**	
	3/25/19 & 5/14/19	Payment for the purchase of hotel accomodation and meals during the conduct of Regional Workshop on March 19-22, 2019.	17,200	Check Nos. 381098 & 422206
	10/04/2019	Payment for the purchase of van rental during the conduct of Regional Workshop on March 19-22, 2019.	1,283	Check No. 422202
		Payment of Daily Subsitence Allowance for the delegates from Implementing and Non-Implementing countries for 4 days.	5,872	Per acknowledgement receipts dated 21 March 2019
	10/04/2019	Payment for the workshop kit used in the conduct of Cross Country Visit on March 19-22, 2019.	1,592	Check No. 381099
	10/04/2019	Payment for the fieldtrip during the conduct of Regional Workshop on March 19-22, 2019.	3,174	Check No. 422201
	06/05/2019	Payment for the Facilitator/Guest Expert during the conduct pof Regional Workshop on March 19-22, 2019.	1,166	Check No. 422205
	06/05/2019	Payment for the purchase of airfare tickets from Vietnam, Cambodia and Myanmar delegates in the conduct of Regional Workshop on March 19-22, 2019.	3,539	Check No. 422204
	04/06/2019	Payment for the purchase of airfare tickets from Indonesia, Malaysia, Singapore and delegates in the conduct of Regional Workshop on March 19-22, 2019.	3,494	Check No. 422216
	09/05/2019	Payment for the purchase of snacks, toll fees, gasoline served during the conduct of Regional Workshop on March 19-22, 2019	608	Liquidation No. 2019-013(B)

Output and Activity No.	Date	Description of Activity	Amount in USD	Reference no. of receipts/checks
	25/03/2019	Payment for the purchase of snacks during the conduct of AFoCO-BIPS TWG meeting re: Preparation for the Regional Workshop on March 19-22, 2019	13	Check No. 381097
	16/01/2019	Payment for the purchase of meals/snacks expenses incurred during the conduct of AFoCo BIPS Meeting on January 4, 2019	146	Check No. 381083
F		**Visit to selected Participating AMS**	**2,919**	
	12/03/2019	Payment for the hotel accomodation and DSA allowance of the 1 (one) Philippines delegate in the Cross Country Visit in Brunei, Darussalam	566	Check No. 381096
	21/02/2019	Payment for the travel tax re: Cross Country Visit in Singapore on February 26-27, 2019 as per travel authority no. 2019-02-034 dtd February 14, 2019	29	Check No. 45953
	26/02/2019	Payment for the travel tax re: Cross Country Visit in Singapore on February 26-27, 2019 as per travel authority no. 2019-02-034 dtd February 14, 2019	29	Check No. 45956
	26/02/2019	Payment for the travel tax re: Cross Country Visit in Singapore on February 26-27, 2019 as per travel authority no. 2019-02-034 dtd February 14, 2019	29	Chrck No. 45957
	21/12/2018	Payment for the purchase of tshirt for official use of AFoCO BIPS participants for the conduct of Cross Country Visit in Zambales Region 3 on Novembwe 20-23, 2019	544	Cherck No. 45951
	15/02/2019	Payment for the purchase of tollfee expenses for official use of Region 3 vehicle	933	Check No. 45952
	08/04/2019	Payment for the purchase of supplies for the official use of AFoCO-BIPS TWG in Regon 3	151	Check No. 45962
	23/05/2019	Payment for the purchase of airtickets of the 1 Philippine delegates for the conduct of Corss Country Visit in Brunei, Darussalam.	638	Check No. 422207
G		**Project Management and Supervision**	**8,159**	
G.1		**Staff Resources (Allowance /Honorarium of Project Staff)**	**4,084**	
	01/14/2019 & 5/29/2019	Payment of honoraria for AFoCO-BIPS TWG for the period of 1st Quarter, CY 2019 (January - March)	4,084	Check Nos. 45947 and 422211
G.2		**Management Support for Operations**	**2,862.00**	
	20/07/2016	Payment for the purchase of meals/snacks served during the conduct of AFoCo-BIPS meeting re: Updates from Inception Report Meeting and Identification of Potencial Site for the Project on July 1, 2016	16	Check No. 355207
	25/07/2017	Payment of toll fees and meals served during the conduct of AFoCo-BIPS meeting on 27 April 2017	119	Check No. 355274
	21/12/2017	Payment of meeting expense for the Year-end Assessment	234	Check No. 355290
	14/03/2018	Payment of toll fees and gasoline during the Consultation cum Inaguaration of bunkhouse multi-purpose hall of MALATAPI	55	Check No. 355296
	02/01/2019	Payment for the purchase of tollfee and car wash expenses for official use of Region 3 vehicle	19	Check No. 45949

Output and Activity No.	Date	Description of Activity	Amount in USD	Reference no. of receipts/checks
	04/03/2019	Payment for the purchase of meals/snacks and toll fee expenses incurred during the conduct of Reconciliation and Finalization of CY 2018 Annual Report and Discussion on 24-25 January 2019 in Zambales, Region 3	164	Check No. 381093
	19/06/2019	Payment for the purchase of meals/snacks expenses incurred during theAFoCO BIPSD Meeting on 04 June 2019	18	Check No. 422219
	06/03/2019	Payment for the purchase of supplies for the official use of AFoCO-BIPS TWG in Regon 3	129	Check No. 45958
	15/03/2019	Payment for the purchase of supplies for the official use of AFoCO-BIPS TWG in Regon 3	152	Check No. 45961
	27/03/2019	Payment for the purchase of supplies for the official use of AFoCO-BIPS TWG in Regon 3	160	Check No. 45962
	Accrued Expenses	Payment for the printing and publication	1,473	Payment on process
	Accrued Expenses	Reimbursement incuured during the courtesy visit of AFoCO Executive Director on 21 - 23 August 2019	279	Payment on process
	Accrued Expenses	Payment of travelling expenses while on official travel in Region 3 on 21 - 23 August 2019	22	Payment on process
	Accrued Expenses	Payment of travelling expenses while on official travel in Region 3 on 21 - 23 August 2019	22	Payment on process
G.3		**Project Coordination Committee Meeting**	**1,213**	
	11/03/2019	Payment for the airfare tickets from Indonesia and Singapore delegates in the 2nd Project Coordination Committee meeting on December 4-6-2018	1,213	Check No. 381094
H		**External Audit**	-	
TOTAL EXPENDITURES			**51,516**	

Prepared by:

MARLON M. ATIENZA
Project Coordinator
AFoCo Regional Project-BIPS

Date:

Noted by:

ORLANDO A. PANGANIBAN
AFoCo Focal Person
Philippines

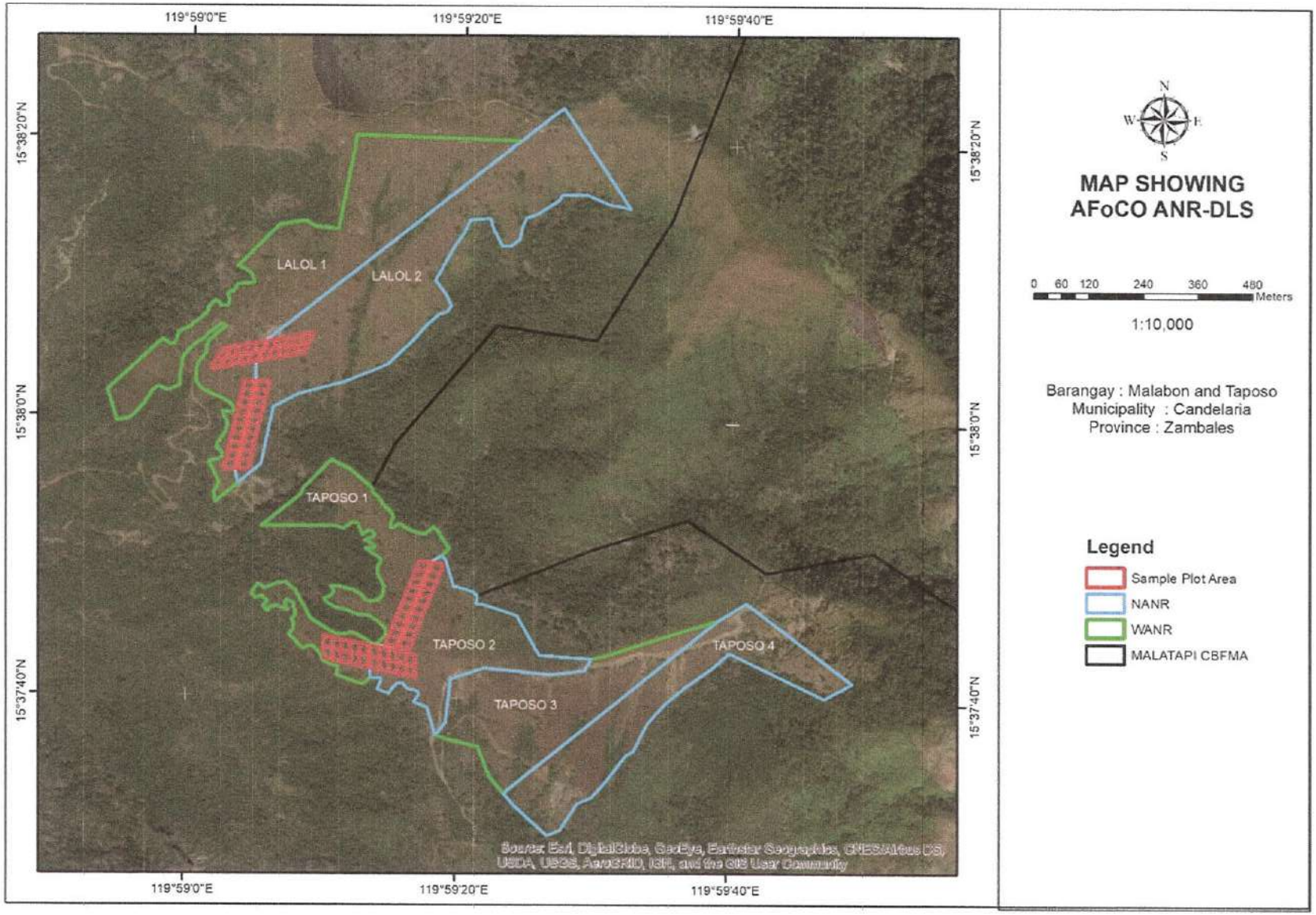
Date:

Approved by:

NONITO M. TAMAYO, *CESO IV*
Director, FMB and ASOF Leader
Philippines

Date:

ANNEX 2


119°59'0"E
119°59'20"E
119°59'40"E
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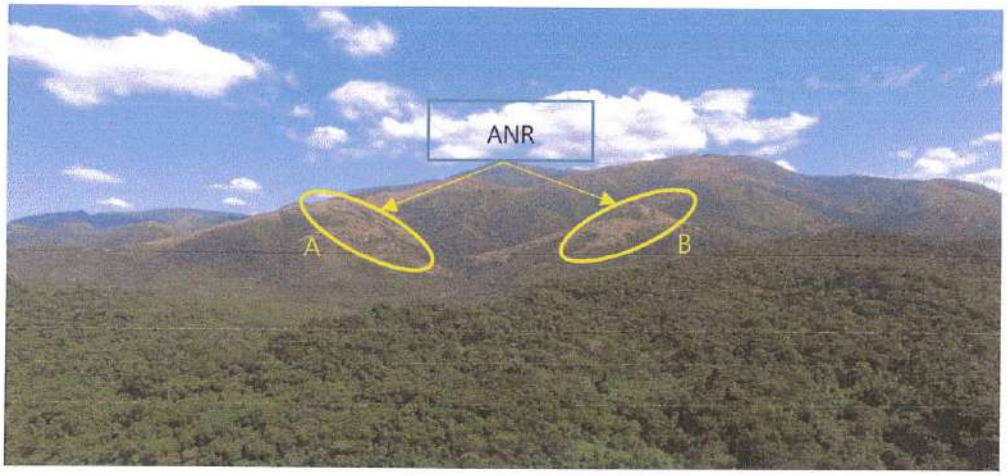
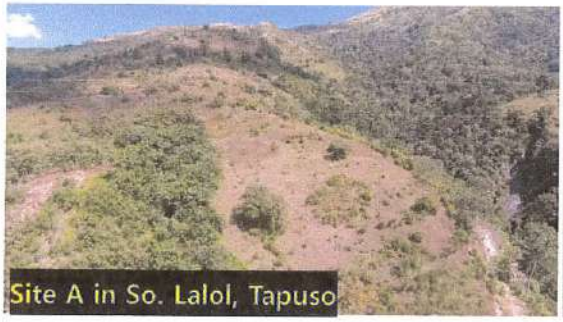
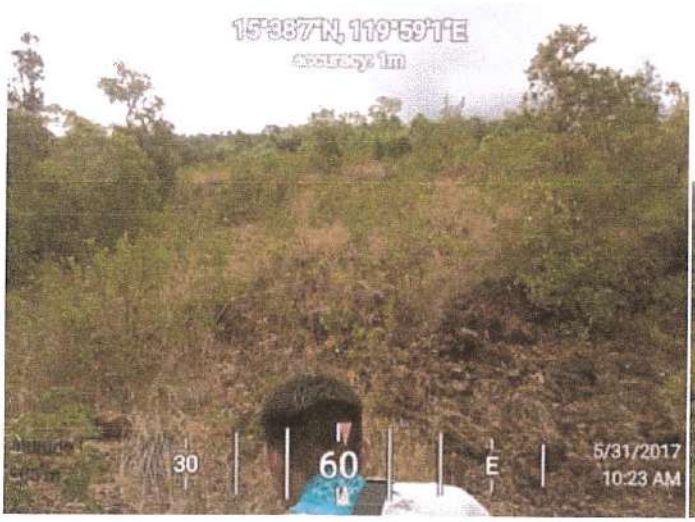
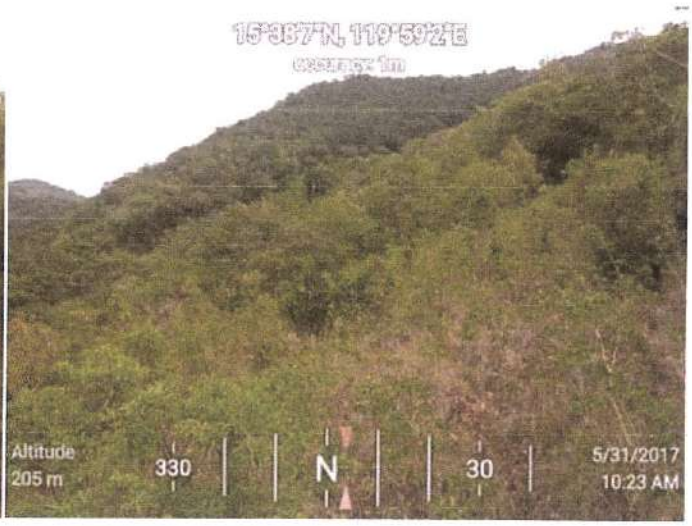
LALOL 1
LALOL 2
TAPOSO 1
TAPOSO 2
TAPOSO 3
TAPOSO 4
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
N
W
E
S
MAP SHOWING
AFoCO ANR-DLS
0 60 120 240 360 480
Meters
1:10,000
Barangay : Malabon and Taposo
Municipality : Candelaria
Province : Zambales
Legend
Sample Plot Area
NANR
WANR
MALATAPI CBFMA



Community Based Forest Management Agreement (CBMA) area of MALATAPI Community Livelihood Center Inc. in Candelaria, Zambales







ANNEX 3

partment of Environment and Natural Resources

rest Management Bureau and DENR Region 3

oCo Regional Project -BIPS

Activities	Unit of work measure	Goal/ hectare	Unit Cost per hectare	PHYSICAL TARGET (in terms of hectares)																Total	BUDGET														Total
				Y1					Y2					Y3							Y1					Y2					Y3					
				Q1	Q2	Q3	Q4	Total	Q1	Q2	Q3	Q4	Total	Q1	Q2	Q3	Q4	Total			Q1	Q2	Q3	Q4	Total	Q1	Q2	Q3	Q4	Total	Q1	Q2	Q3	Q4	Total	
Development of ANR sites			5,100																		45,000	45,000	18,000	45,000	153,000	2,700	-	-	-	2,700	2,700	-	-	-	2,700	158,400
Site validation, assessment and nning, including gathering of periodic data	hectare	1	450	30				30	6				6	6				6	42	13,500	-	-	-	13,500	2,700	-	-	-	2,700	2,700	-	-	-	2,700	18,900
Locating and marking of regenerants or dlings	no.	700	450	30				30					-					-	30	13,500	-	-	-	13,500	-	-	-	-	-	-	-	-	-	-	13,500
Ring weeding (@ 2 md/pass for 2 sses)	spots	700	1,200	30		30		60					-					-	60	18,000	-	18,000	-	36,000	-	-	-	-	-	-	-	-	-	-	36,000
Grass suppressing (@5md/ha/pass for asses/year)	hectare	1	3,000		30		30	60					-					-	60	-	45,000	-	45,000	90,000	-	-	-	-	-	-	-	-	-	-	90,000
Maintenance and Protection			12,000					-					-					-	-	4,500	22,500	4,500	22,500	54,000	22,500	67,500	22,500	67,500	180,000	22,500	67,500	22,500	67,500	180,000	414,000
Establishment of firelines/fire breaks m wide for 100 m; @ 1md/pass for 2 ses per year for 3 years)	sq.m.	1000	1,800		60		60	120		60		60	120		60		60	120	360	-	18,000	-	18,000	36,000	-	18,000	-	18,000	36,000	-	18,000	-	18,000	36,000	108,000
Ring weeding (@ 2md/pass for 2 ses/year for 2 years)	spots	700	2,400					-	30		30		60	30		30		60	120	-	-	-	-	-	18,000	-	18,000	-	36,000	18,000	-	18,000	-	36,000	72,000
Grass suppressing (@5md/pass for 2 ses/year for 2 years)	hectare	1	6,000					-		30		30	60		30		30	60	120	-	-	-	-	-	-	45,000	-	45,000	90,000	-	45,000	-	45,000	90,000	180,000
Patrol works (@0.5md/pass for 4 ses/year for 3 years)	hectare	1	1,800	30	30	30	30	120	30	30	30	30	120	30	30	30	30	120	360	4,500	4,500	4,500	4,500	18,000	4,500	4,500	4,500	4,500	18,000	4,500	4,500	4,500	4,500	18,000	54,000
Project Monitoring and Supervision 3% of the total cost)																				2,605	4,500	1,184	3,553	11,842	1,326	3,553	1,184	3,553	9,616	1,326	3,553	1,184	3,553	9,616	31,074
Total																				52,105	72,000	23,684	71,053	218,842	26,526	71,053	23,684	71,053	192,316	26,526	71,053	23,684	71,053	192,316	603,474
nstruction of Look Out Post	Unit	2	9,000		2			2												-	18,000	-	-	18,000					-					-	18,000
AND TOTA																				52,105	90,000	23,684	71,053	236,842	26,526	71,053	23,684	71,053	192,316	26,526	71,053	23,684	71,053	192,316	621,473.68

nformed by:

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In-Charge, Office of the CENRO

Approved by:

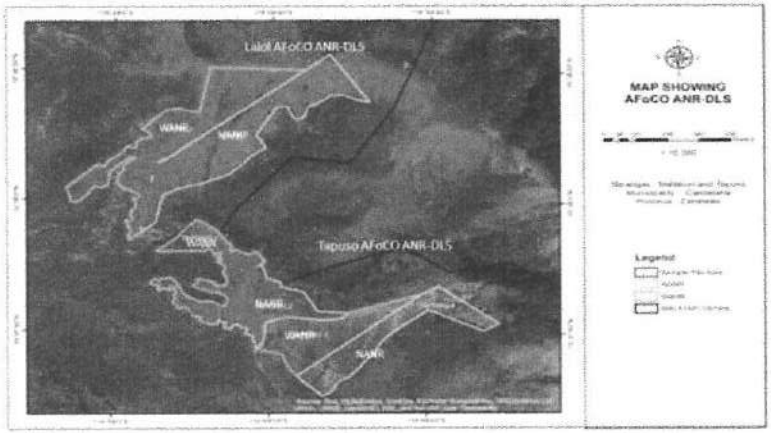
LAUDEMIR S. SALAC
OIC, PENR Officer

ANNEX 4

AFoCo Regional Project

Capacity Building on the Application of Landscape Approach to Support the Sustainable Natural Resources Management in Brunei Darussalam, Indonesia, Philippines and Singapore (BIPS)

Vegetation Assessment (VA) Report



ARMANDO M. PALIJON
Project Consultant

July 2019

Table of Contents

List of Tables

List of Figures

Executive Summary

Various approaches on the *restoration of degraded forest ecosystems* have been developed, tried and implemented worldwide. One of most popular approaches is the traditional reforestation using one or two fast growing species not only to revegetate and protect the area but also to produce future crop of timber for the community and industry. However, alternative approaches that allow nature to work in restoring and rehabilitating the degraded lands and to regain biodiversity, forest productivity and ecological stability become imperative. The project *"restoration of the degraded forest ecosystems through assisted natural regeneration* (ANR) as one of the components of the AFoCo Regional Project entitled "Capacity Building on the Application of Landscape Approach to Support the Sustainable Natural Resources Management in Brunei Darussalam, Indonesia, Philippines and Singapore (BIPS) is quite timely since Asia and the rest of the ASEAN have extensive degraded forest ecosystems that need appropriate and effective restoration activities.

During the early part of 2017,site exploration and selection were conducted. At the middle of 2017, survey, mapping and planning (SMP) was done. At the middle of 2018, the site was made ready for the conduct of ANR. Prior to this, **vegetation assessment** (VA) to determine the presence of regenerants, their population, density, species composition/diversity and frequency and also physical conditions of the site: climate, physiography, geology,soil and others was done. The two 30-ha sites in Candelaria, Quezon, one in Sitio Lalol, Barangay Malabon and the other in Barangay Tapuso chosen for the project were further subdivided into 15- ha blocks. One block is designated as No ANR (NANR) and the other With ANR (WANR). Plots of 25mx200 m in each of the NANR and WANR were established which were further subdivided into 25x20m subplots were VA activities were done. Results of VA showed that both NANR and WANR blocks have very rich regenerants i.e. more than double or triple than the 700 regenerants required for the conduct of pure ANR even without augmentation planting.

Twenty (20) families represented by 32 genera and 35 species of the regenerants were identified in NANR-DLS while 23 families, 34 genera and 49 species for WANR. Among the families, Rubiaceae was the most represented species with 5 genera and 5 species. This is followed by Euphorbiaceae and Verbenacea/Lamiaceae, both with 3 genera and 3 species, and Apocynaceae, Ebenaceae, Fabaceae, Guttiferae/Clusiaceae, Lauraceae, Moraceae and Sapindaceae all with 2 genera and 2 species. Anardiaceae, on the other hand has only one genus with 2 species. The rest of the plant families have 1 genus and 1 species only.

Most dominant, frequently occurring regenerant species include Salingogon (*Callophyllum formosum*), Bitaoi bakil (*Callophyllum pentapetallum*), Salagong liitan ( ), Molaveng aso (*Premna integrifolia*), Molave (*Vitex parviflora*) and (*Mussaenda anisophylla*), among others.

The site is characteristically steep and rocky. It is dominantly covered with clump forming grass, identified as *Themeda triandra* . Due to this, the usual pressing method using the wooden pressing board was found to be not suitable. Unlike cogon (*Imperata cylindrica*), the grass is clump forming, thus, uprooting or pulling out of the grass was instead recommended as ANR approach This was implemented by the PO, the MALATAPI Inc. Grasses were put back where they were uprooted to serve as soil cover or mulch. Aside from these ANR activities, the whole

area in both sites were provided with firebreaks, watch tower, regular foot patrol giving emphasis on the prevention of fire and poaching of forest products. .

Six months and subsequent six months after the conduct of ANR, growth in terms of increase in diameter was measured 5 cm from the base of the trunk using caliper and also in terms of height using meter stick. Average total diameter and height for the year were summed up. Results showed that on the average, the effects of ANR were manifested in growth of both diameter and height in both ANR-DLS sites though not statistically significant yet since the measurement period is barely one year only.

Species recruitment or coming in of new species aside from the species currently occurring in the site was also monitored using a 1x1m quadrat established inside in each of the 25mx20m plot . Results indicate that one year period is not enough to enhance new species to regenerate the area since the site has not yet been transformed into conditions suitable to new species. It was observed however that species of regenerants similar to the dominant regenerant species with remnants in the area like salingogon, bitaoi bakil, tagpo, salagong liitan are the ones regenerating in the area. WANR in both sites were found to have more new regenerants than in the NANR.

One year period may not really be enough to show the effects of ANR on the success of restoring the degraded forest ecosystems. However, the results show the potentials of ANR particularly if this is combined with protection of the area from human activities and also from fire or burning. Moreover, ANR is showing its potentials in restoring and converting degraded forest ecosystems into protective, ameliorative, bio-diverse, productive and ecologically stable at low cost.

1. Background

1.1The AFoCo Regional Project

The AFoCo Regional Project entitled "Capacity Building on the Application of Landscape Approach to Support the Sustainable Natural Resources Management in Brunei Darussalam, Indonesia, Philippines and Singapore or BIPS" is funded under the framework of the Agreement between the Governments of the Member States of the Association of Southeast Asian Nations and the Republic of Korea on Forest Cooperation. This was signed on 18th November 2011, entered into force on 5th August 2012 and extended to 4th August 2016.

The Project was approved by the Governing Council of the AFoCo Agreement at its 6th Session, and was formalized by a Memorandum of Understanding (MOU) signed by the Korea Forest Service (KFS) and DENR-FMB on 30th March 2016. Specific to BIPS, the project is being implemented within the context of differentiated environmental and developmental concerns which cut across the different ecosystems.

The Department of Environment and Natural Resources-Forest Management Bureau DENR-FMB), Philippines was assigned to lead the implementation of the AFoCo Regional Project more particularly its specific project component entitled "*Restoration of Degraded Forest Ecosystem through Assisted Natural Regeneration*" with funding support from the Korea Forest Service (KFS) of the Republic of Korea (ROK).

2. Establishment of **ANR Demonstration Learning Site (DLS)**

One of the components of the AFoCo Regional Project is the "*Restoration of Degraded Forest Ecosystem through Assisted Natural Regeneration.*" The approach is through the establishment of ANR demonstration/learning site within a watershed. DENR Region 3 was chosen as the host region after several site identification activities. **Demonstration Learning Sites are** specifically located at Sitio Lalol Barangay Malabon and Barangay Tapuso, Candelaria, Zambales which are within the jurisdiction of PENRO Zambales and CENRO Masinloc. This place is about 5-6 hours ride from Manila. Implementation of the Project was through DENR Region 3 with the said PENRO and CENRO in Zambales to be the coordinating conduit of FMB-DENR with the PO, the MALATAPI Inc as the maor actor in ANR field implementation.

This ANR-DLS in Candelaria, Zambales is serving as the venue of training activities for forestry sector staff and technicians through training and experiential learning events. Actually, 4 training on ANR and VA were completed using this ANR-DLS..Likewise, it is becoming a showcase in the ANR application not only for the Philippines but more importantly for BIPS countries aimed at promoting *landscape approach application through ANR method.*

The Demonstration Learning Site (**DLS**), as planned, covers 60 hectares i.e., 30 hectares **with ANR** and another 30 hectares with **no ANR** to determine the effects of ANR on the changes in vegetation through time. Two hills with 30 ha-each adjoining with each other, one in Sito Lalol Barangay Malabon and another in Barangay Tapuso, both in Candelaria, Quezon, were chosen as the **DLS.** For easy identification, one is named as Lalol AFoCo ANR-DLS. This is situated at latitude 15° 38' and 5.08"N and longitude of 119° 59' and 8.08". The other one is Tapuso AFoCo ANR-DLS is situated at latitude 15° 32' and 19.24". Please see Figures 1 and 2 showing the two sites separately and Figure 3, showing the proximity of the two ANR-DLS.

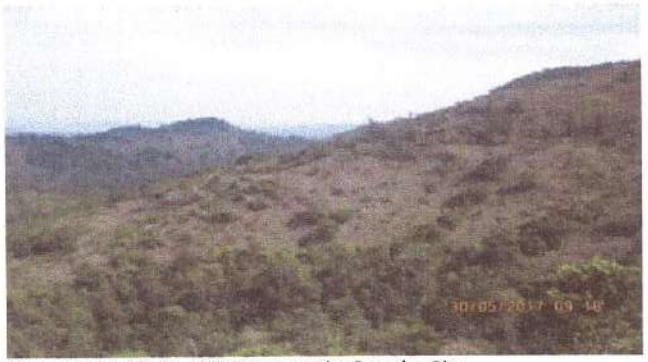


Figure 1 Lalol AFoCo ANR Demonstration Learning Site

Figure 2 Tapuso AFoCo ANR Demonstration Learning Site

Figure 3. Proximity of the Lalol and Tapuso ANR-DLS

3. **Vegetation Assessment** for ANR

Basic to the implementation of ANR as an approach to the restoration of Degraded Forest Ecosystems is the generation of information not only about the physical attributes like climate, physiography, soil and communities situated either within or nearby the target site but most importantly about the natural regenerations (wildlings) including the nearby gallery and patch forests that are potential sources of propagules.

As stipulated in the consultancy engagement, assistance in the ***Vegetation Assessment*** (**VA**) before, during and after ANR application will be provided. This VA is aimed at determining the vegetation changes in terms of growth and development of the regenerants and species recruitment during the 3 year period. The results on the application of ANR will provide reliable information on the effects of ANR treatments on the growth and development of regenerants as well as on the recruitment of regenerants in the ANR site. More importantly such results can be used as references or inputs in formulating policy recommendations and forest restoration plans and budgets.

The design and establishment of the VA plots in the DLS commenced during the first ANR/VA training held last year, 2017 in Candelaria, Zambales with staff of DENR R-3, PENRO Zambales and most especially CENRO Masinloc providing the technical and material assistance to MALATAPI Community Livelihood Center, Inc which is the participating PO of this project.

A 5% sampling was used. Actual establishment of permanent VA plots was quite tedious considering the topography and the rocky nature of the site. With the dedication of the staff of CENRO Masinloc and MALATAPI, the establishment of the quadrat or plot with a 25x20 m size inside the 25X200 m block or strip was successfully completed. Each corner of the plots with ANR and without ANR was geo-referenced (GPS readings) and was provided with markers *(mojon)* in order to ensure permanency of these VA assessment plots for continuous monitoring of the vegetation in terms of changes in composition, growth and recruitment of species. Please see Figures

4 and 5 for the VA Permanent Monitoring plots. In both Lalol AFoCo and Tapuso AFoCo sites, WANR represents the 15 hectare portion of the 30 hectare DLS as *With Application of ANR* while the NANR is the *No Application of ANR* for the other 15 hectare portion.

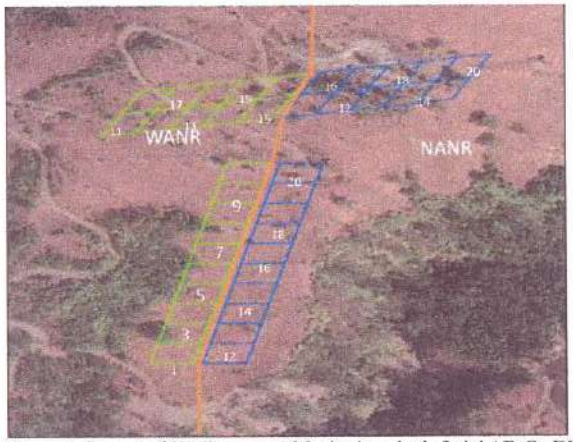


Figure 4. Layout of VA Permanent Monitoring plot in Lalol AFoCo DLS

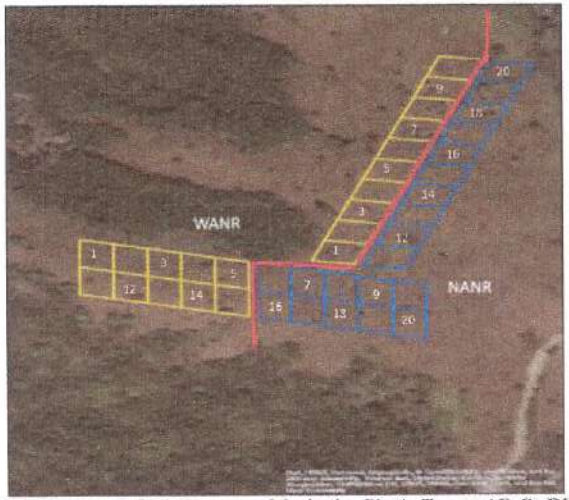


Figure 5. Layout of VA Permanent Monitoring Plot in Tapuso AFoCo DLS

The ANR/VA training conducted for Luzon, Visayas and Mindanao regions on May 8-11, 2018; May 27-30, 2018 and June 5-8, 2018, respectively were utilized for the completion of the VA.

VA activities done at both sites are shown in Figure 6.

Figure 6. Vegetation Assessment Activities done at both ANR-DLS

3.1 Results of VA

Most ANR manuals more particularly the one written by Ganz and Durst in 2003 entitled *Assisted Natural Regeneration: An Overview* provides guidelines in the choice of site, objectives and the type of ANR approach in areas with well spread natural regenerants regardless of slope. The guidelines forwarded by the aforementioned authors were included in the FAO publication " *Advancing assisted natural regeneration (ANR) in Asia and the Pacific*".

The guidelines are presented in the Table 1.

Table 1. Guidelines in choice of site, objectives and ANR type in areas with well spread natural regeneration

Woody plants/ha	Timber, watershed objectives	Nature reserves, areas near forest edges, wet sites not prone to fire
Less than 200/ ha (wider than 7x7 m)	Use conventional Refo or AF	Use conventional Refo or AF
200-600/ha (7x7 m to 4x4 m)	Use conventional Refo or AF	Use ANR with enrichment planting
600-700/ha (4.1 x 4.1 m to 3.8 x3.8 m)	Use ANR with enrichment planting so that canopy closure takes place w/n 3-5 yrs	Use ANR with enrichment planting so that canopy closure takes place w/n 3-5 yrs
Over 700/ha (narrower than 3.8 x 3.8m)	Use ANR for timber production; enrich by planting to achieve desired stocking	Use ANR

This guideline primarily considers the population and/or density of the natural regenerants of woody plants in the area as basis on what type of ANR approach is appropriate in rehabilitating and restoring the degraded forest ecosystems and grasslands.

3.1.1 VA on the population of regenerants

Regenerants at Lalol AFoCo ANR-DLS

As shown in Table 2, the ***population of regenerants*** at Lalol AFoCo ANR-DLS averaged to **2415** per hectare. Since this VA desires to determine the effects of ANR, blocks and plots were designated as NANR and WANR meaning No ANR and With ANR, respectively. The ***population of regenerants for NANR*** averaged to **1810** while for ***WANR*, 3020**. These population can increase several folds since the VA followed the VA process for ANR which considers ***one individual for clump occurring in 1 sq m quadrat***. In this case, the average number of clumps in 25mx20m or 500 m^2 is **52.8**. Thus, if this **52.8 clumps** are multiplied by the no. of stems per clump, **6.75**, and blow it up by **20** to get the ***population of regenerants per ha*** then this will result to **7,128**. Specifically, ***the population of regenerants/ha*** based on average number of clumps and average number of stems per clump for NANR is (43.2 x7.5 x20) **6,480** while for WANR, (62.4 x 6.0 x 20), **7,488**.

Table 2 Population of regenerants at Lalol AFoCo DLS

Treatment	Block	Plot	Count Of stems	Ave No. of stems per 5H m^2	No of stems/ha (Stems/ 5H m^2 X20)	No of clumps per5H m^2	No of Stems per clump	Range of No of stems per clump Min-Max
NANR	B1	**Total B-1**	**518**	**103**	2060	187	23	
		Q-12	71			49	5	2 to 20
		Q-14	75			40	5	2 to 17
		Q-16	74			27	3	2to 5
		Q-18	60			18	5	2 to 11
		Q-20	111			53	5	2 to 32
	B2	**Total B-2**	**391**	**78**	1560	245	52	
		Q-12	71			43	6	2 to 21
		Q-14	75			60	9	2 to 20
		Q-16	74			55	9	2 to 21
		Q-18	60			36	17	2 to 50
		Q-20	111			51	11	2 to 62
		TotalB1+ B2			3620	432	75	
		Average			**1810**	**43.2**	**7.5**	
WANR	BI	**Total B-1**	**982**	**196**	3920	**251**	**24**	
		Q-11	414			135	4	2 to 34
		Q-13	176			49	5	2 to 23
		Q-15	74			19	5	2 to 15
		Q-17	242			33	5	2 to 10
		Q-19	76			15	5	2 to 10
	B2	**Total B-2**	**530**	**106**	2120	**373**	**36**	
		Q-1	238			189	14	2 to 36
		Q-3	39			7	5	2 to 11
		Q-5	99			70	6	2 to 15
		Q-7	54			43	8	2 to 20
		Q-9	100			64	3	2 to 11
		TotalB1+ B2			6040	**624**	**60**	
		Average			**3020**	**62.4**	**6.0**	
Grand Total					9050	105.6	13.5	
Average					**2415**	**52.8**	**6.75**	

Regenerants at Tapuso AFoCo ANR-DLS

As shown in Table 3, the population of regenerants at Tapuso AFoCo ANR-DLS averaged to **1295** per hectare. As mentioned previously, since this VA desires to determine the effects of ANR, blocks and quadrats were designated as NANR and WANR meaning No ANR and With ANR, respectively. The population of regenerants for NANR averaged to **1030** while for WANR, **1560**.

Similarly, the population of regenerants can increase several folds since the vegetation assessment followed the VA process for ANR which considers one individual for clump occurring in 1 sq m quadrat. In this case, the average number of clumps in 25mx20 m or 500m^2 is **59.4**. Thus, if this **59.4** clumps are multiplied by the no of stems per clump,**12.5** and blow it up by **20** to get the population of regenerants per ha then this will result to **14,850.** Specifically, the population of regenerants based on average number of clumps and average number of stems per clump for NANR is (43.9 x 13.6 x 20) **11,940** while for WANR, (74.9 x 11.5 x 20), **17,227**.

Table 3. Population of regenerants at Tapuso AFoCo DLS

Treatment	Block	Plot	Count Of stems	Ave No. of stems per SH m^2	No of stems/ha (Stems/ SH m^2 X20)	No of clumps /SH m^2	Ave no of stems per clump in SH m^2	Range of No of stems per clump Min-Max
NANR	B-1	**Total B-1**	**270**	54	1080	214	49	
		Q-16	24			24	5	2 to 16
		Q-18	57			48	14	2 to 43
		Q-20	39			30	16	2 to 43
		Q-7	75			51	6	2 to 18
		Q-9	75			61	8	2 to 29
	B-2	**Total B-2**	**247**	49	980	225	87	
		Q-12	49			40	10	2 to 11
		Q-14	56			49	24	2 to 78
		Q-16	55			50	30	2 to 129
		Q-18	30			28	14	2 to 46
		Q-20	57			57	9	2 to 45
		TotalB1+B2			2060	439	136	
		Ave			**1030**	**43.9**	**13.6**	
WANR	B-1	**Total B-1**	**624**	105	2100	508	41	
		Q-1	174			132	7	2 to 33
		Q-12	44			41	12	2 to 44
		Q-14	39			46	9	2 to 32
		Q-3	150			139	9	2 to 28
		Q-5	217			150	4	2 to 17
	B-2	**Total B-2**	**267**	53	1020	241	74	
		Q-1	82			70	6	2 to 34
		Q-3	51			41	16	2 to 85
		Q-5	38			34	27	2 to 56
		Q-7	66			60	16	2 to 50

		Q-9	30			36	9	2 to 42
		TotalB1+B2			3120	749	115	
		Average			**1560**	**74.9**	**11.5**	
Grand Total					5150	118.8	25.1	
Average					**1295**	**59.4**	**12.5**	

The VA of AFoCo ANR-DLS in Candelaria, Zambales showed that both Lalol AFoCo ANR-DLS and Tapuso AFoCo ANR-DLS have population more than double the 700 regenerants mentioned by Ganz and Durst in 2003 in their article entitled "*Assisted Natural Regeneration: An Overview*". Thus, both need ANR that may not require enrichment planting.

Remnant trees in both ANR-DLS

Both the vegetation at Lalol AFoCo ANR-DLS and Tapuso AFoCo ANR-DLS are characterized with some scattered remnant trees like Molave (*Vitex parviflora*), Bitaoy bakil (*Callophyllum pentapetalum var pentapetalum*), Tagpo (*Ardisia squamulosa*), Balinghasai (*Buchanania arborescens*) and Salinggogon (*Cratoxylum formusom*) (Figure 6). These remnant trees are serving as sources of propagules (seeds) for the natural regeneration of the area and also as nurse trees for the regenerants. The species of regenerants around the species of the remnants trees are observed to be the same. Both ANR-DLS have gallery and patch forests nearby. Notably, the tree species that can be observed are the same species of the remnant trees. Moreover, there are tree species in the said nearby forests that have timber value like Batino (*Alstonia macrophylla*). Magtalisay (*Terminalia sp.*), Dulag (*Engelhardia serrata var serrata*) and many others. Similarly, these nearby forests are potential sources of propagules for the natural regeneration of both the ANR-DLS

3.1.2 VA for other ecological parameters pertaining to regenerants

3.1.2.a Species Composition and Diversity

Regenerants were identified according to family, genus and species which are manifestations of the composition and diversity of the species. Species richness, diversity and evenness were determined using the standards set by experts as shown below:

Shannon-Weiner (H') Diversity Index (Fernando, 1998)

Limit	Relative Values	Range	
0	Very Low	0	1.9
2	Low	2	2.49
2.5	Moderate	2.5	2.99
3	High	3	3.49
3.5	Very High	3.5	100

Pielou (J') Evenness Index Categories (Fernando, 1998)

Limit	Relative Values	Range	
5%	Very Low	0.05	0.14
15%	Low	0.15	0.24
25%	Moderate	0.25	0.49
75%	Very High	0.75	1

3.1.2a.i Species composition and diversity at Lalol AFoCO ANR-DLS

The species composition at Lalol AFoCO ANR-DLS is shown in Table 4.a. Twenty (20) families represented by 32 genera and 35 species of the regenerants were identified in NANR-DLS while 23 families, 34 genera and 49 species for WANR. Among the families, Rubiaceae was the most represented species with 5 genera and 5 species. This is followed by Euphorbiaceae and Verbenacea/Lamiaceae, both with 3 genera and 3 species, and Apocynaceae, Ebenaceae, Fabaceae, Guttiferae/Clusiaceae, Lauraceae, Moraceae and Sapindaceae all with 2 genera and 2 species. Anardiaceae, on the other hand has only one genus with 2 species. The rest of the plant families have 1 genus and 1 species only.

As shown in Table 4b, the species diversity in both the NANR and WANR as measured using the Shannon-Weiner (H') diversity index are very low while the evenness based on Pielou's Evenness (J') Index are generally moderate in this ANR-DLS.

Table 4. a Species composition at Lalol AFoCO NANR-DLS and WANR-DLS

Treatment			NANR											
BLOCK			Blk 1						Blk 2					
Quadrat			Q-12	Q-14	Q-16	Q-18	Q-20	Tot B-1	Q-12	Q-14	Q-16	Q-18	Q-20	Total B-2
Anacardiaceae	Buchanania	arborescens	1		4	2	2	9	1					1
Annonaceae	Annona	sp.	1				1	2						0
Apocynaceae	Alstonia	macrophylla	17		2		18	37				1		1
Apocynaceae	Tabernaemontana	pandacaqui					1	1	6	3	1		1	11
Burseraceae	Canarium	sp.						0	1					1
Casuarinaceae	Casuarina	equisetifolia	3		1		2	6						0
Dilleniaceae	Dillenia	luzoniensis			4			4					2	2
Ebenaceae	Diospyros	ferrea			1	1		2	2					2
Ebenaceae	Diospyros	pilosanthera						0					1	1
Ericaceae	Vaccinium	alvaresii						0		1		4	7	12
Euphorbiaceae	Acalypha	sp		3	1	3		7	4	6	2	5	5	22
Euphorbiaceae	Breynia	sp.					1	1						0
Euphobiacea	Drypetes	sp.			6			6	1				2	3
Fabaceae	Albizzia	procera			1			1						0
Fabaceae	Desmodium	sp	2	3	4	3		12						0
Guttiferae / Clusiaceae	Cratoxylum	formusom		2		88		90	19	39	35	20	20	133
Guttiferae / Clusiaceae	Callophyllum	pentapetalum var pentapetalum	13	45	33	12	18	121	5	2	3	3	19	32
Juglandaceae	Engelhardia	serrata var serrata		1				1	1		2	1		4
Lauraceae	Litsea	sp			2			2						0
Lauraceae	Litsea	vidallii	1	1	4		1	7	5		2	2	7	16
Moraceae	Ficus	ampelas						0	1				1	2

Myrsinaceae	Ardisia	squamulosa	2	4	3	6	2	17	4	2	1	1	3	11
Phyllanthaceae	Glochidion	sp.						0	3	3	9	3	3	21
Rubiaceae	Canthium	sp						0		1		1	1	3
Rubiaceae	Ixora	philippinensis			1			1						
Rubiaceae	Morinda	citrifolia		3			1	4		1	1			2
Rubiaceae	Musseenda	anisophylla	7	17	2	1	9	36	2		1	3	5	11
Rubiaceae	Neonauclea	sp	26	3	2	1	30	62		1	3	1		5
Sapindaceae	Guioa	koelreuteria			3		1	4					3	3
Thymeliaceae	Wikstroemia	indica	1	2	19		1	23		2	2	1	11	16
Ulmaceae	Trema	orientalis						0				2		2
Urticaceae	Leucosyke	sp.		3	2		3	8		1		3	5	9
Verbenaceae / Lamiaceae	Gmelina	sp	4					4	2		1	1		4
Verbenaceae / Lamiaceae	Vitex	parviflora	4	11	10	2	5	32	3	3	5	6	6	23
Verbenaceae / Lamiaceae	Premna	integrifolia	4	2		5	3	14	11	8	6	2	8	35
		Total Stem Count	86	102	105	125	100	518	71	75	74	60	111	391
		Species count	14	15	20	12	18		17	15	15	18	20	

Treatment			WANR										
BLOCK			Blk 1						Blk 2				
Quadrat			Q-11	Q-13	Q-15	Q-17	Q-19	Tot B-1	Q-1	Q-3	Q-5	Q-7	Q-9	Total B-2
Anacardiaceae	Buchanania	arborescens	1	10	1		1	13	1				2	3
Anacardiaceae	Buchanania	microphylla	7				22	29	3					3
Annonaceae	Annona	sp.	1					1	2					2
Apocynaceae	Alstonia	macrophylla					2	2	1					1
Apocynaceae	Tabernaemontana	pandacaqui	1	1				2	10	6	2		2	20
Combretaceae	Terminalia	sp	1					1	1					1
Dilleniaceae	Dillenia	luzoniensis	2	1	1		2	6					1	1
Ebenaceae	Diospyros	ferrea	2	2				4			1			1
Ebenaceae	Diospyros	pilosanthera	7					7						0
Ericaceae	Vaccinium	alvaresii	4	11				15	1		1	2		4
Euphorbiaceae	Acalypha	sp	8		3	5		16		1	3			4
Euphorbiaceae	Drypetes	sp.			8		2	10						0
Fabaceae	Bauhinia	sp.				1		1						0
Fabaceae	Desmodium	sp	20				3	23			1			1
Guttiferae / Clusiaceae	Callophyllum	pentapetalum var pentapetalum	11 9	34	16	11	31	211	7	1	1		3	12
Guttiferae / Clusiaceae	Cratoxylum	formusom	80	87	19	180		366	78	4	67	40	81	270
Juglandaceae	Engelhardia	serrata var serrata						0		1	8			9
Lauraceae	Litsea	vidallii	10	1	2			13				2	1	3
Moraceae	Ficus	ampelas						0	4					4
Moraceae	Ficus	sp.	1					1						0

Myrsinaceae	*Ardisia*	*squamulosa*	10	4	2	6	3	25	6	4	2		2	14
Myrtaceae	*Decaspermum*	*blancoi*	6		2	1		9						0
Myrtaceae	*Syzygium*	*sp*	5		1			6		4				4
Olacaceae	*Strombosia*	*sp.*		3				3						0
Phyllanthaceae	*Glochidion*	*sp.*	3					3	42		1		5	48
Rubiaceae	*Canthium*	*sp*	1		1			2						0
Rubiaceae	*Mussaenda*	*anisophylla*	1		2	1		4	7	1	3	1		12
Rubiaceae	*Morinda*	*citrifolia*						0	2		2	3		7
Rubiaceae	*Neonauclea*	*sp*						0	1	2				3
Sapindaceae	*Dodonea*	*angustifolia*	3			1		4	2			1		3
Sapindaceae	*Guioa*	*koelreuteria*		3		1		4						0
Theaceae	*Thea*	*lanceolata*	1					1						0
Thymeliaceae	*Wikstroemia*	*indica*	26	9	5	19	3	62	3		1	1		5
Urticaceae	*Leucosyke*	*capitellata*		1				1						0
Urticaceae	*Leucosyke*	*sp.*	7			1		8	1		1	1		3
Verbenaceae / Lamiaceae	*Gmelina*	*sp.*	46	3	2		3	54	13					13
Verbenaceae / Lamiaceae	*Premna*	*integrifolia*	12	4	5	7		28	38	10	4		1	53
Verbenaceae / Lamiaceae	*Vitex*	*parviflora*	29	2	4	8	4	47	15	4	1	3	2	25
		Total Stem count	414	176	74	242	76	982	238	39	99	54	100	530
		Species count	28	16	16	13	11		21	12	16	9	10	

Table 4. b Species Diversity at Lalol AFoCO ANR-DLS

TREAT-MENT	BLOCK	QUADRAT	Count of Stems	Species richness	Shannon-Weiner (H') Diversity Index		Pielou's Evenness (J') Index	
					Index	Category		
NANR	Blk 1	Total/ AveB1	518/103	0	0.00	Very Low	0.71	Moderate
		Q-12	86	14	2.10	Low	0.80	Very High
		Q-14	102	16	1.96	Very Low	0.71	Moderate
		Q-16	105	24	2.48	Low	0.78	Very High
		Q-18	125	12	1.21	Very Low	0.49	Moderate
		Q-20	100	18	2.16	Low	0.75	Moderate
		Total / AveB2	391/78	0	0.00	Very Low	0.80	Very High
		Q-12	71	18	2.47	Low	0.86	Very High
		Q-14	75	15	1.84	Very Low	0.68	Moderate
		Q-16	74	15	1.94	Very Low	0.72	Moderate
		Q-18	60	18	2.40	Low	0.83	Very High
		Q-20	111	20	2.60	Moderate	0.87	Very High

WANR	Blk 1	Total/AveB1	980/196	0	0.00	Very Low		Moderate
		Q-11	412	38	2.55	Moderate	0.70	Moderate
		Q-13	176	17	1.76	Very Low	0.62	Moderate
		Q-15	74	16	2.29	Low	0.83	Very High
		Q-17	242	14	1.11	Very Low	0.42	Moderate
		Q-19	76	11	1.73	Very Low	0.72	Moderate
	Blk 2	Total/AveB-2	530/106	0	0.00	Very Low		Moderate
		Q-1	238	23	2.20	Low	0.70	Moderate
		Q-3	39	12	2.19	Low	0.88	Very High
		Q-5	99	16	1.42	Very Low	0.51	Moderate
		Q-7	54	9	1.08	Very Low	0.49	Moderate
		Q-9	100	10	0.88	Very Low	0.38	Moderate

3.1.2.a.ii Species composition and diversity at Tapuso AFoCO ANR-DLS

The species composition at Tapuso AFoCO ANR-DLS is shown in Table 5.a. Seventeen (19) families represented by 22 genera and 23 species of the regenerants were identified in NANR-DLS while also 17 families, 24 genera and 25 species for WANR.

Among the families, Rubiaceae was similarly the most represented species with 4 genera and 4 species. This is followed by Verbenacea/Lamiaceae with 3 genera and 3 species, and Euphorbiaceae, Apocynaceae, Ebenaceae, Fabaceae, Guttiferae/Clusiaceae, Lauraceae, Moraceae and Sapindaceae all with 2 genera and 2 species. Likewise, Anardiaceae, has one genus with 2 species. The rest of the plant families have one genus and one species only.

As shown in Table 5.b, the species diversity in both the NANR and WANR of Tapuso AFoCO ANR-DLS as measured using the Shannon-Weiner (H') diversity index are very low while the evenness based on Pielou's Evenness (J') Index are very high in NANR and moderate in WANR.

Table 5.a. Species composition at Tapuso AFoCo NANR-DLS and WANR-DLS

Treatment			NANR											
BLOCK			Blk 1						Blk 2					
Quadrat			Q-16	Q-18	Q-20	Q-7	Q-9	Tot B-1	Q-12	Q-14	Q-16	Q-18	Q-20	Total B-2
Anacardiaceae	*Buchanania*	*arborescens*					3	3						
Anacardiaceae	*Buchanania*	*microphylla*									1		1	2
Apocynaceae	*Tabernaemontana*	*pandacaqui*		2	1	5	2	10	4		1		5	10
Ericaceae	*Vaccinium*	*alvaresii*		1				1						
Dilleniaceae	*Dillenia*	*luzoniensis*		2				2						
Euphorbiaceae	*Acalypha*	*sp*	2	2	2			6	2	4	2			8

Euphorbiaceae	*Breynia*	*sp.*				1		1			2		1	3
Fabaceae	*Desmodium*	*sp*			1			1		1				1
Guttiferae / Clusiaceae	*Cratoxylum*	*formusom*	4	19	17	24	50	114	15	17	17	9	11	69
Guttiferae / Clusiaceae	*Callophyllum*	*pentapetalum var pentapetalum*	2	8	3	5	1	19	2	5	3	3	2	15
Lauraceae	*Litsea*	*vidaliii*	1	3	4		1	9	2	2	4	2	1	11
Moraceae	*Ficus*	*ampelas*				1		1		4			3	7
Myrsinaceae	*Ardisia*	*squamulosa*	2	3	2	5	4	16	4	5	9	5	8	31
Phyllanthaceae	*Glochidion*	*sp.*			2	3		5	1	1	1		2	5
Phyllanthaceae	*Phyllanthus*	*sp*									1			1
Rubiaceae	*Canthium*	*sp*		1	1	1	1	4			1			1
Rubiaceae	*Mussaenda*	*anisophylla*	2			3	3	8	6	6	2	2	8	24
Sapindaceae	*Guioa*	*koelreuteria*									1			1
Thymeliaceae	*Wikstroemia*	*indica*	2	2	1	1		6	3	1	2	2	1	9
Verbenaceae / Lamiaceae	*Gmelina*	*sp*		3	1		2	6	2	1	2			5
Verbenaceae / Lamiaceae	*Premna*	*integrifolia*	3	3	1	21	4	32	2	4	3	3	9	21
Verbenaceae / Lamiaceae	*Vitex*	*parviflora*	4	3	1	4	3	15	2	1	1	3	4	11
Urticaceae	*Leucosyke*	*sp.*	2	5	2	1	1	11	4	4	2	1	1	12
		Total Stem Count	24	57	39	75	75	270	49	56	55	30	57	247
		Species count	10	14	14	13	12		13	14	18	9	14	
		Treatment	**WANR**											
		BLOCK	**Blk 1**						**Blk 2**					
		Quadrat	Q-1	Q-12	Q-13	Q-3	Q-5	Tot B-1	Q-1	Q-3	Q-5	Q-7	Q-9	Total B-2
Anacardiaceae	*Buchanania*	*arborescens*	1					1						
Anacardiaceae	*Buchanania*	*microphylla*	1		1			2						
Annonaceae	*Annona*	*sp.*	1					1						
Apocynaceae	*Tabernaemontana*	*pandacaqui*	10	1	1	3	11	26	3	1	1	1		6
Euphorbiaceae	*Acalypha*	*sp*			1		1	2	3	3		5		11
Euphorbiaceae	*Breynia*	*sp.*					2	2						
Fabaceae	*Desmodium*	*sp*	2					2				1		1
Dilleniaceae	*Dillenia*	*luzoniensis*					1	1				1		1
Guttiferae / Clusiaceae	*Cratoxylum*	*formusom*	77	20	15	80	114	306	42	11	26	22	13	114

Guttiferae / Clusiaceae	*Callophyllum*	*pentapetalum var pentapetalum*	9	1	4	4	3	21	2	6	7	5	20
Lauraceae	*Litsea*	*vidaliii*	4	5	2	4	4	19	4	6	3	4	17
Moraceae	*Ficus*	*ampelas*				1	1	2					
Myrsinaceae	*Ardisia*	*squamulosa*	3	3	4	12	7	29	12	6	4	8	4	34
Myrtaceae	*Decaspermum*	*blancoi*				1		1	1					1
Phyllanthaceae	*Glochidion*	*sp.*	26		1	14	13	54	1	2				3
Rubiaceae	*Canthium*	*sp*	3			1	1	5					1	1
Rubiaceae	*Morinda*	*citrifolia*		1				1			1			1
Rubiaceae	*Mussaenda*	*anisophylla*	8	1	1	9	11	30	5	1	2	5	2	15
Rubiaceae	*Neonauclea*	*sp*					1	1						
Sapindaceae	*Dodonea*	*angustifolia*		1				1	3	3		1		7
Sapindaceae	*Guioa*	*koelreuteria*		1				1						
Thymeliaceae	*Wikstroemia*	*indica*				1	2	3		1	1	1	1	4
Verbenaceae / Lamiaceae	*Vitex*	*parviflora*	3	3	1	2	3	12		2	1	1		4
Verbenaceae / Lamiaceae	*Premna*	*integrifolia*	17	3	4	17	36	77	4	3	2	4		13
Urticaceae	*Leucosyke*	*sp.*	1	3	2	1	3	10	1	3		3		7
			9	1	2		3	15	1	3		3		7
		Total Stem count	175	44	39	150	217	625	82	51	38	66	30	267
		Species count	16	13	13	14	18	26	13	14	8	15	7	19

Table 5.b. Species Diversity of Regenerants at Tapuso ANR-DLS1

TREAT-MENT	BLOCK	QUADRAT	Count of Stems	Species richness	Shannon-Weiner (H') Diversity Index		Pielou's Evenness (J') Index	
					Index	Category		
ANANR	Blk 1	Total/AveB-1	268/53	0	0.00	Very Low	0.78	Very high
		Q-16	24	10	2.23	Low	0.97	Very High
		Q-18	57	14	2.24	Low	0.85	Very High
		Q-20	39	14	2.06	Low	0.78	Very High
		Q-7	75	14	2.00	Very Low	0.76	Very High
		Q-9	73	11	1.30	Very Low	0.54	Moderate
		Total/AveB-2	247/49	0	0.00	Very Low	0.87	Very high
		Q-12	49	13	2.27	Low	0.88	Very High
		Q-14	56	14	2.27	Low	0.86	Very High
		Q-16	55	18	2.40	Low	0.83	Very High
		Q-18	30	10	2.07	Low	0.90	Very High
		Q-20	57	14	2.30	Low	0.87	Very High
		Total/AveB-1	624/105	0	0.00	Very Low	0.50	Moderate

WANR	Blk 1	Q-1	174	16	1.18	Very Low	0.43	Moderate
		Q-12	44	13	0.83	Very Low	0.32	Moderate
		Q-14	39	13	1.44	Very Low	0.56	Moderate
		Q-3	150	15	1.34	Very Low	0.49	Moderate
		Q-5	217	19	2.04	Low	0.69	Moderate
	Blk 2	Total/AveB-2	267/53	0	0.00	Very Low	0.63	Moderate
		Q-1	82	13	0.97	Very Low	0.38	Moderate
		Q-3	51	15	2.86	Moderate	1.06	Very High
		Q-5	38	8	0.82	Very Low	0.40	Moderate
		Q-7	66	16	2.51	Moderate	0.90	Very High
		Q-9	30	7	0.84	Very Low	0.43	Moderate

3.1.2.b Relative Density of species and frequency of species of regenerants

Relative density (RD) and relative frequency (RF) of species of regenerants at Lalol AFoCo ANR-DLS are shown in Tables 6.a and 6.b. RD indicates the population or number of stems present in each quadrat (500 m^2) and the whole block. RF, on the other hand, represents the number of times the species of regenerants appear in the quadrats and the whole block.

3.1.2.b.i Relative Density of species and frequency of species of regenerants at Lalol AFoCo ANR-DLS

Tables 6.a and Tables 6.b show the RD and RF of regenerants at Lalol AFoCO ANR-DLS. Salinggogon (*Cratoxylum formusom*) has the highest RD. This is followed by Alagao bundok (*Premna integrifolia*) and Molave (*Vitex parviflora*). Other species of regenerants that showed high RD include Salagong liitan (*Wikstroemia indica*), Tagpo (*Ardisia squamulosa*), Puso puso (*Litsea vidallii*) and Palinlin (*Buchanania microphylla*). In terms of RF, Molave (*Vitex parviflora*) has the highest frequency (100% in all quadrats). This is followed by Tagpo (*Ardisia squamulosa*) and Salingogon (*Cratoxylum formusom*), Alagao bundok (*Premna integrifolia*) Kahoy dalaga (Mussaenda anisophylla) and Salagong liitan (*Wikstroemia indica*).

Table 6.a Relative density of species of regenerants at Lalol AFoCo ANR-DLS

			Stem Count				Relative Density			
		Treatment	NANR		WANR		NANR		WANR	
		Block	1	2	1	2	1	2	1	2
Anacardiaceae	*Buchanania*	*arborescens*	4	2		7	1%	1%	0%	1%
Anacardiaceae	*Buchanania*	*microphylla*	4	3	29	3	1%	1%	3%	1%
Annonaceae	*Annona*	*sp.*		2			0%	1%	0%	0%
Apocynaceae	*Alstonia*	*macrophylla*								
Apocynaceae	*Alstonia*	*macrophylla*	2	2	6	1	0%	1%	?	0%
Apocynaceae	*Tabernaemontana*	*pandacaqui*	1	11	2	20	0%	3%	0%	4%
Combretaceae	*Terminalia*	*sp*			1	1	0%	0%	0%	0%
Dilleniaceae	*Dillenia*	*luzoniensis*	4	2	6	1	1%	1%	1%	0%
Ebenaceae	*Diospyros*	*pilosanthera*		1	7		0%	0%	1%	0%
Ebenaceae	*Diospyros*	*ferrea*	9	1	13	3	2%	0%	1%	1%

Euphorbiaceae	*Acalypha*	*sp*	7	22	16	4	1%	6%	2%	1%
Euphorbiaceae	*Breynia*	*sp*	1				0%	0%	0%	0%
Euphorbiaceae	*Drypetes*	*sp.*	6	3	10		1%	1%	1%	0%
Ericaceae	*Vaccinium*	*alvarasii*		12	15	4	0%	3%	2%	1%
Fabaceae	*Bauhinia*	*sp.*			1		0%	0%	0%	0%
Fabaceae	*Desmodium*	*sp*	12		23	1	2%	0%	2%	0%
Guttiferae / Clusiaceae	*Cratoxylum*	*formusom*	90	133	366	270	17%	34%	37%	51%
Guttiferae / Clusiaceae	*Callophyllum*	*pentapetalum var pentapetalum*	37	1		1	7%	0%	0%	0%
Juglandaceae	*Engelhardia*	*serrata var serrata*	1	4		9	0%	1%	0%	2%
Lauraceae	*Litsea*	*vidallii*	7	16	13	3	1%	4%	1%	1%
Moraceae	*Ficus*	*ampelas*		2		4	0%	1%	0%	1%
Moraceae	*Ficus*	*sp.*			1		0%	0%	0%	0%
Myrsinaceae	*Ardisia*	*squamulosa*	17	11	25	14	3%	3%	3%	3%
Myrtaceae	*Decaspermum*	*blancoi*			9		0%	0%	1%	0%
Myrtaceae	*Syzygium*	*sp*			6	4	0%	0%	1%	1%
Olacaceae	*Strombosia*	*sp.*			3		0%	0%	0%	0%
Phyllanthaceae	*Glochidion*	*sp.*		21	3	48	0%	5%	0%	9%
Rubiaceae	*Canthium*	*sp*		3	2		0%	1%	0%	0%
Rubiaceae	*Mussaenda*	*anisophylla*	36	11	4	12	7%	3%	0%	2%
Rubiaceae	*Morinda*	*citrifolia*	2		1	2	0%	0%	0%	0%
Rubiaceae	*Neonauclea*	*sp*	62	5		3	12%	1%	0%	1%
Sapindaceae	*Dodonea*	*angustifolia*			4	3	0%	0%	0%	1%
Sapindaceae	*Guioa*	*koelreuteria*	4	3	4		1%	1%	0%	0%
Theaceae	*Thea*	*lanceolata*			1		0%	0%	0%	0%
Thymeliaceae	*Wikstroemia*	*indica*	23	16	62	5	4%	4%	6%	1%
Verbenaceae / Lamiaceae	*Gmelina*	*sp.*	4	4	54	13	1%	1%	5%	2%
Verbenaceae / Lamiaceae	*Vitex*	*parviflora*	32	23	47	25	6%	6%	5%	5%
Verbenaceae / Lamiaceae	*Premna*	*integrifolia*	14	35	28	53	3%	9%	3%	10%
Urticaceae	*Leucosyke*	*capitellata*			1		0%	0%	0%	0%
Urticaceae	*Leucosyke*	*sp.*	8	9	8	3	2%	2%	1%	1%
		Grand Total	518	391	982	530	100%	100%	100%	100%

Table 6.b Relative frequency of species at Lalol AFoCO A

			No. of Quadrats Present				Relative Frequency			
		Treatment	NANR		WANR		NANR		WANR	
		Block	1	2	1	2	1	2	1	2
Euphorbiaceae	*Acalypha*	*sp*	3	5	3	2	60%	100%	60%	40%
Anacardiaceae	*Buchanania*	*arborescens*	2	2	0	3	40%	40%	0%	60%
Annonaceae	*Annona*	*sp.*	0	1	0	0	0%	20%	0%	0%
Apocynaceae	*Alstonia*	*macrophylla*	3	1	2	1	60%	20%	40%	20%
Anacardiaceae	*Buchanania*	*microphylla*	3	2	2	1	60%	40%	40%	20%

Apocynaceae	Tabernaemontana	pandacaqui	1	4	2	4	20%	80%	40%	80%
Combretaceae	Terminalia	sp	0	0	1	1	0%	0%	20%	20%
Dilleniaceae	Dillenia	luzoniensis	1	1	4	1	20%	20%	80%	20%
Ebenaceae	Diospyros	ferrea	4	1	4	2	80%	20%	80%	40%
Ebenaceae	Diospyros	pilosanthera	0	1	1	0	0%	20%	20%	0%
Ericaceae	Vaccinium	alvaresii	0	3	2	3	0%	60%	40%	60%
Euphorbiaceae	Breynia	sp	1				20%	0%	0%	0%
Euphorbiaceae	Drypetes	sp.	1	2	2	0	20%	40%	40%	0%
Fabaceae	Bauhinia	sp.	0	0	1	0	0%	0%	0	0
Fabaceae	Desmodium	sp	4	0	2	1	80%	0%	40%	20%
Guttiferae / Clusiaceae	Cratoxylum	formusom	2	5	4	5	40%	100%	80%	100%
Guttiferae / Clusiaceae	Callophyllum	pentapetalum var pentapetalum	3	1	0	1	60%	20%	0%	20%
Juglandaceae	Engelhardia	serrata var serrata	0	1	0	0	0%	20%	0%	0%
Moraceae	Ficus	ampelas	0	2	0	1	0%	40%	0%	20%
Lauraceae	Litsea	vidallii	4	4	3	2	80%	80%	60%	40%
Moraceae	Ficus	sp.	0	0	1	0	0%	0%	20%	0%
Myrsinaceae	Ardisia	squamulosa	5	5	5	4	100%	100%	100%	80%
Myrtaceae	Decaspermum	blancoi	0	0	3	0	0%	0%	60%	0%
Myrtaceae	Syzygium	sp	0	0	2	1	0%	0%	40%	20%
Olacaceae	Strombosia	sp.	0	0	1	0	0%	0%	20%	0%
Phyllanthaceae	Glochidion	sp.	0	5	1	3	0%	100%	20%	60%
Rubiaceae	Canthium	sp	0	3	2	0	0%	60%	40%	0%
Rubiaceae	Morinda	citrifolia	2	0	1	1	40%	0%	20%	20%
Rubiaceae	Mussaenda	anisophylla	5	4	3	4	100%	80%	60%	80%
Rubiaceae	Neonauclea	sp	5	3	0	2	100%	60%	0%	40%
Sapindaceae	Dodonea	angustifolia	1	3	0	2	20%	60%	0%	40%
Sapindaceae	Guioa	koelreuteria	2	1	2	0	40%	20%	40%	0%
Theaceae	Thea	lanceolata	0	0	1	0	0%	0%	20%	0%
Thymeliaceae	Wikstroemia	indica	4	4	5	3	80%	80%	100%	60%
Verbenaceae / Lamiaceae	Gmelina	sp.	1	3	4	1	20%	60%	80%	20%
Verbenaceae / Lamiaceae	Vitex	parviflora	5	5	5	5	100%	100%	100%	100%
Verbenaceae / Lamiaceae	Premna	integrifolia	4	5	4	4	80%	100%	80%	80%
Urticaceae	Leucosyke	capitellata	0	0	1	0	0%	0%	20%	0%
Urticaceae	Leucosyke	sp.	3	3	2	3	60%	60%	40%	60%
		Grand Total								

3.1.2.b.ii Relative Density and frequency of species of regenerants at Tapuso AFoCo ANR-DLS

Tables 7.a and Tables 7.b show the RD and RF of regenerants at Tapuso AFoCO ANR-DLS. Salinggogon (*Cratoxylum formusom*, similarly, has the highest RD. This is followed by Tagpo (*Ardisia squamulosa*), Bitaoy bakil (*Callophyllum pentapetalum var pentapetalum*) and Alagao bundok (*Premna integrifolia*). Other species of regenerants that showed high RD include Kahoy dalaga (*Mussaenda anisophylla*), (*Leucosyke sp*), *Gmelina sp*, Puso puso (*Litsea vidallii*), Pandakaki (*Tabernaemontana pandacaqui*), Monkey apple bundok (*Glochidion sp.*) and Molave (*Vitex parviflora*).

In terms of RF, Salingogon (*Cratoxylum formusom*), Kahoy dalaga (Mussaenda anisophylla) had the highest RF followed by Pandakaki (*Tabernaemontana pandacaqui*), Bitaoy bakil (*Callophyllum pentapetalum var pentapetalum*), (Puso puso (*Litsea vidallii*), Alagao bundok (*Premna integrifolia*) Salagong liitan (*Wikstroemia indica*) and Molave (*Vitex parviflora*).

Table 7.a Relative density of species of regenerants at Tapuso AFoCO ANR-DLS

			Stem Count				Relative Density			
		Treatment	NANR		WANR		NANR		WANR	
		Block	1	2	1	2	1	2	1	2
Euphorbiaceae	Acalypha	sp	6	8	2	11	2%	3%	0%	4%
Anacardiaceae	Buchanania	arborescens	3		1		1%	0%	0%	0%
Anacardiaceae	Buchanania	microphylla		2	2		0%	1%	0%	0%
Annonaceae	Annona	sp.			1		0%	0%	0%	0%
Apocynaceae	Tabernaemontana	pandacaqui	10	10	28	6	4%	4%	4%	2%
Ericaceae	Vaccinium	alvaresii	1				0%	0%	0%	0%
Euphorbiaceae	Breynia	sp.	1	3	2		0%	1%	0%	0%
Dilleniaceae	Dillenia	luzoniensis	2		1	1	1%	0%	0%	0%
Fabaceae	Desmodium	sp	1	1	2	1	0%	0%	0%	0%
Guttiferae / Clusiaceae	Cratoxylum	formusom	114	69	306	114	42%	28%	49%	43%
Guttiferae / Clusiaceae	Callophyllum	pentapetalum var pentapetalum	19	15	21	20	7%	6%	3%	7%
Lauraceae	Litsea	vidallii	9	11	19	17	3%	4%	3%	6%
Moraceae	Ficus	ampelas	1	7	2		0%	3%	0%	0%
Myrsinaceae	Ardisia	squamulosa	16	31	29	34	6%	13%	5%	13%
Myrtaceae	Decaspermum	blancoi			1	1	0%	0%	0%	0%
Phyllanthaceae	Glochidion	sp.	5	5	54	3	2%	2%	9%	1%
Phyllanthaceae	Phyllanthus	sp		1			0%	0%	0%	0%
Rubiaceae	Morinda	citrifolia			1	1	0%	0%	0%	0%
Rubiaceae	Canthium	sp	4	1	5	1	1%	0%	1%	0%
Rubiaceae	Mussaenda	anisophylla	8	24	30	15	3%	10%	5%	6%
Rubiaceae	Neonauclea	sp			1		0%	0%	0%	0%
Sapindaceae	Dodonea	angustifolia			1	7	0%	0%	0%	3%
Sapindaceae	Guioa	koelreuteria		1	1		0%	0%	0%	0%
Thymeliaceae	Wikstroemia	indica	6	9	3	4	2%	4%	0%	1%

Verbenaceae / Lamiaceae	*Premna*	*integrifolia*	32	21	77	13	12%	9%	12%	5%
Verbenaceae / Lamiaceae	*Gmelina*	*sp*	6	5	15	7	2%	2%	2%	3%
Verbenaceae / Lamiaceae	*Vitex*	*parviflora*	15	11	12	4	6%	4%	2%	1%
Urticaceae	*Leucosyke*	*sp.*	11	12	10	7	4%	5%	2%	3%
		Grand Total	270	247	625	267	100%	100%	100%	100%

Table 7.b. Relative frequency of species of regenerants at Tapuso ANR-DLS

			No. of Quadrats Present				Relative Frequency (%)			
		Treatment	NANR		WANR		NANR		WANR	
		Block	1	2	1	2	1	2	1	2
Anacardiaceae	*Buchanania*	*arborescens*	0	2	5	1	0%	40%	100%	20%
Annonaceae	*Annona*	*sp.*	0	2	5	1	0%	40%	100%	20%
Anacardiaceae	*Buchanania*	*microphylla*	1	2	5	1	20%	40%	100%	20%
Apocynaceae	*Tabernaemontana*	*pandacaqui*	5	4	5	1	100%	80%	100%	20%
Dilleniaceae	*Dillenia*	*luzoniensis*	1	3	5	1	20%	60%	100%	20%
Euphorbiaceae	*Acalypha*	*sp*	4	3	5	1	80%	60%	100%	20%
Euphorbiaceae	*Breynia*	*sp.*	1	2	5	1	20%	40%	100%	20%
Ericaceae	*Vaccinium*	*alvaresii*	0	2	5	1	0%	40%	100%	20%
Fabaceae	*Desmodium*	*sp*	0	3	5	1	0%	60%	100%	20%
Guttiferae / Clusiaceae	*Calophyllum*	*pentapetalum var pentapetalum*	5	4	5	1	100%	80%	100%	20%
Guttiferae / Clusiaceae	*Cratoxylum*	*formusom*	5	5	5	1	100%	100%	100%	20%
Lauraceae	*Litsea*	*vidalii*	5	4	5	1	100%	80%	100%	20%
Moraceae	*Ficus*	*ampelas*	2	2	5	1	40%	40%	100%	20%
Myrsinaceae	*Ardisia*	*squamulosa*	5	5	5	1	100%	100%	100%	20%
Myrtaceae	*Decaspermum*	*blancoi*	2	2	5	1	40%	40%	100%	20%
Phyllanthaceae	*Glochidion*	*sp.*	5	2	5	1	100%	40%	100%	20%
Phyllanthaceae	*Phyllanthus*	sp	0	2	5	1	0%	40%	100%	20%
Rubiaceae	*Canthium*	*sp*	2	3	5	1	40%	60%	100%	20%
Rubiaceae	*Morinda*	*citrifolia*	0	3	5	1	0%	60%	100%	20%
Rubiaceae	*Mussaenda*	*anisophylla*	5	5	5	1	100%	100%	100%	20%
Rubiaceae	*Neonauclea*	*sp*	1	2	5	1	20%	40%	100%	20%
Sapindaceae	*Dodonea*	*angustifolia*	2	3	5	1	40%	60%	100%	20%
Sapindaceae	*Guioa*	*koelreuteria*	0	2	5	1	0%	40%	100%	20%
Thymeliaceae	*Wikstroemia*	*indica*	3	5	5	1	60%	100%	100%	20%
Verbeneceae/	*Gmelina*	*sp*	4	3	5	1	80%	60%	100%	20%
Verbenaceae / Lamiaceae	*Premna*	*integrifolia*	5	4	5	1	100%	80%	100%	20%
Verbenaceae / Lamiaceae	*Vitex*	*parviflora*	4	4	5	1	80%	80%	100%	20%
Urticaceae	*Leucosyke*	*sp.*	5	3	5	1	100%	60%	100%	20%

Pictures of most dominant, dense and frequently occurring species of regenerants that are common in both Lalol AFoCo ANR-DLS and Tapuso AFoCO ANR-DLS are shown in Figure 1.

Figure 7. Most dominant, dense and frequently occurring species of regenerants common in both Lalol AFoCo ANR-DLS and Tapuso AFoCO ANR-DLS

Pictures of some remnant trees that are common in both Lalol AFoCo ANR-DLS and Tapuso AFoCO ANR-DLS are shown in Figure 2

Figure 8. Some remnant trees common in both Lalol AFoCo ANR-DLS and Tapuso AFoCO ANR-DLS

3.2 Conduct of ANR

Immediately after the establishment of ANR plots and assessment of the vegetation, ANR activities more appropriate to the bio-physical site conditions were determined and applied. Based on the published guidelines on ANR, grass pressing using a pressing wooden board is suggested specifically if the grass species is cogon (*Imperata cylindrica*). In this particular site, grass pressing was found to be not suitable since the area is rocky. The grass species is not running but clump forming and therefore can be easily be uprooted or pulled out from the ground. Thus, uprooting of the grass and putting back where they were uprooted was the one practiced as ANR activity. The whole area was provided with firebreaks and watch tower. Protection and maintenance were given emphasis. The partner PO, the Malatapi Inc, the one engaged in the project was and still is efficiently performing its assigned tasks.

3.3 Continuous Monitoring and Assessment of Regenerants

The success of the ANR will depend on how well the partner PO, the MALATAPI, Inc conducts the ANR activities including protection and maintenance of the area. To determine the effects of ANR, the growth in terms of increase in diameter and height of the existing regenerants and the recruitment of species were monitored. This was done by the MALATPI Inc in coordination with CENRO Masinloc.

Methodology:

In each of the 25x20m sub-plot, 20 regenerants were randomly selected and their diameter 5cm from the base of the trunk and total height were measured using a caliper and meter stick, respectively. Initial measurements were done during the VA, then in February 2019 and subsequently in July 2019.

Results:

The progress in growth and development of regenerants in Lalol AFoCo DLS and Tapuso AFoCo DLS as affected by ANR is shown in Appendix Table 1. Graphical presentations of the results on diameter and height growth are shown in Figures 3 and 4, respectively. The Figures show that the initial average diameter of the regenerants at Lalol is lower in WANR with 5.25mm than in NANR with 5.58mm but higher in Tapuso with 6.6mm than in NANR with 5.54mm only.

However, regardless of the size of the initial average diameter of regenerants, increase in diameter as affected by ANR was observed to be consistent. During the first six months and subsequent six months after the conduct of ANR, the WANR in Lalol had 1.64mm and 0.83mm increase in diameter, respectively, much higher than in NANR with 1.56mm and 0.73mm, respectively. Thus, the average total increase in diameter for the one year observation period for WANR is higher with 2.48mm than in NANR with only 2.29mm. This trend can also be observed in Tapuso, WANR had increase in diameter of 2.02mm for the first six months and 0.95mm for the subsequent six months for a total of 2.97mm. These are much higher than in NANR with only 1.55mm and 1.04mm, respectively, for a total average diameter during the one year period of 2.59mm only..

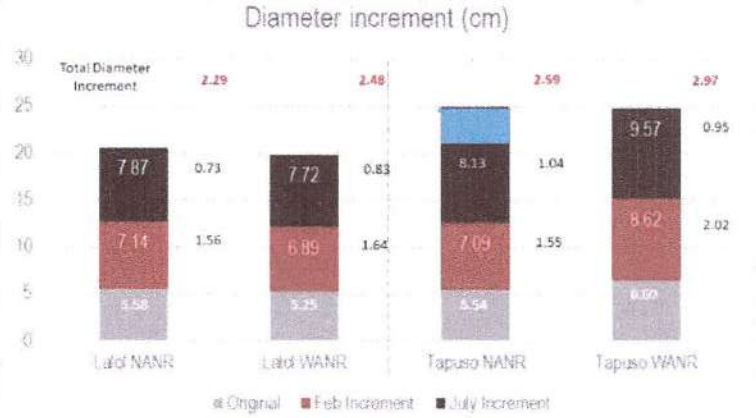


Figure 9. Diameter growth of regenerants as affected by ANR

With regard to height, the initial measurements were higher in WANR in both Lalol (113.54 cm) and Tapuso (99.5 cm) than those in NANR (107.4cm and 96.3cm, respectively). The difference in initial height of regenerants did not give an advantage to the WANR regenerants in terms of increase in height growth. Total increase in height at Lalol is higher in WANR with 15.85mm than in NANR with only 14.36cm. At Tapuso on the other hand, total increase in height is lower in WANR with 16.76mm than in NANR with 195.7 cm). Similarly, this only means that one year period is very short to really see the long term effect of ANR on growth and development of the plants.

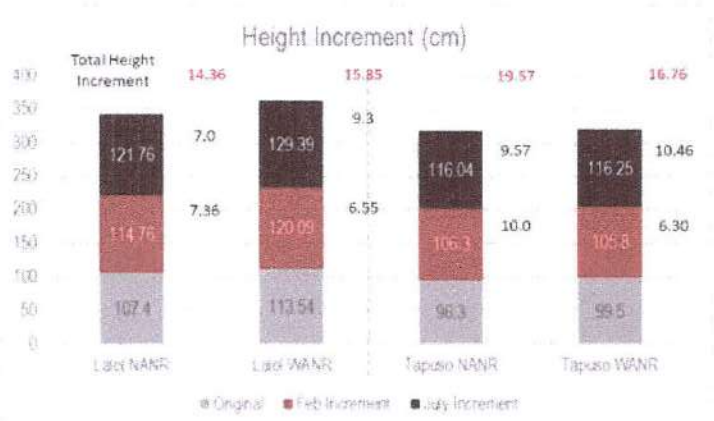


Figure 10. Height growth of regenerants as affected by ANR

In both sites, the increase in growth in diameter and height in either WANR or NANR can be observed to be higher during the first six months than during the subsequent six months after the conduct of ANR. The reason for this is the difference in weather conditions, rainy season during the first six months which is favorable for growth of regenerants. The next six months was dry season and therefore the regenerants have to survive with the unfavorable weather conditions; high light intensity, high temperature, less soil moisture, among others.

3.4 Species recruitment

One indicator of success in ANR is the the coming in of new species in the site or simply species recruitment. This will happen once improvement of the site progresses that will become suitable for other plant species to grow and survive.

In the case of ANR in Candelaria Zambales, species recruitment is not happening yet given this only one year period after the conduct of ANR.

However, in the monitoring and evaluation (M&E) that was done in the area i.e., establishing a 1mx1m quadrat in each 25mx20 m plot, it was observed that species regenerants similar to the dominant species with remnants in the area like salingogon, bitaoi bakil, tagpo, salagong liitan are the ones regenerating in the area. It can be observed that WANR in both sites have more new regenerants than in the NANR. In Lalol, for example, there are 12 regenerants in WANR with average diameter of 0.1mm and average height of 16.25cm while only 8 regenerants with average diameter of 0.1 and average height of 15.9cm.In Tapuso, on the other hand, WANR has 8 regenerants with average diameter of 0.1 and average height of 13.5cm while NANR has only 2 regenerants with average diameter of 0.1mm and average height of 11.0 cm.

Table 8. Species recruitment as influenced by ANR at Lalol AFoCo DLS
(1mx1m in each 20mx25m plot)

Treatment: NANR					Treatment: WANR				
Block	Plot	Species	Dia (mm)	Ht (cm)	Block	Plot	Species	Dia (mm)	Ht (cm)
1	**Total B-1**				1	**Total B-1**			
	Q-12	Salingogon Bitaoi bakel	0.1 0.1	16 10		Q-11	Bitaoi bakil	0.1	20
	Q-14					Q-13	Bitaoi bakil Salingogon	0.1 0.1	20 12
	Q-16					Q-15	Bitaoi bakil	0.1	11
	Q-18					Q-17	Salingogon	0.1	14
	Q-20					Q-19	Salingogon	0.1	15
2	**Total B-2**				2	**Total B-2**			
	Q-12	Bitaoi bakil	0.1	29		Q-1	Salingogon Salingogon	0.1 0.1	17 14
	Q-14					Q-3			
	Q-16	Salingogon Salingogon	0.1 0.1	24 27		Q-5	Dulag	0.1	23
	Q-18	Salingogon Tagpo	0.1 0.1	17 15		Q-7			
	Q-20	Salagong liitan	0.1	15		Q-9	Salingogon Salingogon Glochidion	0.1 0.1 0.1	22 15 12
	TotalB1+ B2	**8**	0.8	127		**TotalB1+ B2**	12	1.2	195
	Average (TB1+TB 2/8)		0.1	15.9		**Average (TB1+TB 2/12)**		0.1	16.25

Table 9. Species recruitment as influenced by ANR at Tapuso AFoCo DLS
(1mx1m in each 20mx25m plot)

Treatment: NANR					Treatment: WANR				
Block	Plot	Species	Dia (mm)	Ht (cm)	Block	Plot	Species	Dia (mm)	Ht (cm)

1	**Total B-1**				1	**Total B-1**			
							Salingogon	0.1	15
							Salingogon	0.1	14
	Q-12					Q-11	Salingogon	0.1	17
	Q-14					Q-13	Salingogon	0.1	17
	Q-16					Q-15			
	Q-18					Q-17			
	Q-20					Q-19	Salingogon	0.1	15
2	**Total B-2**				2	**Total B-2**			
	Q-7	Acalaypa	0.1	10		Q-1	Salingogon	0.1	8
		Bitaoi bakil	0.1	12			Tagpo	0.1	9
	Q-9					Q-3			
	Q-16					Q-5	Salingogon	0.1	13
	Q-18					Q-12			
	Q-20					Q-14			
	TotalB1+ B2	2	0.2	22		**TotalB1+ B2**	8	0.8	108
	Average (TB1+TB2 /2)		0.1	11		**Ave (TB1+TB2 /8)**		0.1	13.5

3.5 Potentials of the ANR-DLS

3.5.1. Potential of the ANR-DLS as Environmental protection and amelioration forest

Both the Lalol AFoCO ANR-DLS and Tapuso ANR-DLS in Candelaria, Zambales have a lot of potentials as protection forest for soil, water and wildlife conservation based on population and density of the regenerants. The species composition and diversity, though quite low, can increase through time with presence of remnant trees and gallery and patch forests and the efficient and effective ANR interventions like protection from poaching of both animals and timber and more importantly from fire or intentional burning.

3.5.2 Potentials of the ANR-DLS as production forest

Though the area is intended as strict protection zone, the presence of timber producing species in the area can make the site also potential for timber production. These timber producing species include Molave (*Vitex parviflora*) which is found to be one of the species with high density and frequency. Other timber producing species occurring in the area include Bitaoy bakil (*Callophyllum pentapetalum*), Magtalisay (*Terminalia sp.*) Batino (*Alstonia macrophylla*), Dulag (*Engelhardia serrata var serrata*), Balinghasai (*Buchanania arborescens*) and Palinlin (*Buchanania microphylla*). The seeds can be collected and be raised in the nursery for use in the augmentation planting in the area.

Another potential of the area is the production of non-wood products. Salagong liitan is one of the bast fiber producing species that is growing wildly in the area. They are also prolific in terms of fruit/seed production. Proper harvesting of the bark can make the production sustainable.

Some species have high ornamental values. These include tapgo (*Ardisia squamulosa*), Salingogon (*Cratoxylum formosum*) and others. These can be propagated and be introduced as ornamental plants.

3.5.3 As Biodiversity Conservation Forest

Pure ANR can promote biodiversity conservation. There is no supplemental planting that commonly requires weeding to promote the growth of the plants used.. Such silvicultural operations usually eliminates native species naturally regenerating in the area. ANR enhances the growth of the existing regenerants and allows natural improvement of the sites for the recruitment of species. Moreover, birds and other seed dispersal agents will habitate the area that will contribute in bringing in of other plant species in the area.

3.5.4 As demonstration and learning sites and ecotorurism destination

ANR facility in Zambales will serve as a model for ANR as approach in the restoration of degraded forest ecosystems not only for BIPS but also other ASEAN and Asia region. Success in ANR through this project will also become reference for policy makers and development agencies particularly in the planning through Landscape Approach to Support the Sustainable Natural Resources Management and specifically in the restoration of degraded forest ecosystems. Ultimately, this ANR-DLS will become an ecotourism destination not only for locals but also foreign ec-tourists

ANNEX 5

DENR-FMB AFoCo Regional Project-BIPS:

Capacity Building on the Application of Landscape Approach
to Support the Sustainable Natural Resources Management
in Brunei Darussalam, Indonesia, Philippines and Singapore (BIPS)

Specific Project

Restoration of degraded forest ecosystems through Assisted Natural Regeneration

Component

Training on Vegetation Assessment (VA) and Assisted Natural Regeneration

TRAINING COMPLETION REPORT

TRAINING

Vegetation Assessment (VA) and Assisted Natural Regeneration (ANR)
Dawal Beach Resort and Restaurant
May 29-June 01, 2017

I. Content and Methodology

The training covered the basics of the theory and practice of Vegetation Assessment (VA) and Assisted Natural Regeneration (ANR). The training methods employed were 30% lecture discussion and 60% hands-on and 10% workshop. This training was aimed at capacitating the participants on the methodology on how to conduct vegetation assessment and specifically establishment of sampling plots, tagging and labeling of regeneration, chart mapping, collation of data and analysis. Moreover, it was aimed at providing the knowledge and skills in the application of ANR based on the results of VA.

Morning of the first day of the training was highlighted by the introduction of the participants. This was followed by leveling off with the participants to know their concerns and what they want to learn from the 4-day training. This was followed by orientation on AFoCo Regional BIPS project by the AFoCo Regional Project Coordinator, ***Forester Marlon Atienza***. He discussed the background of the project, how it came about, its rationale, coverage, specific project and components for each participating country. Department Memoradum Order No. 17 dated 1989 signed by former Secretary Fulgencio Factoran Jr. Theories and practice of VA including data analysis were discussed by Forester Nico Almarines while overview of ANR was provided by the Consultant, Dr. Armando M. Palijon. Presentation of the experiences on the implementation of ANR done in 2005 was presented by Forester Emma Castillo. This topic provided the eye opener on the intricacies of applying ANR as an approach to rehabilitation of degraded forest land and grassland and how such approach can be successful though the active participation of the community.

In the afternoon of day 1 of the training, topics on the technological, social and ecological dimensions of ANR and the various techniques on application or implementation of ANR were similarly presented and discussed by the Consultant. Toward the end of the afternoon session, grouping of the participants was undertaken which was highlighted by the orientation on the various equipment, tools, supplies and materials that will be needed for the hands-on for VA and ANR. The participants were reminded that the re-entry plan of the activities that need to be done after the training is a requirement and is very much needed for the success of the project.

The second day was intended for hands-on training on VA. As early as 6:30 a.m., the participants and trainors started the journey to the VA/ANR site. They were brought to a point where vehicle cannot anymore pass through. Before the walk, each group was issued with equipment, tools and supplies like Suunto compass, meter tape, digital and non-digital caliper, tally sheet, and clip board. GPS was also made available by trainor, CENRO and FMB-DENR for geo-referencing of transect/plot. The walk to the VA/ANR site started at around 7:30 a.m. There was no established trail, thus the ephemeral creek was used as the trail. Ascent to the site after the creek was more thrilling through a narrow trail that was established by representative of Malatapi Livelihood Center and CENRO. After more than an hour and a half walk, they reached the site with a sigh of relief. The Group did not right away establish the VA transect/plot. They decided to go around the area and have a quick re-assessment of the site.

The landscape was amazing with very thick regeneration. The dominant regenerant is Salinggogon (*Cratoxylum formusum*). The varied color of the leaves i.e, from light green, yellowish, pinkish to red make the landscape very attractive. However, the grass suspected to be *Chrysopogon* is the dominant ground cover. The grass is so dense and thick and is already lodging due to age. In some areas, this grass is interspersed with sporadically distributed cogon (*Imperata cylindrica*). This means that the area is undergoing plant succession with the gradual replacement of Cogon by *Chrysopogon* grass species. Another observation is that the area is so rocky that use of wooden board as presser will not be effective and therefore new technique to further lodge the grass is necessary.

Immediately after lunch, the trainors and participants decide to divide the 30 ha-area into: half with ANR and the other half without ANR. Establishment of monitoring plot was demonstrated which actually will be the real site for monitoring the changes of vegetation in terms of growth and development of the regenerants and the recruitment or coming in of new regenerants into the area as affected by ANR. Since the sampling intensity is 10% as suggested, three (3) half hectare permanent monitoring plots were planned to be established for with ANR treatment and without ANR treatment. These monitoring plots will also be established in the other 30-ha VA/ANR site.

To capture the differences in elevation, a 25m x 200m plot was established for ANR and the same dimension of plot for without ANR. The plot was further subdivided into 25m quadrats or grid for easy monitoring. In addition, 2- 50m x100m plots will be established for each ANR and without ANR treatments to complete the 10% required sampling intensity. Likewise, the plot will be further subdivided into 25quadrats.

Locating, tagging and charting/mapping of the regenerants were demonstrated. Afterward, the PO and the CENRO participants continued the inventory of the regenerants, However, this was disrupted by the thunderstorms and the scare of a possible heavy rainfall. Thus, it was suggested that participants should stop the work and leave the area ASAP. On the way back, new route was used. At first, the participants followed a trail. It was not steep since it is somehow along the contour. But this is leading to a very steep, rocky creek which was used as the trail. One really has to be so cautious and careful in going down this trail because one mistake will mean your life. Fortunately, though God grace and protection no untoward incident happen. God really is good.

The third day was supposedly intended for the demonstration of the application of ANR. However, it was decided to visit the 2nd -30-ha site which is located at the other side of the mountain. Again early morning of third day, everybody was ready and very much eager to see the said site. We were brought to a new route to the site. Again, we started the walk at a point where we vehicle cannot pass through. It was a long walk. Unfortunately, it was the wrong route to the ANR site. Majority of us, went down except Mark Anthony Santos, Ka Julian and Kagawad Jaime who proceeded to the area by crossing 3 hills. Forester Emmanuel Penson Jr. suggested that they will go to the area to see the situation, take pictures and to determine whether the approach in VA and ANR can also be applied in the site. When the group of Bong and Mark Anthony came down they presented a lot of pictures that manifest the kind of conditions in the area. This site has thinner grass and rocks are visible as compared to the first ANR site. The regenerants are not as dense but the species are quite diverse. It was confirmed

that the VA and ANR approach that will be conducted in first site can also be done in this second site.

In the afternoon of this same 3rd day, planning workshop was undertaken. The plan was formulated based on the program of AFoCo and release of budget for the project. After dinner, integration of the knowledge gained and sharing of experiences were done. This was followed by a simple closing program with distribution of certificates as its highlight.

Early morning of the fourth day was a quick visit to Potipot Island which is only few minutes banca ride from Dawal Beach Resort and Restaurant. It was not a rest and relaxation but a tree walk where the trainor acted as the guide. Every plant species that was encountered in the area during the walk was identified. This served as a taxonomy review for training participants either Foresters or non-foresters. At 9:00 a.m. of this same day, we had a group picture taking and then snacks and lunch afterward. The sentimental part is the *bidding goodbye* with the trainors and participants before the final homeward bound.

II. Venue

The training activities were conducted at Dawal Beach Resort and Restaurant. It was a nice venue for the training on VA and ANR specifically for lecture-discussion part. It is situated strategically being very accessible and near to the ANR site (only about 30 minutes) and to CENRO and participating PO, the Malatapi Livelihood Center, Inc. Moreover, the place has facilities for participants to unwind since it has beach, swimming and recreational facilities.

III. Participants

The Training was attended by 30 participants summarized as follows:

FMB-DENR Staff	**R-3 DENR Staff**
Jeanna Lane M. Bago	Dolores C. Santos
John Winlove R. Dadis	Cerila C. Manzano
Rogelio C. Gibe	Emmanuel B. Penson, Jr.
Felixberto P. Lansigan	Danilo Araneta
Marlon M. Atienza	
Emma N. Castillo	
PENRO Staff	**MALATAPI LIVEIHOOD CENTER Inc.**
Eric B. Manlogon	Julian H. Dedicatoria
Rosalina S. Quilalang	Evelyn A. Grace
CENRO Staff	Carlo C. Doriman
Mark Anthony C. Santos	Jaime C. Ednilao
Rexson C. Victor	Shemark Ruiz
Anthony G. Dominico	Patrick Edades
Quinnee S. Vallejos	Melvin Foronda
Jowell P. Dellosa	Flores Alop
Henry V. Apostol	Loreta A. Sevillena
Eden Joy D. Nacana	Cerauna S. Edades
	Luisa H. Lumbre

IV. Training Staff Involved:

Resource Persons

Dr. Armando M. Palijon- AFoCo BIPS consultant
Adjunct Professor, UPLB

Forester Nico Almarines- Teaching Associate
Institute of Renewable Natural Resources
2F Forest Science Building, College of Forestry and Natural Resources

Forester Marlon Atienza- Coordinator, AFoCo Regional Project-BIPS
Senior Forest Management Specialist
Forest Resources Management Division
FMB-DENR, Visayas Avenue, Diliman, Quezon City

Forester Emma Castillo- Member, Technical Working Group, AFoCo BIPS
Senior Forest Management Specialist
Forest Resources Conservation Division
FMB-DENR, Visayas Avenue, Diliman, Quezon City

Evaluator
Managed and reported by: Ms. Cerila C. Manzano and Dolores C. Santos
Staff, Conservation and Development Division
DENR-R3, Sn Fernando Pampanga

V. Issues and Concerns/Recommendations/Lessons Learned

VI. Training Materials

Compiled E-copy of PowerPoint Presentation and report on Site Visit and Demo on VA/ANR PowerPoint Presentations of Forester Atienza and Forester Castillo on AFoCo and DENR Projects

VII. Appendices

Appendix 1. Snapshots of the training

Figure 1. Training participants (not complete during the picture taking)

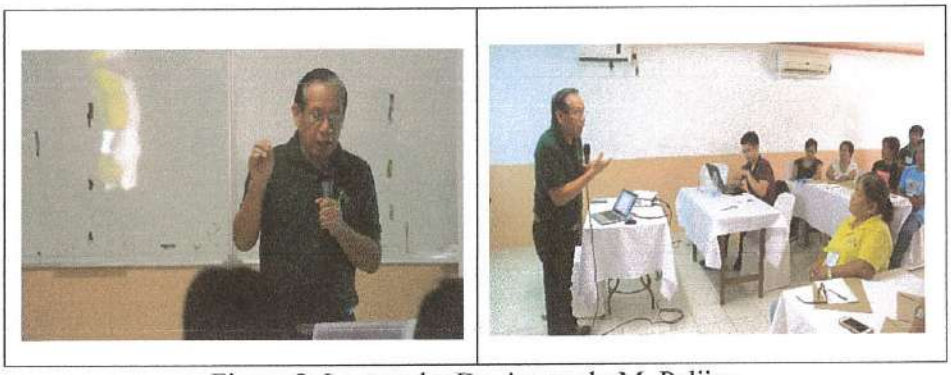


Figure 2. Lecture by Dr. Armando M. Palijon

Figure 3. Lecture by Forester Marlon Atienza

Figure 4. Lecture by Forester Emma Castillo

Figure 5. Lecture by Forester Nico Almarines

Figure 6. Sharing of Participants

Figure 7. Hike to the VA/ANR site and Quick Rest

VA- ANR Sites
The Tapuso AFoCo

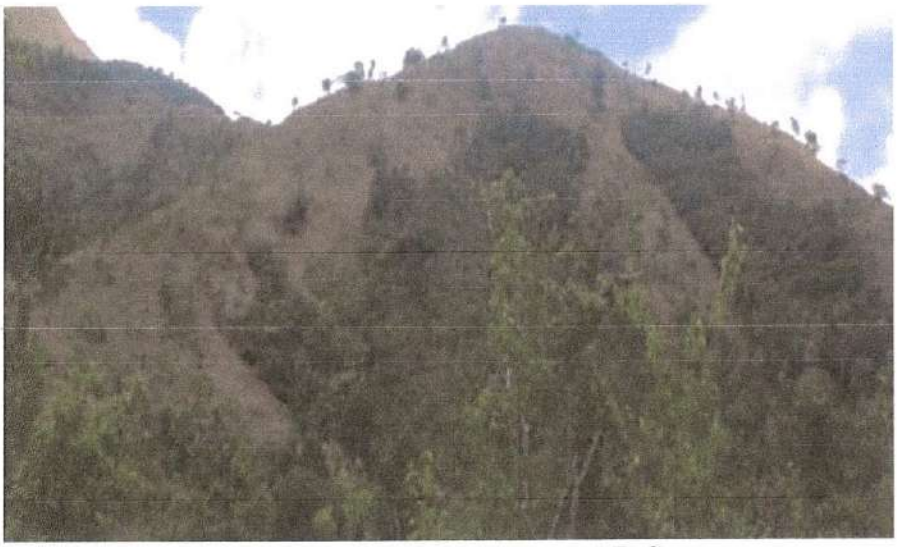


Figure 8. VA/ANR Site, Tapuso AFoCo

Layout for VA

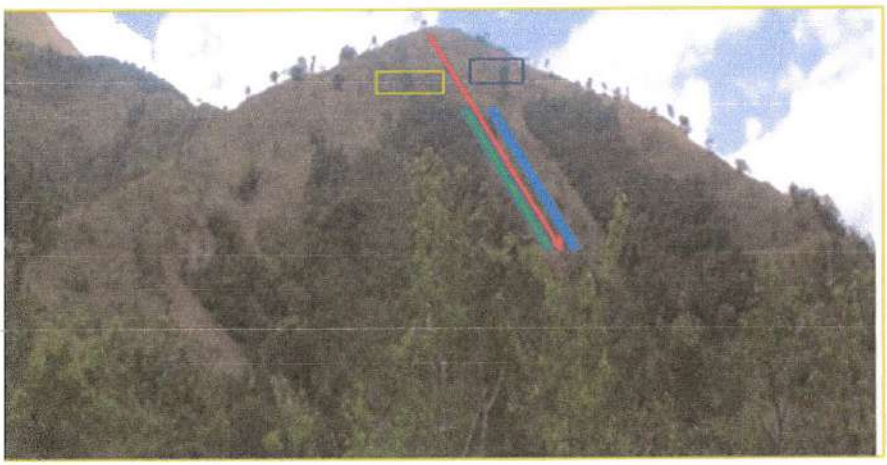


Figure 9. VA with ANR (left) and VA without ANR(right)

Figure 10. Landscape of Tapuso AFoCo

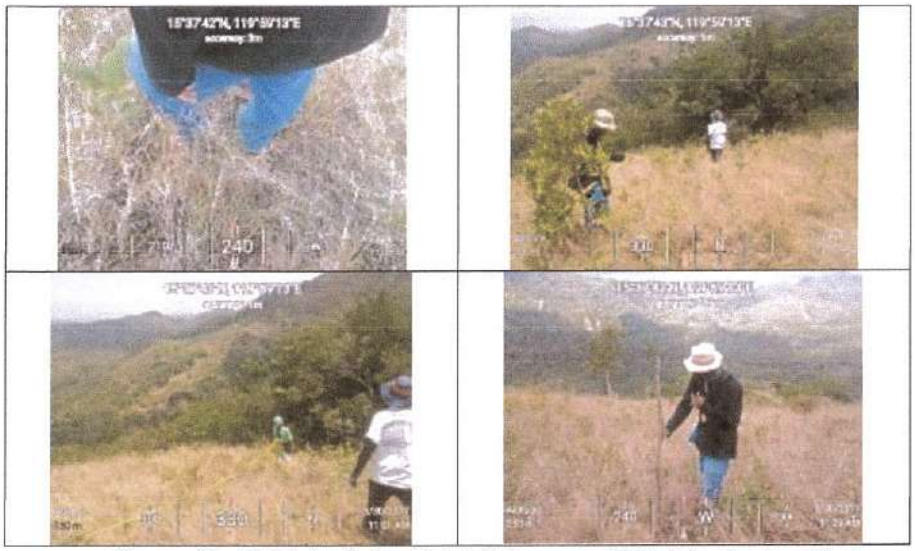


Figure 11. Field Activity- Establishment of VA Monitoring Plot

Figure 12. Sample of VA… Locating, identification, tagging and measurements of regenerants

Appendix 2. Re-entry plan

See attached re-entry plan

Appendix 3. Evaluation of the training

See attached evaluation

DENR-FMB AFoCo Regional Project-BIPS:

Capacity Building on the Application of Landscape Approach
to Support the Sustainable Natural Resources Management
in Brunei Darussalam, Indonesia, Philippines and Singapore (BIPS)

Specific Project

Restoration of degraded forest ecosystems through Assisted Natural Regeneration

Component

Training on Vegetation Assessment (VA) and Assisted Natural Regeneration

Luzon Cluster

Picture of the participants Luzon Cluster with Masinloc CENRO Ariel Mendoza and Zambales PENRO Laudemir Salac

TRAINING COMPLETION REPORT

Vegetation Assessment (VA) and Assisted Natural Regeneration for Luzon Cluster

Dawal Beach Resort and Restaurant
May 8 to 11, 2018

I. Content and Methodology

The training covered the theory and practice of Vegetation Assessment (VA) and Assisted Natural Regeneration (ANR). The training methods employed were 60% lecture discussion and 40% practicum or field work. This training was aimed at capacitating the participants on the methodology on how to conduct vegetation assessment specifically dealing with establishment of sampling plots, tagging and labeling of regeneration, chart mapping, collation of data and analysis. Moreover, it was aimed at providing the knowledge and skills in the application of ANR based on the results of VA.

First day was the arrival of the participants. At 4:00 pm, the newly built Afoco-BIPS multi-purpose hall at the government center of Municipality of Masinloc was used as the venue for the opening program of the training. The CENRO of Masinloc, **Forester Ariel Mendoza** and PENRO of Zambales, **Forester Laudemir Salac** warmly welcomed the participants. Both gave inspiring and challenging messages. Afterward, the training was moved to the training venue at Dawal Hotel and Resort. Briefly, each participant humbly introduced himself/herself citing his/her name and position in their respective offices. This was followed by leveling off with the participants to know their concerns and what they want to learn from the 4-day training. These expectations (see Appendix I) became their basis on whether these were achieved during the4-day training.

Morning of 2nd day, Forester Eileen Grace Quizon of AfoCo FMB did the orientation of the participants on the Afoco-BIPS project in lieu of **Forester Marlon Atienza**, Regional Coordinator of this project. Miss Quizon discussed the background of the project, how it came about, its rationale, coverage, specific project and components for each participating country. She emphasized the growth of AFoCo to AFoCO that is from cooperation to Organization. This means that the Philippines will be one among the members of Organization after President DU30 has signed the document this coming June, 2018.

Forester Armando M. Palijon, the lead trainor and consultant, presented the overview of the VA and ANR and afterwards the technological, ecological and socio-cultural and institutional dimensions of ANR. These refreshed the participants about ecology, silvics and plant succession which are basic in silviculture and ANR and also allowed them to reminisce their experiences in upland community development from social preparation, organizing and empowerment.

Subsequently, Forester **Nico Almarines** lectured the theories and practices of VA including data analysis. Actual establishment of plots in the ANR site was shown and how VA was initially conducted at the ANR site in Tapuso, Candelaria, Zambales. He included the use of

PAST, the software that is very useful in analyzing the various ecological parameters like plant diversity.

In the afternoon of 2nd day, **Forester Emma Castillo** presented status and experiences on the implementation of ANR in the country. This topic provided the eye opener on the intricacies of applying ANR as an approach to rehabilitation of degraded forest lands and grasslands and how such approach can be successful though the active participation of the community. She also conducted a workshop on the content of the Department Memorandum Circular that is being formulated specifically for the revival of implementation of ANR in the country. This will be a revised/improved version of DMC No. 89-17 issued by former Secretary Factoran in 1989. Once signed, this will again make ANR as one of the major approaches in restoration and rehabilitation of degraded forest lands and grasslands.

After the lecture/discussion, Q and A on the various topics presented, the participants were briefed on the field work/hands-on that will be conducted the following day. Physical features of the site, existing vegetation (regeneration) and the species that can be expected were shown to the participants using actual pictures. Experiences of Malatapi on VA and ANR and other projects with DENR were shared by the President of MALATAPI, Ms. Evelyn Grace.

Prior to this training, a visit to the site by the AFoCo-BIPS team composed of Ms. Dolly Santos of DENR Region 3, Foresters Jea Bago and Bert Lansigan and CENRO staff: **Foresters Quinee Vallejos, Eden Joy Nacana and Mark Anthony Santos** and **Messrs. Rexson Victor** and **Anthony Dominico** together with the consultant, **Forester Armando M. Palijon**. Lay out of the VA plots for both with and without ANR was fixed during this said visit. Thus, it was emphasized that they, the participants, will not anymore do the plot establishment rather they will proceed with the locating, identifying and tagging of regeneration. The participants were then grouped according to the DENR Region they represent. Participants from FMB, Region 3, CENRO Masinloc and PO (Malatapi) were distributed to each each of the five groups.

Forester Marlon Atienza, Regional Coordinator of the AFoCo BIPS project was able to join the participants in the evening of this 2nd day. He was introduced to the participants and was asked to provide more insights about the project.

Third day, as early as 6:00 a.m., the participants and trainors together with the Regional Coordinator of the BIPS Project, Forester Atienza, started the journey to the VA/ANR site. They were brought to a drop off point where vehicle cannot anymore pass through. Before the walk, each group was issued with tally sheet, clip board and meter stick/tape. After more than an hour walk to Lalol ANR site, the participants joyfully reached the site. Prior to the VA, actual specimens and the identification of the species were shown to the participants in order to make the identification and tagging easier.

Each of the groups proceeded with VA: locating, tagging, identification and measurement of height and diameter. Clumps and number and species of regenerants in a clump were noted. Everybody enjoyed the VA work especially the identification of plants whose species are new to them. Amazingly, local people represented by Malatapi members identified the names of most plants as .... Mala such as Malakardis, Malahabi and other mala. Thus, participants were

curious enough to ask why mala. The Malatapi people responded that this is because their PO is named Mala-tapi.

VA was not completed by some groups due to lack of tags. However, Malatapi and CENRO Masinloc promised that they will finish the VA work.

In the afternoon of this 3rd day training, the participants encoded the data listed on their tally sheet using available laptop computers. Afterward, simple computation of the population/density of the regenerants were shown to determine if the area needs pure ANR or ANR with enrichment planting.

As a summary of the training, **Forester Armando M. Palijon** continued the ANR lecture by encouraging the participants to react and/or comment on the various principles, concepts and practices of ANR as an approach to forest restoration and rehabilitation. He also challenged the participants to come up with re-entry plan complete with budget and schedule of implementation that they can submit to their respective offices. With the information that FASPS—FMB, represented by Forester Rolando Carbon, will be willing to infuse P2 million for ANR implementation for each region, the ANR project can have bright future. This amount may not be enough to plan and implement VA and ANR in each region, but with the well-funded expanded National Greening program, additional fund can be shared for this ANR project.

Closing program was held in the evening of the third day again with CENRO Ariel Mendoza of Masinloc and PENRO Audie Salac of Zambales gracing the occasion. This was done to provide the participants some extra time to enjoy the beauty of Candelaria and Masinloc. Thus, in the morning of the 4th day, the training was highlighted with a trip to nearby islands: Potipot and Hermana Minor using the DENR-PAMB motor boats. The participants were so thankful of the opportunity to attend the 4 day training.

II. Venue

The training activities were conducted at Dawal Beach Resort and Restaurant in Candelaria, Zambales. It was a nice venue for the training on VA and ANR specifically for lecture-discussion part. It is situated strategically being very accessible and near to the drop off point of the ANR site (only about 30 minutes) and to CENRO and participating PO, the Malatapi Livelihood Center, Inc. Moreover, the place has facilities for participants to unwind since it has beach, swimming pool and recreational facilities.

III. Participants

The Training was attended by participants summarized as follows

Name	Region	Male	Female
1. Felix Sigue	1	1	
2. Virginia Ago-an	1		1

3. Diosdado Callueng	2	1	
4. Severino Antonio	2	1	
5. Rizza V. Villar	3		1
6. Emmanuel B. Penson	3	1	
7. Cerila C. Manzano	3		1
8. Dolores C. Santos	3		1
9. Rosalina Quilalang	3		1
10. Erik Manlogon	3	1	
11. Quinnee S. Vallejos	3		1
12. Mark Anthony Santos	3	1	
13. Gladys Baliwag	4A		1
14. Roy Alvin Escultor	4A	1	
15. Jaime M. Ancheta Jr.	4B	1	
16. Malco P. Lamigo	4B	1	
17. Jackson Guevarra	CAR	1	
18. Julia Tabaan	CAR		1
19. Eileen Grace Quizon	AFoCo FMB		1
20. Emma Castillo	AFoCo FMB		1
21. Nestor Antolin	FRCD FMB	1	
22. Rolando Carbon	FASPS	1	
23.	Malatapi		
24.	Malatapi		
25	Malatapi		
LUZON CLUSTER		**12**	**10**

IV. Training Staff Involved:

Coordinators:

Dolores C. Santos, DENR R-3
Jea Bago- AFoCo-FMB
Eileen Grace Quizon- AFoCo-FMB

Assistant Coordinator:

Quinee S. Vallejos- CENRO Masinloc

Resource Persons

Dr. Armando M. Palijon- AFoCo BIPS consultant
Retired Professor, UPLB
Forester Nico Almarines- Teaching Associate

Institute of Renewable Natural Resources
2F Forest Science Building, College of Forestry
and Natural Resources

Forester Eileen Quizon- AFoCo, FMB-DENR,
Visayas Avenue, Diliman, Quezon City

Forester Emma Castillo- AFoCo- FMB-DENR,
Visayas Avenue, Diliman, Quezon City

Evaluator

Managed and reported by: Dolores C. Santos **and Cerila Manzano**
DENR-R3, Sn Fernando Pampanga

Support Staff

CENRO Masinloc; Forester Mark Anthony
Mr. Rexson C. Victor
Mr. Anthony Dominico

DENR-FMB, R-3 and CENRO Masinloc Drivers

V. Evaluation

Attached is the result of the participant's evaluation of the training (Appendix I1.). This evaluation speaks of the success of the VA/ANR training.

VI. Training Materials

Compiled E-copy of PowerPoint Presentation (Appendix 11.)

VII. Re-entry plan

Some of the DENR Regions that participated in the training submitted re-entry plan (Appendix 111) that accordingly will be submitted for consideration of their respective Regional Directors for implementation. Hopefully with the upcoming DMC on VA/ANR, the re-entry plan will not just be consigned in a dusty shelf rather it will be implemented for the sake of restoring and/or rehabilitating the degraded forest lands and grasslands.

VII. Other attachments

Appendix 1v. Snapshots of the training

Figure 1. Training participants (not complete during the picture taking) at AFoCo Multi-purpose hall, Government Center, Masinloc, Zambales

Figure 2. Masinloc CENRO Forester Ariel Mendoza delivering a welcome address

Figure 4. Zambales PENRO Forester Laudemir Salac inspiring the participants

Trek to Lalol AFoCo VA/ANR site

Signage to VA/ANR site

Participants at the drop off point

Quick rest after about 2 hour trek to the site

Locating, mapping, identification, tagging, measuring attributes of regenerants and improvising tags

Trek back after Vegetation Assessment

The Lalol AFoCo VA/ANR site

Diversity of plants that can be observed on the way to the site

Diversity of plants that can be observed on the way to the VA/ANR site

Submitted by:

ARMANDO M. PALIJON –
Lead Trainor and AFoCo BIPS consultant

DENR-FMB AFoCo Regional Project-
BIPS:

Capacity Building on the Application of Landscape Approach to Support the Sustainable Natural Resources Management
in Brunei Darussalam, Indonesia, Philippines and Singapore
(BIPS)

Specific Project

Restoration of degraded forest ecosystems through Assisted Natural Regeneration

Picture of the participants-Mindanao Cluster

TRAINING COMPLETION REPORT

Vegetation Assessment (VA) and Assisted Natural Regeneration for Mindanao Cluster

Dawal Beach Resort and Restaurant
May 27 to 30, 2018

I. Content and Methodology

The training covered the theory and practice of Vegetation Assessment (VA) and Assisted Natural Regeneration (ANR). The training methods employed were 60% lecture discussion and 40% practicum or field work. This training was aimed at capacitating the participants on the methodology on how to conduct vegetation assessment specifically dealing with establishment of sampling plots, tagging and labeling of regeneration, chart mapping, collation of data and analysis. Moreover, it was aimed at providing the knowledge and skills in the application of ANR based on the results of VA.

First day was the arrival of the participants. Since the participants were so tired travelling from Mindanao, the opening program was instead moved to the 2nd day of the training.

Morning of 2nd day, the opening was held at the training venue which is Dawal Hotel and Resort. As usual, **Forester Quinee Vallejos,** served as emcee of the program. PENRO Zambales well prepared video of nvocation and rendition of the National Anthem with environmental activities as background provided a very atmosphere for the training participants.

For the program to proceed, CENRO of Masinloc, Zambales, **Forester Ariel Mendoza,** warmly welcomed the participants. He gave an inspiring and challenging messages. **Forester Vallejos was able to set the tone by asking each participants to b**riefly, introduced himself/herself including the position in his/her office. This was followed by leveling off with the participants to know their concerns and what they want to learn from the 4-day training. Similar with the previous batch of trainees, these expectations (see Appendix I) became their basis on whether such were achieved during the 4-day training.

Forester Jeanna Lane Bago of AfoCo FMB did the orientation of the participants on the Afoco-BIPS project in lieu of **Forester Marlon Atienza**, Regional Coordinator of this project. Forester Bago discussed the background of the project, how it came about, its rationale, coverage, specific project and components for each participating country. She likewise emphasized the growth of AFoCo to AFoCO that is from cooperation to **O**rganization. This means that the Philippines will be one among the members of Organization after President DU30 has signed the document this coming June, 2018.

Forester Armando M. Palijon, the lead trainor and consultant, presented the overview of the VA and ANR and afterwards the technological, ecological and socio-cultural and institutional dimensions of ANR. These refreshed the participants about ecology, silvics and plant succession which are basic in silviculture and ANR and also allowed them to reminisce their experiences in upland community development from social preparation, organizing and empowerment.

Subsequently, **Forester Vincent Palomo**, also a new Faculty member of the Institute of Renewable Natural Resources substituted for **Forester Nico Almarines** who was on vacation with his family in UAE. He discusssed the theories and practices of VA including data analysis.

Actual establishment of plots in the ANR site was shown and how VA was initially conducted at the ANR site in Tapuso, Candelaria, Zambales. He included the use of PAST, the software that is very useful in analyzing the various ecological parameters like plant diversity.

In the afternoon of this 2nd day, **Forester Armando M. Palijon,** discussed lengthily the theories and practices of ANR as an approach to forest restoration and rehabilitation. For the participants to have a good idea about the VA/ANR sites in Candelaria, Zambales, power point presentation of the visits and activities of the previous batches of trainees and the progress of the VA/ANR being done by the PO with the assistance of the staff of CENRO Masinloc was done. Physical features of the site, existing vegetation (regeneration) and the species that can be expected were shown to the participants using actual pictures.

The participants, afterward, were briefed on the field work specifically with regard to VA that will be done the following day. Field work attire was emphasized. The participants were grouped into 5 based on the Regions that they were representing. the PO (MALATAPI) participants including the other members of this PO, CENRO staff, and FMB, DENR R-3 participants were distributed to each group. After the lecture/discussion, Q and A on the various topics presented, the participants were briefed on the field work/hands-on that will be conducted the following day.

On the third day of training, as early as 6:00 a.m., the participants and trainors started the journey to the VA/ANR site. They were brought to a drop off point where vehicle cannot anymore pass through. Before the walk, each group was issued with tally sheet, clip board and meter stick/tape. After more than an hour walk to Lalol ANR site, the participants safely reached the site. Prior to the VA, actual specimens and the identification of the species were shown to the participants in order to make the identification and tagging easier.

Each of the groups proceeded with VA: locating, tagging, identification and measurement of height and diameter. Clumps and number and species of regenerants in a clump were noted. Everybody enjoyed the VA work especially the identification of plants whose species are new to them. Again, VA was not completed by some groups due to lack of tags. However, Malatapi and CENRO Masinloc also promised that they will complete the work on VA.

In the afternoon of this 3rd day training, the participants also encoded the data listed on their tally sheet using available laptop computers. Afterward, simple computation of the population/density of the regenerants were shown to determine if the area needs pure ANR or ANR with enrichment planting.

As a summary of the training, **Forester Armando M. Palijon** presented the lecture of Forester **Emma Castillo** on the status and experiences on the implementation of ANR in the country . This topic provided information that ANR VA was not new in the Philippines. That the country was first in conceptualizing and developing the methodologies of VA and ANR. Further, the presentation provided the participants the information on the intricacies of applying ANR as an approach to rehabilitation of degraded forest lands and grasslands and how such approach can be successful though the active participation of the community. It was emphasized in the lecture that

Department Memorandum Circular similar to the one issued by former Secretary Factoran, the DMC No. 89-17 n 1989 is being formulated specifically for the revival of implementation of ANR in the country. a revised/improved version of. Once signed, this will again make ANR as one of the major approaches in restoration and rehabilitation of degraded forest lands and grasslands.

Forester Palijon challenged the participants to come up with re-entry plan complete with budget and schedule of implementation that they can submit to their respective offices. As per information from Forester Roalndo Carbon, who represented FASPS—FMB during the training for the Luzon Cluster las May 8-11, 2018, the said office will be willing to infuse P2 million for ANR implementation for each region particularly if the proposal is good and acceptable for implementation. This can provide ANR project can have bright future. This amount may not be enough to plan and implement VA and ANR in each region, but with the well-funded expanded National Greening program, additional fund can be shared for this ANR project.

Experiences of Malatapi on VA and ANR and other projects with DENR were shared by the President of MALATAPI, Ms. Evelyn Grace

Closing program was held in the evening of the third day again with **CENRO Ariel Mendoza of Masinloc and PENRO Audie Salac of Zambales** gracing the occasion. The program was highlighted with the distribution of certificate of participation and party time afterward.

As a bonus, the participants was given the time to enjoy the beauty of Candelaria and Masinloc. Thus, in the morning of the 4th day, a trip to Kids Pool inside one of the mining areas in Masinloc which is no longer operating. It was a 2 hour travel from the training venue. Majority of the participants were so thankful of the opportunity to attend the 4 day training.

II. Venue

The training activities were conducted at Dawal Beach Resort and Restaurant in Candelaria, Zambales. It was a nice venue for the training on VA and ANR specifically for lecture-discussion part. It is situated strategically being very accessible and near to the drop off point of the ANR site (only about 30 minutes) and to CENRO and participating PO, the Malatapi Livelihood Center, Inc. Moreover, the place has facilities for participants to unwind since it has beach, swimming pool and recreational facilities.

III. Participants

The Training was attended by participants from Mindanao Cluster and joined by the representatives from FMB: AFoCo, FASPS, FMP and INREMP, CENRO Masinloc and DENR R-3. The lis is shown in the Table below:

Name	Region	Male	Female
Edgardo Pancilla, Jr.	9	1	
Josephine Tangalin	9		1
Analie Uayan	10		1

Mercy Pitogo	10		1
Niche Cruz	11		1
Ma. Fe Samonte	11		1
Leonida Liza Curias	12		1
Wilma Saladero	12		1
Jennifer Abucejo	13		1
Genalyn Arbolonio	13		1
Jeanna Lane Bago	FMB		1
Angelica Panuela	FMB-FMP		1
Johanna San Pedro	FMB-INREMP		1
Raymart Salazar	FMB	1	
Elaine Anne Parlade	DENR-FASPS		1
Berny Nopia	FMB	1	
Eugina Peralta	3		1
Rosalinda Mamaoag	3		1
Jestoni Gonzales	3	1	
Louvely Anne Alcanse	3		1
Augusto Colcol	PO	1	
Patrick Edades	PO	1	
Ryan			
MINDANAO CLUSTER		**6**	**16**

IV. Training Staff Involved:

Coordinators:

Ms. Dolores C. Santos, DENR R-3
Ms Cerila Manzano- DENR R-3
Forester Jeanna Lane Bago- AFoCo-FMB

Assistant Coordinator

Foresrer Quinee Vallejos

Resource Persons

Forester. Armando M. Palijon- AFoCo BIPS consultant
Retired Professor, UPLB
Forester Vincent Palomo- Assistant Professor
Institute of Renewable Natural Resources
2F Forest Science Building, College of Forestry and Natural Resources
Forester Jeanna Lane Bago- AFoCo, FMB-DENR,
Visayas Avenue, Diliman, Quezon City
- AFoCo- FMB-DENR,
Visayas Avenue, Diliman, Quezon City

Evaluator

Evaluation managed and reported by:

Dolores C. Santos **and Cerila Manzano**
DENR-R3, Sn Fernando Pampanga

Support Staff

CENRO Masinloc; Forester Mark Anthony
Mr. Rexson C. Victor
Mr. Anthony Dominico

DENR-FMB, R-3 and CENRO Masinloc Drivers

V. Evaluation

Attached is the result of the participant's evaluation of the training (Appendix 1I.). This evaluation speaks of the success of the VA/ANR training.

VI. Training Materials

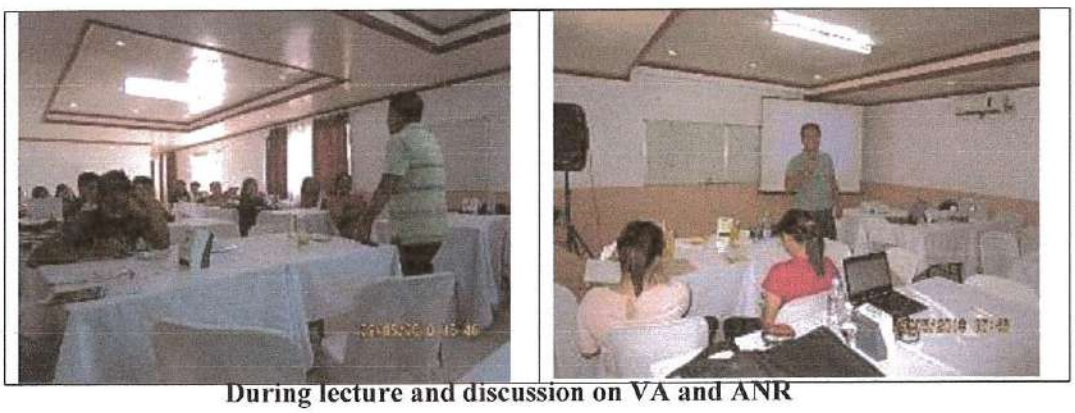
Compiled E-copy of PowerPoint Presentation (Appendix 1I1.)

VII. Re-entry plan

Some of the DENR Regions that participated in the training submitted re-entry plan (Appendix 111). Accordingly, this will be submitted for consideration of their respective Regional Directors for implementation. Hopefully, with the upcoming DMC on VA/ANR which will be the legal and official basis of ANR application in restoring and/or rehabilitating the degraded forest lands and grasslands, the re-entry plan will not just be consigned in a dusty shelf..

VIII. Other attachments

Appendix 1V. Snapshots of the training



During lecture and discussion on VA and ANR

Participants while having snacks and at the same time listening to the lecture

Figure 1. Training participants at the drop off point for the trek to VA/ANR

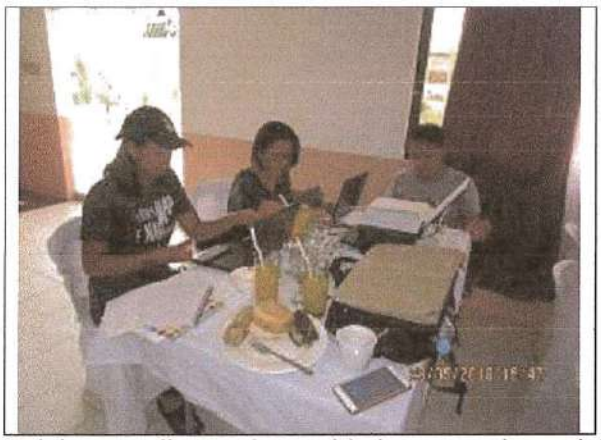
Directional signage to the VA/ANR site

Quick rest on the way to the VA/ANR site

Locating, mapping, identifying and tagging the regenerants

Participants on the way back from tha VA/ANR site

Participants encoding the VA information



Training coordinators busy with documentation activity

Submitted by:

ARMANDO M. PALIJON –
Lead Trainor and AFoCo BIPS consultant

DENR-FMB AFoCo Regional Project-BIPS:

Capacity Building on the Application of Landscape Approach
to Support the Sustainable Natural Resources Management
in Brunei Darussalam, Indonesia, Philippines and Singapore (BIPS)

Specific Project

Restoration of degraded forest ecosystems through Assisted Natural Regeneration

Component

Training on Vegetation Assessment (VA) and Assisted Natural Regeneration
Visayas Cluster including R-5 Bicol

Picture of the participants at the drop off point where transport by vehicle is not anymore feasible

TRAINING COMPLETION REPORT

Vegetation Assessment (VA) and Assisted Natural Regeneration for Visayas Cluster including R-5

Dawal Beach Resort and Restaurant
June 5-8 2018

I. Content and Methodology

The training covered the theory and practice of Vegetation Assessment (VA) and Assisted Natural Regeneration (ANR). The training methods employed were 60% lecture discussion and 40% practicum or field work. This training was aimed at capacitating the participants on the methodology on how to conduct vegetation assessment specifically dealing with establishment of sampling plots, tagging and labeling of regeneration, chart mapping, collation of data and analysis. Moreover, it was aimed at providing the knowledge and skills in the application of ANR based on the results of VA.

First day was the arrival of the participants. Since the participants were so tired travelling from the
Visayas including Bicol, the opening program was instead moved to the 2nd day of the training.

Morning of 2nd day, the opening was held at the training venue which is Dawal Hotel and Resort. As usual, **Forester Quinee Vallejos,** served as emcee of the program. PENRO Zambales well prepared video of invocation and rendition of the National Anthem with environmental activities as background provided very good atmosphere for the training participants.

In this training, CENRO of Masinloc, Zambales, **Forester Ariel Mendoza,** again warmly welcomed the participants. Similarly, he gave an inspiring and challenging messages.

For the training to proceed, **Forester Vallejos,** set the tone by asking each participants to briefly, introduced himself/herself including the position in his/her office. This was followed by leveling off with the participants to know their concerns and what they want to learn from the 4-day training. Similar with the previous batch of trainees, these expectations (see attached **Appendix 1**) became their basis on whether such were achieved during the 4-day training.

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Experiences of Malatapi on VA and ANR and other projects with DENR were shared by the President of MALATAPI, Ms. Evelyn Grace

Closing program was held in the evening of the third day again with **CENRO Ariel Mendoza of Masinloc and this time with newly appointed PENRO, Forester Raymond Rivera of Zambales** gracing the occasion. PENRO Rivera provided the atmosphere for the participants to be serious and dedicated in their respective work. He emphasized that this kind of learning event is being provided to the participants not only for them to have something to add in the curriculum vitae but should be applied in their respective work. Furthermore, he enjoined the participants to work harder for the achievements of the DENR goals and objectives.

Early morning of the 4th day of the training, the participants were brought to two islands in e time Masinloc to enjoy the beaches and have a swim to the clear blue water of the sea. Majority of the participants were so thankful of the opportunity to attend the 4 day training.

II. Venue

The training activities were conducted at Dawal Beach Resort and Restaurant in Candelaria, Zambales. It was a nice venue for the training on VA and ANR specifically for lecture-discussion part. It is situated strategically being very accessible and near to the drop off point of the ANR site (only about 30 minutes) and to CENRO and participating PO, the Malatapi Livelihood Center, Inc. Moreover, the place has facilities for participants to unwind since it has beach, swimming pool and recreational facilities.

III. Participants

The Training was attended by participants from Mindanao Cluster and joined by the representatives from FMB: AFoCo, FASPS, FMP and INREMP, CENRO Masinloc and DENR R-3. The list is shown in the Table below:

Name	Region	Male	Female
Ma. Theresa Inong	3		1
Julie Ann Maniago	3		1
Orlando Tomas	3	1	
Ronnel Astor	5	1	
Mikee Angela Balmedina	5		1
Mary Ann Baldove, PPM	6		1
Caludette Brender	6		1
Junar Lendio	7	1	
Federick Tuga	7	1	
Nelia Casas	8		1
Dailinda Villamor	8		1
Leyminda Maranon	FMB		1
Janeth Borbon	FMB		1
Paula Camille La Rosa	FMB		1
Fernando Edualino	PO	1	
Joey Muyano	PO	1	
Joven Foranda	PO	1	
Total		7	10

IV. Training Staff Involved:

Coordinators:

Ms. Dolores C. Santos, DENR R-3
Ms Cerila Manzano- DENR R-3

Forester Jeanna Lane Bago- AFoCo-FMB

Assistant Coordinator
Foresrer Quinee Vallejos-CENRO Masinloc

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Retired Professor, UPLB
Forester Vincent Palomo- Assistant Professor
Institute of Renewable Natural Resources
2F Forest Science Building, College of Forestry
and Natural Resources
Forester Jeanna Lane Bago- AFoCo, FMB-DENR,
Visayas Avenue, Diliman, Quezon City
- AFoCo- FMB-DENR,
Visayas Avenue, Diliman, Quezon City

Evaluator
Managed and reported by: Dolores C. Santos and Cerila Manzano
DENR-R3, Sn Fernando Pampanga

Support Staff

CENRO Masinloc; Forester Mark Anthony
Mr. Rexson C. Victor
Mr. Anthony Dominico

DENR-FMB, R-3 and CENRO Masinloc Drivers

V. Evaluation

Attached is the result of the participant's evaluation of the training (**Appendix II).** This evaluation speaks of the success of the VA/ANR training.

VI. Training Materials

Compiled E-copy of PowerPoint Presentation (**Appendix 1I1**.)

VII. Re-entry plan

Some of the DENR Regions that participated in the training submitted re-entry plan (**Appendix 1V**). Accordingly, this will be submitted for consideration of their respective Regional Directors for implementation. Hopefully, with the upcoming DMC on VA/ANR which will be the legal and official basis of ANR application in restoring and/or rehabilitating the degraded forest lands and grasslands, the re-entry plan will not just be consigned in a dusty shelf..

VIII. Other attachments

Appendix V. Snapshots of the training

Lecture of Forester Armando Palijon with the participants attentively listening

Lecture of Forester Vincent Palomo with the participating actively participating

ANR video presentation

Participants ready for a trek to the Lalol AFoCo VA/ANR site

Trek to the VA/ANR site

Locating and mapping the regenerants

Identification, Tagging, Mapping and Measuring of regenerants

ANR: uprooting, spreading and tamping of grass

Selfie after VA and before trek back to Venue

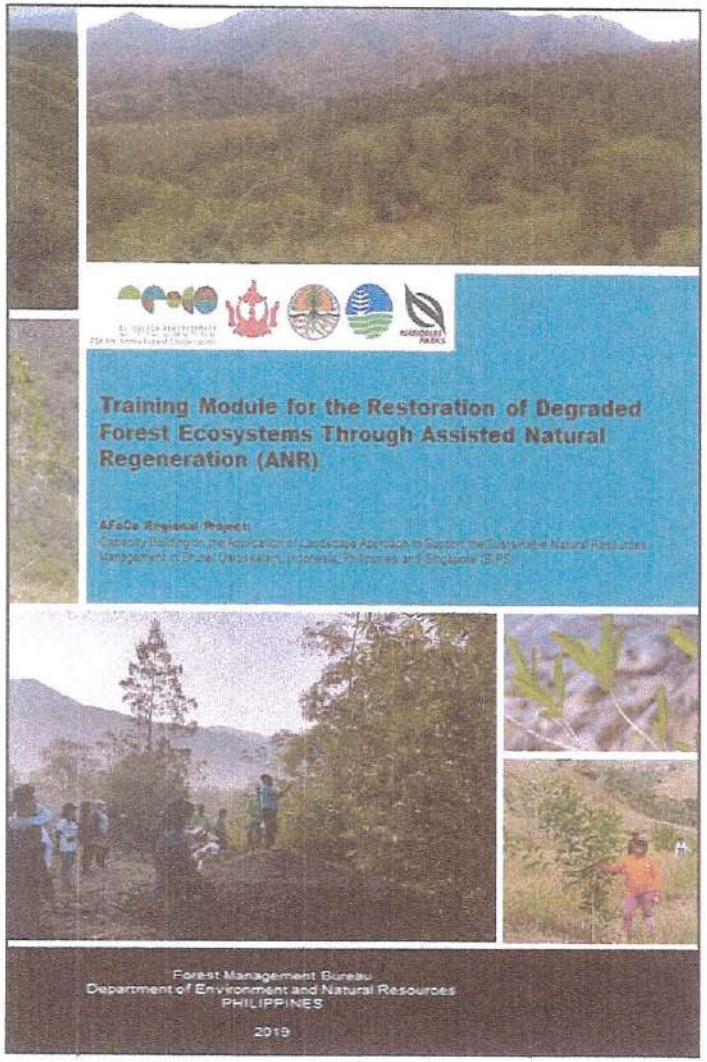
Encoding of VA data and analysis

Closing program and distribution of certificates

Enjoying the islands in Masinloc

Submitted by: Armando M. Palijon- Lead Trainor and Consultant

ANNEX 6



FOREST MANAGEMENT BUREAU

FOREWORD

With a mission to rehabilitate degraded forestland and to prevent deforestation and forest degradation in the context of sustainable forest management, AFoCO projects are focused on capacity building training programs, biodiversity conservation, community forestry, climate change mitigation, and forest restoration.

In the Philippines, these areas of concerns are likewise considered as the entry points of any development initiatives towards sustainable forest management, especially so in support of the priority programs of the DENR for the forestry sector, the National Greening Program and the National Forest Protection Program.

The AFoCO Project entitled "Capacity Building on the Application of Landscape Approach to Support the Sustainable Natural Resources Management in Brunei Darussalam, Indonesia, Philippines and Singapore" or simply the AFoCO-BIPS Project was launched in CY 2016 in line with our efforts to strengthen trans-boundary cooperation of forestry sectors within ASEAN countries.

Under said project, the Philippines implemented an In-country project perspective entitled "Restoration of Degraded Forest Ecosystem through Assisted Natural Regeneration" which aimed to capacitate DENR technicians/practitioners and concerned stakeholders within the identified project area in implementing ANR technologies as an approach/strategy to the restoration of degraded forestlands.

This training module published by the Forest Management Bureau provides relevant discussion on ANR principles, techniques and practices, including guidelines on the step by step procedure of ANR implementation. Moreover, it highlights the processes on the conduct of Vegetation Assessment (VA) which aims to determine the effects of ANR on the restoration/rehabilitation of degraded forestland area, as manifested by the changes in vegetation.

We acknowledge the contribution of the members of the project Technical Working Group (TWG) from the FMB & DENR Region 3, and Mr. Arman Palijon, project consultant, for the completion of information included in this publication.

FOR. NONITO M. TAMAYO, *CESO IV*
Director

The AFoCo - BIPS Project

The ASEAN-Republic of Korea Forest Cooperation (AFoCo) is a regional, inter-governmental cooperation mechanism in the forest sector which was formalized in August 2012. It is an agreement between the Republic of Korea and 10 ASEAN Member States (AMS) which aims to: 1) facilitate forest cooperation, undertake projects and translate sound forest policies into action with a mission to rehabilitate degraded forestland and to prevent deforestation and forest degradation in the context of sustainable forest management as well as under the broader scope of addressing the impact of climate change; and 2) to provide a platform for dialogue between the AMS and the ROK towards the establishment of the Asian Forest Cooperation Organization (AFoCO). The AFoCo Agreement has three categories of cooperation projects namely: Individual, Regional and Landmark Projects.

Under the said Agreement and by virtue of the Memorandum of Understanding (MOU) between the Korea Forest Service (KFS) of the ROK and the Department of Environment and Natural Resources (DENR) of the Philippines, a Regional Project entitled **"Capacity Building on the Application of Landscape Approach to Support the Sustainable Natural Resources Management in Brunei Darussalam, Indonesia, Philippines and Singapore (BIPS Project)"** is being implemented, with the Philippines as the lead implementing country. Said Project primarily aims to strengthen trans-boundary cooperation of respective forestry sector within ASEAN countries through the application of landscape approach in natural resources management.

Specific to each BIPS country, said Project is being implemented within the context of differentiated environmental and developmental concerns which cut across the different ecosystems. In the instant case, the Philippines is implementing its In-Country Project Perspective on the **"Restoration of Degraded Forest Ecosystem through Assisted Natural Regeneration (ANR)"**.

The Philippines' Project aims to facilitate the restoration of degraded forestland thru Assisted Natural Regeneration (ANR) by capacitating the concerned stakeholders within the identified Project Area. Specifically, the Project intends to achieve the following objectives, to wit;

1. Contribute to the restoration of degraded forestlands inside and adjacent to identified Project area;
2. Establishment of thirty (30) hectares of demonstration plots for Assisted Natural Regeneration inside the identified Project area;
3. Capacity building of stakeholders to enhance technical capability on Assisted Natural Regeneration; and
4. Document the initial findings and lessons learned from the activities using Assisted Natural Regeneration as approach to forest restoration.

Rationale

In pursuit of achieving the Project objectives particularly on capacity building, the four (4) batches of training on ANR and Vegetation Assessment (VA) shall be facilitated with the concerned stakeholders within the identified Project area, including DENR technical personnel from the Central and Regional/Field Offices.

Learning Objectives

The training aims to capacitate selected staff of DENR Central Office, Forest Management Bureau (FMB) and Field Offices (Regional Office, Provincial Environment and Natural Resources Office (PENRO) & Community Environment and Natural Resources Office (CENRO)) relative to ANR principles, techniques and practices, to include the VA for the characterization of the vegetation changes as influenced by ANR implementation.

Methodology

The training shall include classroom lectures and discussions and actual field work and experiential learnings on ANR technologies and activities, including VA.

Topics

1. The Philippines Forestry Scenario
2. ANR Basic Concepts and Principles and Implementation Status
3. ANR Step by Step Procedures
4. Vegetation Assessment
5. Re-entry Action Planning

Expected Outputs

At the end of the training activity, the following are expected to have been achieved:

1. Pool of experts comprised of at least 60 personnel from the DENR Central Office, Forest Management Bureau and Field Offices capacitated relative to ANR technologies and activities and VA; and

2. Participants re-entry plan on how learnings shall be implemented in their place of assignments.

Topic No. 1:

The Philippines Forestry Scenario

Over the years, the massive change in the Philippine landscape can be gleaned in relation to the changes in forest areas. The country suffers from severe deforestation which resulted to rapid decrease by nearly 50% in forest cover from 1970 to 2000 (Aquino et al, 2014).

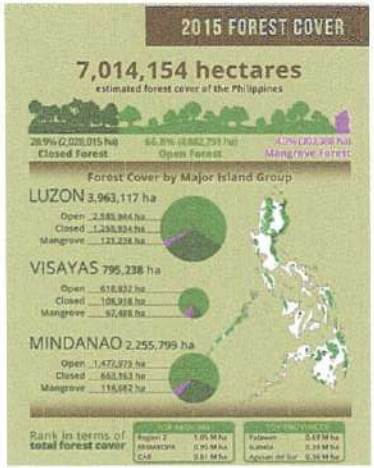
Second growth forests are the largest and most dynamic natural forest ecosystem in the Philippines covering about 83% (5 million hectares) of the total forest area (Lasco et al, 2001). They are the heavily exploited forest in the country since the implementation of logging ban in the primary forests in 1992 (Lasco et al, 2001), but their natural recovery just like other tropical forest areas subjected to intensive anthropogenic activities are usually slow due to soil degradation, recurring disturbances, and isolation from intact forests (Shono et al 2007). Hence, the need to manage them to accelerate their recovery and restore productivity, biodiversity and other values is widely recognized (Parotta et al, 1997).

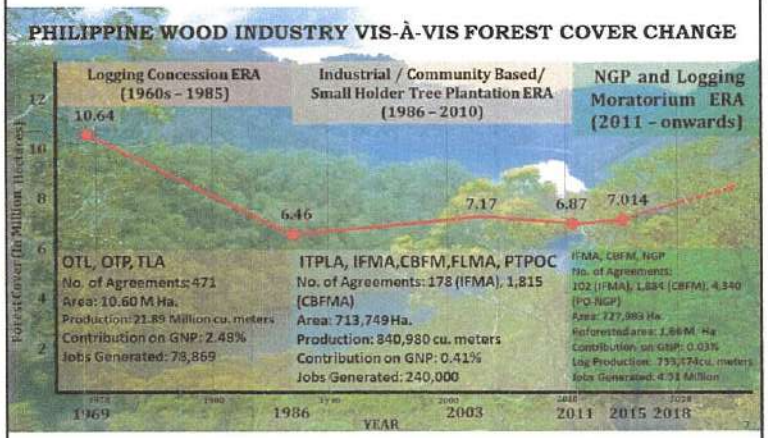
One of the unique features of forest resources is that multiple stakeholders are associated with its multiple uses and represent local to global interests. Efforts towards sustainable forest management need to consider these varying interests, without marginalizing the concerns of the local communities, especially those whose lives depend on these resources for survival. This calls for the development and institutionalization of social processes that will ensure that the local communities and other legitimate stakeholders are able to participate meaningfully in decision making concerning forest management and benefit sharing from forests (Rebugio et. al, 2010).

Moreover, in order to overcome the adverse effects of this situation, application of Assisted Natural Regeneration (ANR) has been a great opportunity to fulfill the country's commitment to sustainable natural resources management.

Assisted Natural Regeneration (ANR) is considered one of the most viable methods to restore degraded tropical forestlands and transform them into more productive forests (Carandang et al, 2007; Shono et al, 2007). The aim of ANR is to accelerate the trajectory of natural successional processes by reducing or removing barriers to natural forest regeneration such as competition to available resources by weed species; recurring disturbances like grazing, fire and wood harvesting; and marginal soil condition (Shono et al, 2007). ANR is most suited for areas where protection functions of forests is critical such as areas which are ecologically vulnerable, areas where conservation of biological diversity and soil and water are highly needed, among others (Sajise, 2003). Unlike to the conventional restoration methods that involve planting of nursery grown seedlings, ANR is said to offer significant cost advantages due to reduced costs associated with seedling propagation and transplanting (Shono et al, 2007) However, despite of its advantages, ANR techniques are still vastly under-appreciated and under-utilized in the Philippines (Ganz & Durst, 2003) perhaps for lack of effective promotion, government support, and/or published quantitative data to support its effectiveness. Although there are policies and guidelines already issued to prioritize application of ANR, published data of ANR effectiveness and extent of its application in the country are still limited (DENR 1989; cited by Carandang et al, 2007). Its continued implementation including documentation of restoration results and ecological requirements of natural regeneration should have provided opportunities to improve the application of ANR technology.

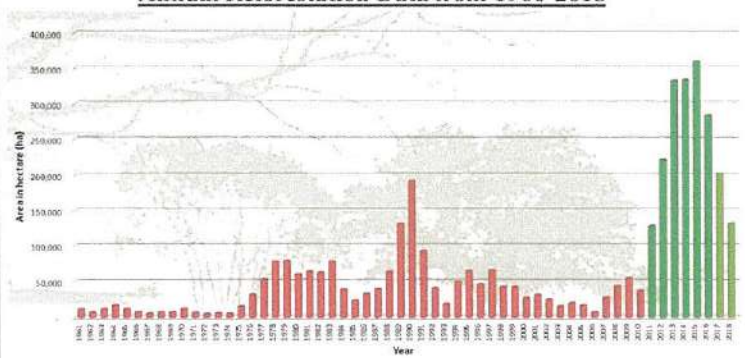
Statistical Information





Statistical Information

Annual Reforestation Data from 1960-2018



Major Policies and Initiatives for Forest Restoration

Revised Forestry Code of the Philippines (Presidential Decree No. 705, May 1975)

- The Law has provided the basis for the rehabilitation of forest lands to ensure their continuity in productive condition

National Integrated Protected Areas Systems Act (Republic Act 7586, 1992)

- The Law provides the legal framework for the establishment and management of protected areas

Community Based Forest Management Program (Executive Order No. 263, 1995)

- The program encourages reforestation and sustainable management of forests. Key to this strategy is the promotion of active and productive partnership between the government and forest communities in developing, rehabilitating and managing forestlands

Promoting Sustainable Forest Management (Executive Order No. 318, 2004)

- This decree provides the guiding principle for sustainable forest management with priority for rehabilitation and protection; it provides incentives for the private sectors' participation in forest development

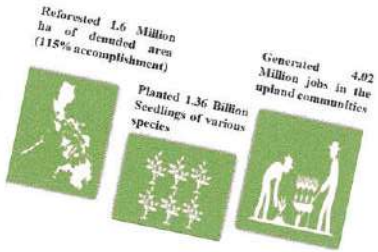
Major Policies and Initiatives for Forest Restoration

The National Greening Program (Executive Order No. 26, 2011)

- The NGP is a massive forest rehabilitation program of the government that seeks to grow 1.5 Billion trees in 1.5 Million hectares nationwide within a period of six years, from 2011-2016

Expanding the Coverage of the National Greening Program (Executive Order No. 193, 2015)

- Covers all the remaining unproductive, denuded and degraded forestlands to be managed for production and protection purposes as well as to achieve carbon neutrality
- It includes the development of new plantations and sustainable management of established plantations as well as protection of existing forests



Philippines Master Plan for Climate Change Resilient Forestry Development (January 2016-2028)

- One strategic policy measure is forest expansion to be achieved through afforestation/restoration in available barren and degraded lands, deforested areas and marginal lands, and to further extend tree planting in farmlands, grazing lands, recreation areas, and to support expansion of community forestry, farm forestry, etc.

Topic No. 2:

ANR Basic Concepts, Principles, and Implementation Status

ANR is a process of rehabilitating denuded forestlands by taking advantage of trees already growing in the area. This usually involves activities such as locating and releasing of indigenous trees, maintenance, augmentation planting and protection (Philippine Official Reference for Forest-Related Terms and Definitions ITTO PD 222/03 Rev. 1 (F). This was introduced for the rehabilitation and development of watersheds, protection and production forests being the most economical and cost-effective method that is feasible in any given situation. It also intends to accelerate the re-establishment of vegetative cover that approximates a natural forest in terms of species diversity and composition. It does not require further research and study about what suitable species should be planted in the area. In general, the objective for ANR is to improve productive capacity, environmental functions, and biodiversity value of a certain degraded area.

However, ANR was properly and effectively carried out in only a handful of cases and thereby, did not have a significant contribution to the over-all rehabilitation efforts of the government. Most were done through short term contracts that did not have any benefit of extended follow up maintenance and protection activities. Further, personnel assigned to monitor or carry-on ANR activities were eventually reassigned/transferred to other units or promoted to higher offices of DENR. After more than two decades since the institutionalization of ANR, many DENR field personnel have a vague understanding of ANR and commonly confuse with other rehabilitation methods.

As a conclusion, awareness regarding the advantages and effectiveness in the application of Assisted Natural Regeneration is very crucial. ANR can be more applicable if learning and experiential motivations can be attained especially on a landscape scale. With this, ANR strategy can balance trade-offs and plays an important role in landscape restoration approach.

Based on the Landscape Approach, ANR strategy is applied to support the sustainable natural resources management with basic principles that maybe related to the existing laws and regulations of the Philippines, to wit:

1. Plant diversity enhancement. Naturally-generated vegetation will almost always comprise a mixture of species. Therefore, ANR produces a more diverse and multi-layered vegetative cover. This diversity helps ensure environmental stability and is very desirable in areas intended for watersheds restoration;

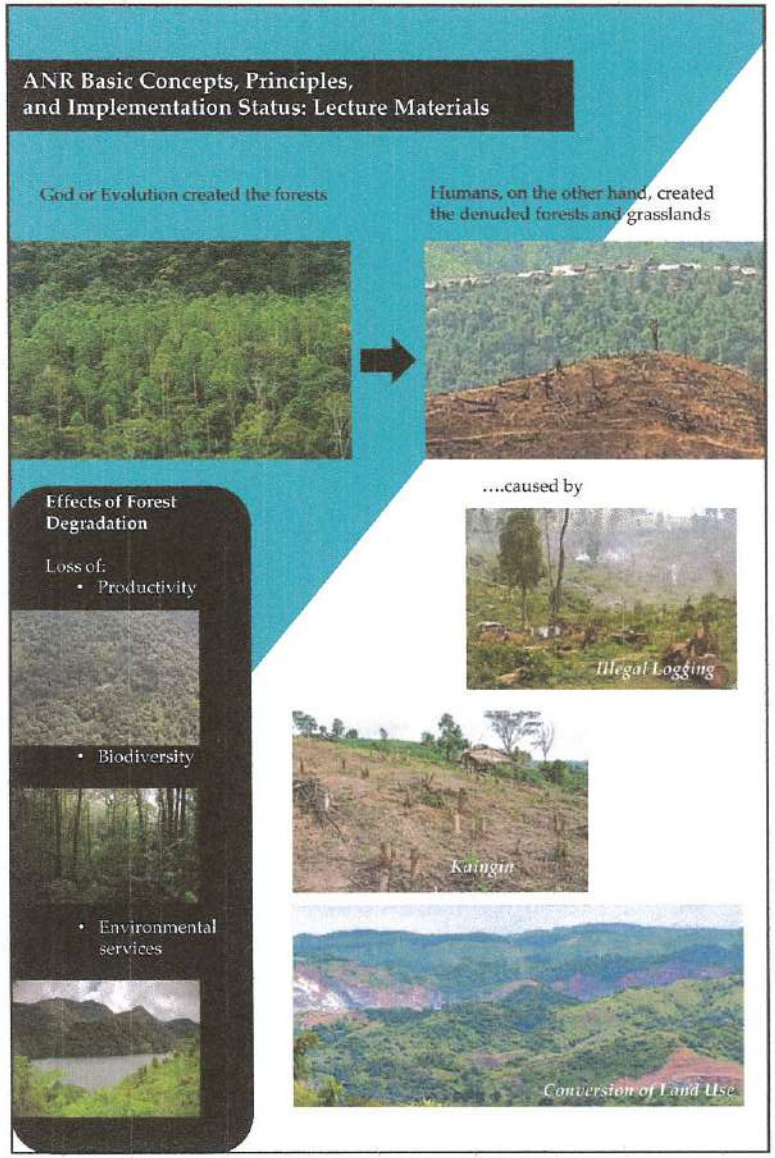
2. Acceleration of Forest Restoration. ANR takes advantage of wild seedlings already growing in an area. Root systems of these seedlings are already in place. Therefore, the seedlings can grow rapidly when competition is reduced or removed;

3. Reduction of Forest Restoration costs. ANR takes full advantage of existing regeneration on site, hence costs incurred in ANR for seedling production including site preparation and planting are eliminated, thereby, costs are lower. However, there may be some instances wherein planting with seedlings can be included in ANR; and

4. Community Participation or community-based participation. It has been proven that active community participation plays a vital role in promoting the sustainability of most development projects. Correspondingly, ANR implementation is likewise believed to be effective if it is widely supported by the communities.

Degraded Forest – a forest with decline productivity or ability to support natural ecosystems or types of agriculture

Grassland – area predominantly vegetated with grasses such as Imperata, Themeda, Saccharum spp. among others



ANR Basic Concepts, Principles, and Implementation Status: Lecture Materials

- ANR is a forest restoration approach popularized as early as the 80's
- Human protection and preservation of natural tree seedlings (wildlings) in forested areas
- Wildings are, in particular, protected from undergrowth & extremely flammable plants such as *Imperata* grass

Approaches to Forest Rehabilitation

PROGRAM

- Program for Forest Ecosystem Management (PROFEM)
- Family Approach
- Social Forestry
- Community Based Forest Management (CBFM)
- National Greening Program (NGP)

METHODS

- Reforestation
- Agroforestry
- Pioneer Climax Regeneration
- Accelerated Plant Succession
- Assisted Natural Regeneration (ANR)

ANR Basic Concepts, Principles, and Implementation Status: Lecture Materials

Related terms used in Forest Restoration Strategies

- ANR in Philippines
- Forest Restoration in Thailand
- Imitating nature in Brazil
- Accelerated Natural Regeneration

Sajise (2003)

Sajise 2003) simply describes it as

"Working with Nature"

ANR

- Described as "Simple, inexpensive and effective technique for converting *Imperata* areas to more productive forests

Ganz and Durst (2003-FAO RAPA)

ANR
a flexible approach to reforestation

1. Uses *natural regeneration* (NR) of forest trees .....

.. wildlings or naturally growing seedlings on site

2. Assists NR by preventing fire, pressing cogon (*Imperata*) and helping NR grows faster

3. Plant additional stocks when needed or wanted (augmentation or supplemental *planting*)

Natural Regeneration (NR)

- *"Pioneer"* tree species already growing in grasslands.

.... well established & adapted in the site

-ANR *stimulates* new NR from seeds coming from nearby forests

- Use of *existing* NR and enhancing *recruitment* of NR
- Avoids the concern of *matching species to the site*
- *Encouragement of NR* can help restore a *diverse natural native forest*

ANR Basic Concepts, Principles,
and Implementation Status: Lecture Materials

Applied in degraded forest & grasslands

- More particularly ....

Cogon
(*Imperata cylindrica*)

- Others grass species:
  -*Miscanthus*
  -*Themeda triandra*
  -*Saccharum spontaneum*
  -*Chrysopogon paniculatum*
  -*Capillipedium parviflorum*

Other Areas for ANR

- Areas where enrichment planting is carried out, favoring natural & local species that are sources of premium wood or non-timber forest products such as rattan, resin, honey and other valuable products

- Areas where Agroforestry Production system is to be established

(Sajise, 2003)

Key elements of ANR in grasslands

- Control fire

- Suppress *Imperata* growth

- Restrict grazing

- Involve local

Why practice ANR?

- ANR promotes development of more diverse forests unlike conventional reforestation
- Have social, environmental and cost advantages

ANR Basic Concepts, Principles,
and Implementation Status: Lecture Materials

What are the potentials of ANR?

1. **Involve local people** in developing a forest to meet their needs which will likewise motivate them to conserve it.
2. **Reduce total reforestation costs** due to less site preparation, nursery establishment and enrichment planting
3. **Fit well with farmer's cropping** schedule since ANR concentrates on maintenance instead of planting
4. **Provide local employment,** if there is outside funding.
5. **Include species chosen by villagers,** thru enrichment planting

What are the potentials of ANR?

6. **Develop a forest with diverse native species** which provides habitat for diverse wildlife and reduces the risk of damage from pest and diseases
7. **Reclaim land for long term timber production** since it assists natural woody species that can be used as nurse trees for enrichment planting of high-value timber tree species
8. **Avoid soil erosion**. ANR include little or no cultivation. Pressed grass (cogon) continues to cover and protect the soil.
9. **Quickly restore forest cover** to watersheds. Forest to be developed is not only diverse but more importantly multistory with shrubs and herbaceous plants as undergrowth

Multistory forests control erosion and increase water infiltration. Restoration may take 2-7 yrs.

Benefits of ANR

- Equal or better than the traditional reforestation
- Cost of is much less than traditional reforestation
- Technologies are simple and easy to implement.
- Resulting forest is, biologically, highly diverse
- Benefits to local people are quite substantial.

Ganz and Durst (2003-FAO RAPA)

Advantages of ANR & other Forest Restoration strategies

- Faster & cheaper (no need for a nursery);
- Promotes and conserves biodiversity;
- Maintains the original vegetation stand and corresponding ecosystem functions;
- Maintains the integrity of the soil and involves minimum soil disturbance;
- Labor intensive and provides employment for the local community & promotes use of indigenous knowledge (IK);
- Can promote people empowerment if IK and traditional institutions are used and valued;
- Promotes hydrologic integrity and biotic functions.

(Sajise, 2003)

ANR Basic Concepts, Principles,
and Implementation Status: Lecture Materials

What are the constraints of ANR and recommended solutions?

1. Reluctance of people to participate ...

Better to plan the project with local people.

2. Conflicting laws and regulations: on land tenure

If communities are not legally allowed to own, enter, or manage their surrounding forests, then they will not cooperate with government on ANR's fire prevention and other maintenance activities

Negotiate land tenure as part of the project to give people long term interest in ANR

What are the constraints of ANR?

3. Poverty-

Local people must provide for their short term needs. Their time and possibly the ANR area is needed for food production.

Consider food and farming needs first. Negotiate pay for local people's labor if the project serves regional goals or subsidize...

4. Labor scarcity-

ANR is labor intensive. Labor often becomes limiting factor since ANR is usually applied in remote grassland areas with low population densities.

Encourage community participation

What are the constraints of ANR?

5. Inadequate extension staff

ANR activities are spread throughout the year, thus the project staff may not be able to supervise all activities and therefore must put more responsibility in the hands of the villagers.

Solution:

Train local people in ANR techniques; plan adequate resources for the training

What are the constraints of ANR?

6. Planning uncertainties

Total nursery costs, maintenance activities & production are difficult to predict due to uncertainties in the number of seedlings needed for enrichment planting, the time period for the natural woody species to close canopy, and the composition and volume of the secondary forest vegetation that will eventually emerge.

Conduct inventories of species present on the site. Acknowledge uncertainties in targets and budgets: plan flexibly. Monitor results and learn from experience

7. Fire, uncontrolled burning and grazing, firewood collection and charcoal making

The community should take the lead in solving such concerns/issues

ANR Basic Concepts, Principles,
and Implementation Status: Lecture Materials

Technological, bio-physical & socio-cultural dimensions of ANR

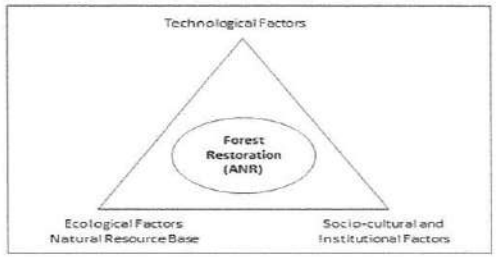


Figure 1: Conceptual Framework of ANR Strategy for forest rehabilitation

The 3-dimensions must work in a complementary manner to ensure success.
(Sajise, 2003)

Ecological principles as basis for ANR

- Basic assumptions inherent to plant community succession...

  1. ***Species replacement*** during succession occurs because ***populations tend to modify the environment***, making conditions ***less favorable for their own existence***, thus leading to ***progressive substitutions***; and

  2. **Climax** is the end point consisting of a plant community that is ***self-perpetuating*** and ***in equilibrium***.

Ecological Succession as basis for ANR

- **Ecological succession**
  -is an apparently orderly process of community changes, which is directional and often predictable.

e.g.
Plant succession or simply changes in plant community

Classification of Succession

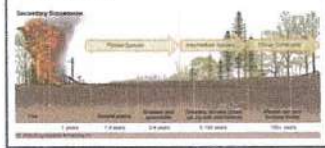
- **Primary succession**

- Begins on bare rock and reaches a climax

- **Secondary succession**

-Occurs after the disruption of a previously well-developed community

- Mostly observed in the Tropics.

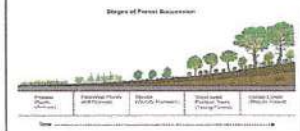


ANR Basic Concepts, Principles,
and Implementation Status: Lecture Materials

Types of succession

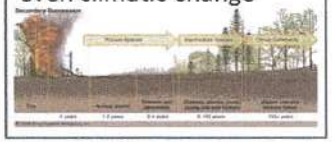
- **Autogenic**

-Changes are internally generated or self-propelled



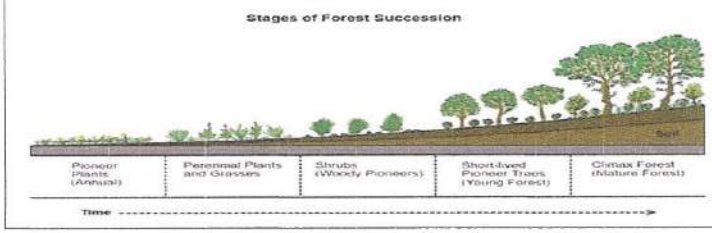
- **Allogenic**

-Changes are brought about by external factors such as fire, volcanic eruption, earthquakes & even climatic change



Stages in Plant Succession(PS)

- Seral Stages -Distinct & recognizable stages of PS
- Climax -Final steady state of PS e.g. TRF
  -The function of the prevailing climate or edaphic conditions.



Plant succession (PS) process

- **Depending on the level of degradation,**

PS will involve the replacement of:

annuals (have a relatively short life cycle)

by **perennials** and **pioneer or gap**

species (have longer life cycle)

then finally by **climax-**

based tree species

Biotic & Abiotic Interaction

- *Ecological succession (ES)* as an ecological process is not only confined to *changes in plant community composition* in an area.
- During such ES, interactions between and among biotic components as well as with their abiotic environment
- Biotic: plants, animals, microbial organisms & other living organisms
- Abiotic: Climatic, edaphic, physiographic conditions

ANR Basic Concepts, Principles,
and Implementation Status: Lecture Materials

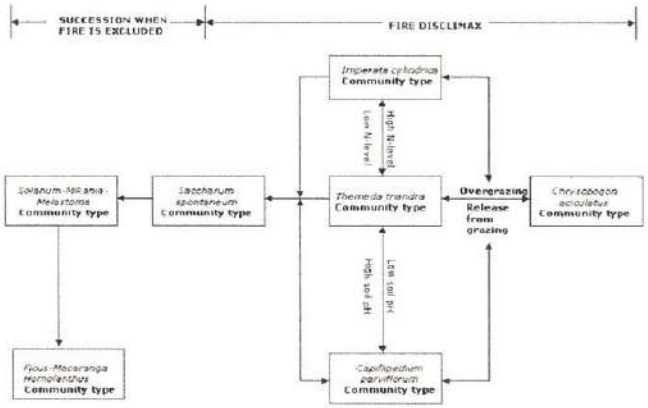
Disruptions in Plant Succession

Climax is not reached due to occurrence of dominant external factors:

- Grazing
- Burning (fire)
- Indiscriminate harvesting (firewood & charcoal)

Resultant plant community will persist i.e. very different from climatic or edaphic climax

Fire Disclimax



Disruptions in Plant Succession

- ***Human induced***.... to enhance plant succession reach climatic or edaphic climax, the *human induced disturbances must be prevented. How?*

-Through ***human interventions***

Human Interventions

- The decision on the kind of human intervention be pursued depends on:
  - ➢ Knowledge (both indigenous & formal)
  - ➢ Technological availability
  - ➢ Cultural beliefs & practices
  - ➢ Economic incentives or disincentives
  - ➢ Prevailing policy including the effectiveness of its implementation

ANR Basic Concepts, Principles,
and Implementation Status: Lecture Materials

CHALLENGES IN THE MAINSTREAMING OF ANR

- ANR method is not well recognized for large-scale restoration due to limited technical personnel with knowledge and skills to demonstrate the actual ANR application *in situ*.
- ANR is commonly confuse with other rehabilitation methods such as enrichment planting, timber stand improvement, etc.
- ANR method is a complex matter that needs a thorough understanding of the biophysical, technological, socio-economic and cultural condition prevailing in the area.

Status of ANR as an approach to rehabilitate grasslands

- Great opportunities to diversify strategies and to expand restoration work.
- Low cost & numerous benefits from ANR, can make ANR acceptable for application
- ANR techniques are still vastly under-appreciated & under-utilized
- Why? Few efforts have been made to promote ANR.

Ganz and Durst (2003-FAO RAPA)

Priority programs related to rehabilitation of degraded forests and grasslands

- Upland watershed development
- Developing biological diversity
- Amelioration of environmental problems: soil erosion, flooding & drought

- Providing forest products: fuelwood & fodder for local communities
- Reducing subsistence pressures on other forests

Source: Chokkalingam, 2001and Sajise (2003)

Efforts to promote ANR in ASIA-Pacific Region

- Regional office for ASIA-Pacific of UN-FAO

-Co-organized with DENR a Regional Workshop & Study Tour for ANR in 2002

With support from: IPGRI, CIFOR & ICRAF

Aim: promote ANR in the region thru:

-Discussion
-Exchange of information re: ANR application and implementation
-Formulating recommendations for broader ANR applications

Topic No. 3:

ANR Step by Step Procedure

Topic No. 3

ANR Step by Step Procedure

Assisted Natural Regeneration (ANR) is based on the principles of ecological succession and is best applied if there are patches of natural forest or trees mixed within the grassland. Its basic concept emphasizes protection and nurturing tree seedlings and saplings already growing on degraded sites, rather than establishment of entire new forest plantations.

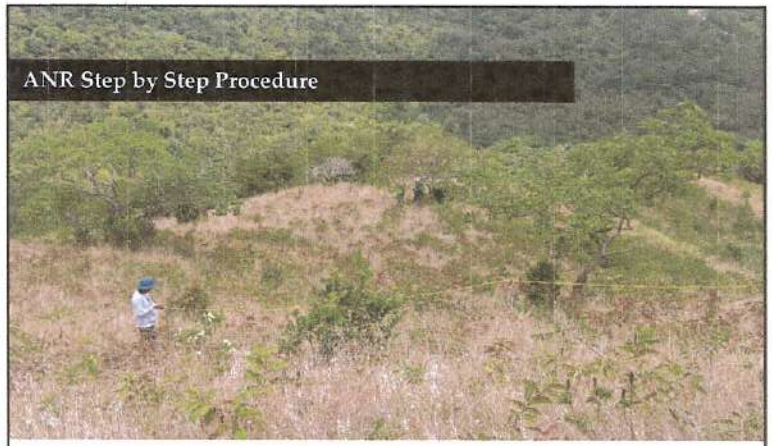
The Major preliminary step to implement ANR is to clarify its goals and objectives.

ANR Goals and Objectives:

- Must be clear
- Can be done by farmers & communities on their own
- Can be promoted and subsidized by a regional or national program re: watershed & timber production goals
- Broad goals need to be negotiated & agreed upon between community and assistance-providing institutions
- Must understand that not all goals are compatible, thus, misunderstanding must be avoided
- Specific objectives must be decided upon ahead of time

Once these goals and objectives have been clarified and agreement between the community and assisting institution have been reached, then application of ANR can proceed.

Goals/ Objectives	Community	Outside Program
Compatible long term goals	Get access to land for non-timber forest products, fuelwood and poles Get legal tenure to nearby or ancestral forest lands Practice shifting cultivation	Produce high-value timber for concessions Improve watershed conditions by reforesting and preventing fires Guide shifting cultivators to use *Imperata* grasslands & secondary forest land instead of primary forest land
Conflicting long term goals	Use the land later for shifting agriculture	Be sure that the area will be managed as forest in the future
Compatible short term goals	Get help while road access and marketing for farm and forest products	Provide roads to facilitate reforestation activities
Conflicting short term goals	Earn cash income for labor on the project	Keep project costs low by expecting villagers to invest labor in ANR in expectation of later products



A. Development of ANR Sites

Step 1: Site Validation, Assessment and Planning

Conduct actual ground survey of the identified area using GPS receiver; Prepare map of the area in a scale of 1:10,000 projected using GIS of ArcGIS, ArcView or Manifold software; and Take geotagged photos of the area (i.e. panoramic view or landscape area).

Criteria for selection must be formulated & followed:

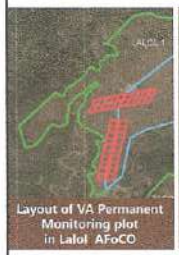
- Interest & acceptance of the community
- Community's goals and objectives can be achieved with ANR
- Community people's willingness to organize and be major actor in preventing fire, minimizing activities detrimental to the success of ANR like grazing, poaching, charcoal making & others
- Lands identified by the villagers
- Sites that match the ANR's goals and objectives or goals and objectives that match the sites
- Site is very accessible to the community

Better to know the site well:

- Understand the local people
- History of the area
- Local plant species
- Environmental conditions
  - ✓ Edaphic
  - ✓ Physiographic
  - ✓ Climatic
  - ✓ Etc.

ANR Step by Step Procedure

Site	Objectives
Areas available to villages where villagers have tenure or harvest rights	Produce forest and tree products for local and sale
Areas bordering villages or where shifting cultivation is practiced	Improve fallows Use land for AF in the future
Steep slopes	Reduce the threats Reduce flow of water from area during the rainy season
Areas subject to erosion because of regular burning of *Imperata* cover	Reduce soil erosion and siltation Reduce flow of water from area during rainy season
Land under timber concession	Establish nurse trees for timber species at low cost
Areas in or near national parks, game refuges and natural reserves	Restore native forest species Improve wildlife habitat



Layout of VA Permanent Monitoring plot in Lalol AFoCO

Layout of VA Permanent Monitoring Plot in Tapuso AFoCO DLS

Using the technology, google, GPS, Total Station and other surveying and mapping, the ANR site map can be easily prepared.

However, it is important that we encourage the villagers to do the community mapping showing the land uses including the ANR site.

Using the Vegetation Assessment (VA), areas can be divided into priority ANR site that needs augmentation or supplemental planting. This depends on the number of vegetation per hectare.

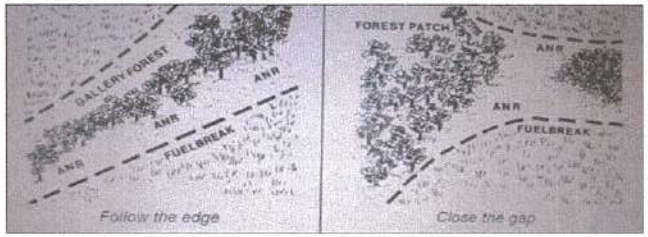
ANR Step by Step Procedure

Priority ANR patches in the selected site

- Consider the stage of plant succession
- Segregate areas with >600 NRs from those with <600 NRs
- >600 NRs apply ANR
- < 600 NRs, may use conventional reforestation

Where to start ANR work?

In areas that can be protected from fire.



Consideration: labor available to monitor & control fire & to establish & maintain firebreaks

ANR Step by Step Procedure

In areas close to forest

- Gallery forest
- Forest Edges
- Forest patches

→ -Have seed bearing trees and seed dispersing wildlife

→ -Will increase the number of NR coming into the ANR area

→ -Soil and other environmental conditions are more favorable near these adjoining forests

Grasslands far from adjoining forests and have been burned and grazed for a long time do not have enough NR to make ANR successful

ANR for areas with ***advanced*** Plant Succession

- Areas with close canopy & trees are 2m tall or more,
  - -Use appropriate silvicultural treatments like Timber Stand Improvement (TSI)
  - -Aim: Improve the G&D of residuals or NR.

ANR Step by Step Procedure

ANR in areas where NRs are present, decide what areas to prioritize

Mixed brushland with scattered trees and grasses	Degraded grasslands with at least 200 wildlings/ha
-Probably less fire risk	-Probably more fire risk
-Early success and confidence	-Longer time to reach objectives
-Shade tolerant enrichment planting	-Sun-loving enrichment plantings
-ANR gives moderate environmental benefits	-ANR gives high environmental benefits

Guidelines in choice of site, objectives and ANR type in areas w/ well spread NR regardless of slope

Woody plants/ha	Timber, watershed objectives	Nature reserves, areas near forest edges, wet sites not prone to fire
Less than 200/ ha (wider than 7x7 m)	Use conventional Refo or AF	Use conventional Refo or AF
200-600/ha (7x7 m to 4x4 m)	Use conventional Refo or AF	Use ANR with enrichment planting
600-700/ha (4.1 x 4.1 m to 3.8 x3.8 m)	Use ANR with enrichment planting so that canopy closure takes place w/n 3-5 yrs	Use ANR with enrichment planting so that canopy closure takes place w/n 3-5 yrs
Over 700/ha (narrower than 3.8 x 3.8m)	Use ANR for timber production; enrich by planting to achieve desired stocking	Use ANR

ANR Step by Step Procedure

A. Development of ANR Sites

Step 2: Locating and Marking of Regenerants or Wildlings

Walk through the area and look for regenerants or wildlings within and under the grasses; Mark the regenerants with stakes. The stakes should be about 1.5-3 cm in diameter and 1.5 m in height. Use stakes pruned from large trees. Do not cut existing vegetation to be used as stakes.

Locate and mark all existing woody wildlings hidden in the grass so that these can be protected during grass pressing & patch or ring clearing.

Two (2) workers to do the work:

- One is marking the wildlings with stake
- The other does the ring weeding or pressing the grass & other weeds using the foot

ANR Step by Step Procedure

A. Development of ANR Sites

Step 3: Ring Weeding

Remove all competing vegetation, such as grass and vines within at least one half meter radius around the marked regenerants. Hand cultivate around the tree and remove grass rhizomes. Slashing may be done also if it will be repeated often. Place the cut grasses into the base of the wildlings to protect it from direct exposure to sunlight and to serve as fertilizer over time. The initial ring weeding treatment should be implemented at the onset of the rainy season so that the liberated seedlings will have the full growing season of accelerated growth.

- Uproot weeds within ½ meters from the base of the wildlings: ferns, climbing vines, other weeds
- Avoid damage to stems & roots of wildlings
- Cultivate the soil around the wildlings
- Remove grass rhizomes, up to ½ meters diameter if labor is available

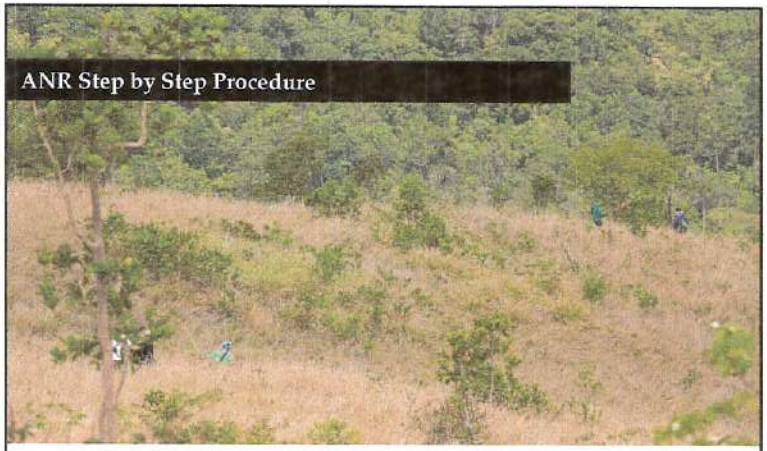
Step 4: Suppressing the Grasses

Suppress the surrounding grasses through pressing or lodging using wooden board. When pressing, loop the rope over your shoulder as you lift the board from one location to the next. The rope should be long enough to ensure that the board lays flat on the ground when you are standing upright. Adjust the length according to your height by knotting the rope. Pull the board up with the use of the ropes when moving forward. Lay the board on top of the grass and press down by stepping on it. Ensure that the surrounding regenerants will not be damaged. Pressing should be done at the beginning and end of the rainy season when the grass stems are soft.

- Herbicides can be considered if labor is limited

Purposes in ANR:

1. **Reduce fuel hazard** – press at the beginning of the dry season and whenever the grass is tall and dry
2. **Control *Imperata* growth** and reduce competition with the vegetation – press during the rainy season when leguminous cover crops & woody species emerge rapidly
3. **Make it easier and faster to move around and work in the ANR area** – press anytime of the year
4. **Prepare enrichment planting areas** – press before the planting season



B. Protection and Maintenance of Established ANR Site

Step 5: Establishment of Firelines or Firebreaks/Greenbreaks in Fire-Prone Areas

Establish firelines or firebreaks/ greenbreaks of at least 8 meters wide or about 10% of the total ANR area, strategically located on the boundary and/or top of ridges as barrier to slow or stop the progress of fire. All combustible materials from within the firelines or firebreaks/greenbreaks, such as grasses, should be removed. In the case of firebreaks/ greenbreaks, fire-resistant species may be planted such as kakawate, banana, abaca, coffee, malunggay, or cash crops which can provide immediate source of income or food.

- Most critical activity in ANR
- At least a month before dry season begins, make plan and organize a firefighting team; Review plans and roles of each member of the team
- During dry season, patrol the area to prevent fire occurrence

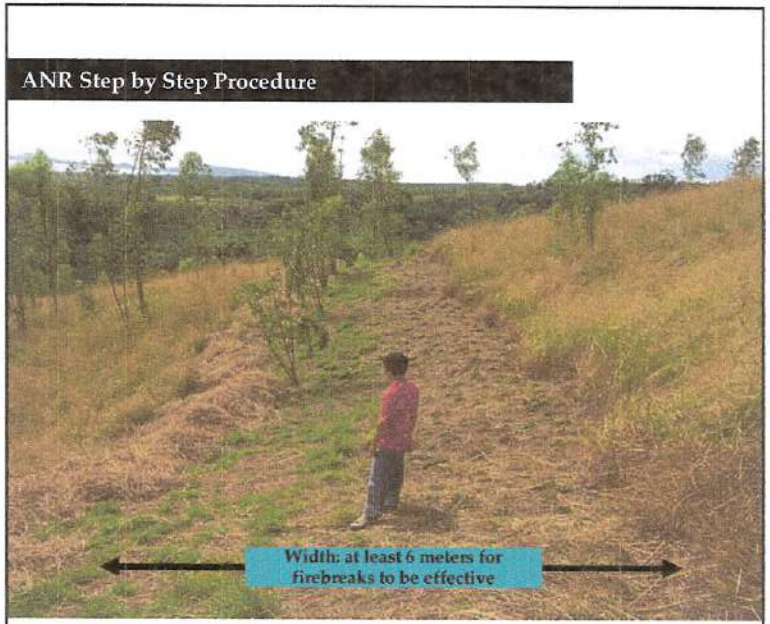
FUEL BREAKS

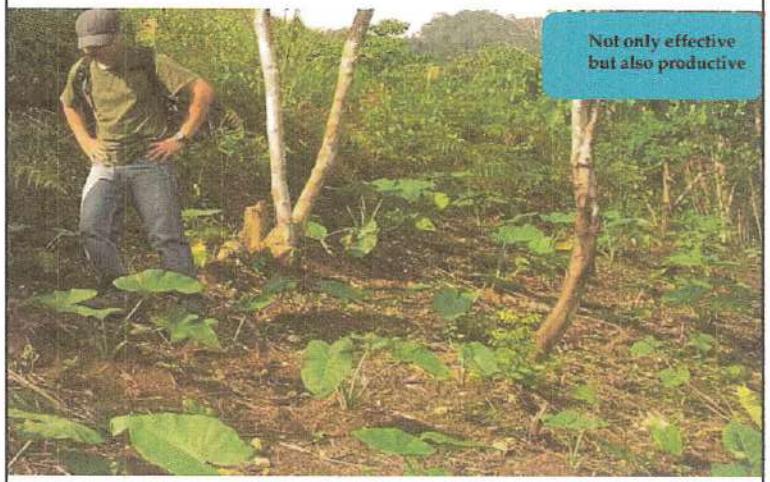
Size of each block with fuel breaks depends on:

- **Terrain** – the flatter the area, the slower the fire to spread than on slopes, thus blocks are larger
- **Amount of volatile material** – the more flammable fuel, the smaller will be the block

General Rule: 4 blocks/ha for Philippine grasslands

- Priority ANR area follows the forest edges which should be bounded by the fuel break
- If there are gaps between forest patches, better close the gaps, with fuel breaks on both sides of the forest edges





ANR Step by Step Procedure

B. Protection and Maintenance of Established ANR Site

Step 6: Continue Ring Weeding and Pressing of Grasses

Conduct two to three passes of ring weeding and pressing of grasses every year when grasses begin to compete with wildlings for light and nutrients. During weeding and pressing, watch for new regenerants to be marked and ring weeded.

- During rainy season, do and repeat the operations at least every 1 ½ months
- During dry season, do pressing usually every 2-3 months if grass begins to grow tall
- Mark new wildlings as they come into the ANR area especially along forest edges. Similarly apply cultural practices, as needed

Step 7: Conduct augmentation (enrichment) planting with indigenous wildlings found within or nearby vicinities if there is not enough natural regeneration that survived in the area

The objectives of enrichment planting are: (1) Fill gaps to shade out *Imperata* and to convert the whole area to forest; (2) Increase density so that the canopy will close sooner; (3) Add trees of species valued for timber, fruit, nuts or other products; and (4) Add Nitrogen-fixing species as an improved fallow.

Plants for enrichment planting can include cover crops, orchard trees, and plantation trees, including nurse trees.

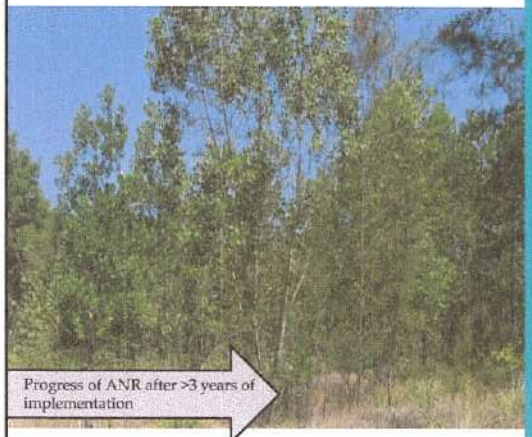
Step 8: Conduct patrol work and monitoring activities around the ANR area

DO NOT....

- CULTIVATION OR PLOWING – this will expose the land to erosion on steep slopes. It may also destroy existing woody plants.
- CONTROLLED BURNING – makes regrowth of *Imperata* more rapid. Woody species may killed or damaged. Soil is exposed to erosion.
- BRUSHING/SLASHING – takes more work than pressing. It stimulates more regrowth of *Imperata*.

ANR Step by Step Procedure

Progress of ANR after 2 years of implementation



Progress of ANR after >3 years of implementation

Other maintenance & protection activities:

- **Protect the area from grazing** – fence the area or assign guards to protect the site from such activity. However, animals may help in seed dispersal. Make a 1 year test and determine whether grazing can increase vegetation or otherwise.
- **Press grass near forests** – temperature, moisture and soils are more favorable than in open areas. It stimulate seed germination.
- **Pull down or slash vines** – to encourage to produce fruits/seeds.
- **Protect wildlife** – educate the community. Birds, bats, and wild pigs can carry seeds into the grasslands.
- **Apply fertilizer** – it depends on species, size of vegetation, soil, fire risk, plantation value, etc.
- **Do thinning** – thin the one that is smaller, unhealthy or less desirable species.
- **Thin and transplant** – during rainy season, transplant healthy thinned plant in nearby areas with similar soil, light & moisture.

Topic No. 4:

Vegetation (Natural Regeneration) Assessment for ANR

Vegetation Assessment (VA) training module will primarily delve on the procedures of the conduct of VA that will be done in three phases. The main aim is to determine the effects of ANR on the restoration/rehabilitation of the grassland area into a forest as manifested by the changes in vegetation in terms of growth and development of existing Natural Regeneration (NR) and addition of NR through species recruitment process. The 3 phases of VA are: before the implementation of ANR (BI-ANR); during ANR Implementation (D-ANR-I) and after ANR implementation (A-ANR-I).

BI-ANR is a basic requirement in order to have baseline information of the natural regeneration (wildlings which will include the natural growing seedlings and wildlings of forest tree species in the area). Prior to the conduct of VA-BI-ANR, information on the biological (vegetation which will include forest patches, gallery and sporadically distributed remnant trees and pioneers; fauna like birds; etc), physical (climate, soil, physiography), social conditions and other relevant information are necessary not only in the conduct of the three phases of VA but in outlining the ANR approaches/methodologies that are most suited to the site. These biophysical and social factors will be emphasized during the training since the outcome of ANR implementation will be influenced by them. The procedures in the conduct of VA-BI-ANR will be discussed and demonstrated thoroughly.

The protocol for VA like transect lines and plots will be introduced during the training. The density of transect lines and plots will be determined based on the intensity of sampling and configuration of the site. The transect lines and plots, in this case, will be established permanently in the site since the progress and outcome of ANR implementation during and after ANR implementation will be continuously monitored and analysed. Procedures on geotagging/geo-referencing of each plot along transect line and locating and marking of the NR in the plot will be included in the training. Tally sheets will be used to record the species and attributes (diameter at base of trunk and height) of the NR.

The conduct of VA D-ANR-I (i.e., 1 ½ years after) will use the same transect lines and plots. Tally sheets indicating the original list of species and attributes of NR will be used to monitor the growth in diameter and height. In addition, recruitment or coming in of NR (their species and attributes) into the site will be recorded in the tally sheet. This VA during this stage of ANR implementation will be important to determine the progress of ANR implementation as indicated in the growth and development of existing NR and addition or recruitment of NR.

The conduct of VA A-ANR-I (i.e., 3 years after) will likewise use the same transect lines and plots and the tally sheets for monitoring the growth and development of the existing species and recruits in VA D-ANR-I. This VA will be the culminating activity that will finally determine the effects of ANR implementation.

VA will not be complete unless data are collated and analysed. The training will include the methodologies in data analysis. Diversity, frequency, density, dominance and other ecological indicators of vegetation that can be applied for NR data analysis will be used. Established formula for each will be presented during the training. More importantly, analysis of the growth and development of existing NR and recruits will be included in the training. Preparation of chart maps and reports on VA during the 3 stages of ANR implementation will be provided to the participants.

Natural Regeneration *refers to naturally growing seedlings/saplings, (wildlings) whether in primary, secondary, abandoned/denuded forests or grasslands.*

Vegetation (Natural Regeneration) Assessment for ANR

Sampling

OBJECTIVES

1. Identify Species, Density & Distribution of NR in proposed ANR site
2. Determine the ANR approach based on the information gathered in Objective No.1
3. Assess ANR effects on restoration of the site based on Growth & Development of the existing NR and recruitment of additional NR during and after ANR.

PROCEDURES

1. Select/design sampling method
2. Establishment of plots and transects
3. Vegetation survey
4. Data encoding and storage
5. Data analysis and reporting
6. Monitoring

Vegetation (Natural Regeneration) Assessment for ANR

Sampling

FACTORS AFFECTING SAMPLING PROCEDURE:

1. Project & Sampling Objectives

Ref: http://ref.data.fao.org/photo?entryId=1bdfcbf3-f71d-4733-a937-22ca872dbe3e

2. Site Homogeneity

3. Budget

Ref: https://image.shutterstock.com/image-vector/cartoon-vector-illustration-cash-coins-260nw-45014608.jpg

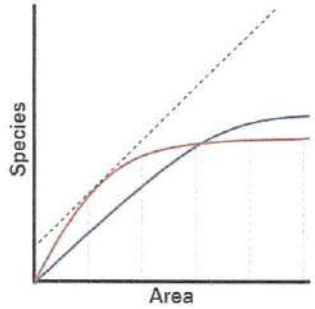
4. Logistics

Ref: http://lbxsolutions.com/wp-content/uploads/2017/05/Inbound-Logistics.jpg

Vegetation (Natural Regeneration) Assessment for ANR

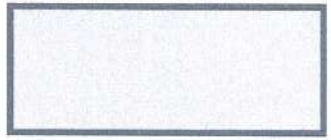
Sampling

SAMPLING INTENSITY - Size of the sample area e.g. Sample size of a 30-ha area at a 10% sampling intensity is 3 ha



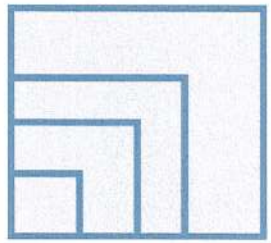
PLOT TYPE:

Shape – Rectangular or Square



Size:

- 100 x 100
- 50 x 50
- 20 x 20
- 20 x 50
- 10 x 25



Vegetation (Natural Regeneration) Assessment for ANR

Sampling

3-1 ha plots distributed in the area capturing the physiological feature i.e., top, middle, and low portion of the slope

Plots laid out along the transects established along the slope

10% sampling – 3 has for 30 has thus, for 20x20m = 75 plots and for 10x25m = 120 plots will be needed.

Vegetation (Natural Regeneration) Assessment for ANR

Plot Establishment

Transect Lines and Plots

Transect lines

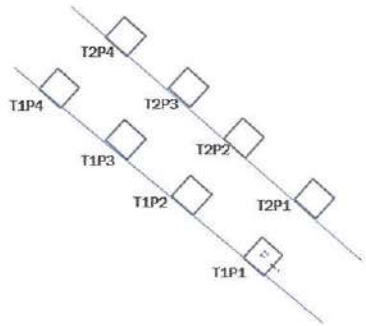
- Must be laid out not so near to the ANR boundary
- Must be equally spaced
- Number will be dependent on the length & width of the ANR site and the number of plots for 10% sampling

Plots

- Must be distributed equally along the transect lines
- The number of plots on the transect line will be dependent on length of the transect line and on the number of the plots required for 10% sampling

Transect & Plots must be permanent

- Since the intention is to monitor the effect of ANR, each plot should be geo-tagged.
- Transects and plots are chronologically numbered.
- Durable markers must be installed.



Vegetation (Natural Regeneration) Assessment for ANR

Plot Establishment

Locating and Marking NR (Wildlings)

- In each plot, woody plants including wildlings and saplings (15-200cm tall) will be located and marked;
- Clump of wildlings within $1m^2$ is counted as one plant;
- Markers must be visible and durable to last for the 3-yr monitoring period;
- The wildlings and saplings will be numbered consecutively as indicated below:

Transect 1 Plot No. 1

ID No.	Species	Dia at base	Ht	Remarks
P11				
P12				
P13				
P14				
P15				
P1n				
P1total				

Transect 1 Plot No. 2

ID No.	Species	Dia at base	Ht	Remarks
P21				
P22				
P23				
P24				
P25				
P2n				
P1total				

Vegetation (Natural Regeneration) Assessment for ANR

Advantages of transects and small plots for sampling

- Can be used to segregate the areas with >600 NRs from those with <600 NRs
- Provide info for the kind of ANR methods to use.
- e.g., -simple continuous pressing or may need augmentation planting

Data Analysis of Natural Regeneration is a result of locating and mapping of the individual trees of the species.

Frequency = $\frac{\text{No. of sampling units in which a species occurs}}{\text{Total number of sampled units established}}$

Density = $\frac{\text{Total no. of individuals in all sampling units}}{\text{Total number of sampled units established}}$

Abundance = $\frac{\text{Total No. of individuals in all sampling units}}{\text{Total number of sampled units established}}$

Vegetation (Natural Regeneration) Assessment for ANR

Monitoring of growth & development of NR during ANR implementation

- Growth & development can be monitored either monthly or quarterly
- Similar data sheet bearing the original dimeter and height as presented above will be used
- Current diameter and height will be recorded to find out if there is an improvement in growth & development due to ANR

Growth & Development Monitoring

Monthly: _____ or Quarterly _____

Transect 1 Plot No. 1

ID No.	Species	Dia at base 1	2	3	4	Ht 1	2	3	4	Remarks
P11										
P12										
P13										
P14										
P15										
P1n										
P1total										

Monthly: _____ or Quarterly _____

Transect 1 Plot No. 2

ID No.	Species	Dia at base 1	2	3	4	Ht 1	2	3	4	Remarks
P21										
P22										
P23										
P24										
P25										
P2n										
P2total										

Vegetation (Natural Regeneration) Assessment for ANR

Monitoring of growth & development of NR during ANR implementation

Growth & Development Monitoring

Year 1

Transect 1 Summary

Plot No.	Species	Increase in dia	Increase in Ht	Remarks
P1	Sp 1			
P1 Sp 1 total				
P1	Sp 2			
P1 Sp2 total				
P1	Sp n			
P1 Sp n total				
P1 all spp total				
P2	Sp 1			
P2 Sp 1 total				
P2	Sp 2			
P2 Sp2 total				
P2	Sp n			
P2 Sp n total				
P2 all spp total				

Vegetation (Natural Regeneration) Assessment for ANR

Species recruitment during ANR

Some seeds dispersed by birds & other animals, wind & other agents from adjoining patch, gallery forests or remnant trees (climax or pioneer) may:

- germinate and become an additional NR in the area;
- their location will be marked and will likewise be given an ID no. as species recruit 1, 2, 3; and
- their species, diameter and height will be recorded and monitored

See Table below:

Transect 1 Plot No. 1

ID No.	Species	Dia at base	Ht	Remarks
P1SR1				
P1SR2				
P1SR3				
P1SR4				
P1SR5				
P1SRn				
P1SRtotal				

Transect 1 Plot No. 2

ID No.	Species	Dia at base	Ht	Remarks
P2SR1				
P2SR2				
P2SR3				
P2SR4				
P2SR5				
P2SRn				
P1SRtotal				

Vegetation (Natural Regeneration) Assessment for ANR

Species recruitment during ANR

Species recruitment

Transect 1 Summary

Plot No.	Species	Ave Dia at base	Ave Ht	Total	Remarks
P1	SpR 1				
P1 SpR 1 total					
P1	SpR 2				
P1 SpR2 total					
P1	SpR n				
P1 SpR n total					
P1 all spp Rtotal					
P2	SpR 1				
P2 Sp R1 total					
P2	SpR 2				
P2 Sp2R total					
P2	SpR n				
P2 Sp nR total					
P2 all spp Rtotal					

Species Recruitment

Summary for all transect and plots and species

Species R	Total	Ave Dia at base	Ave Ht	Total/ha (no of individuals x 10000/plot size m²)
1				
2				
3 n				
Total				

Vegetation (Natural Regeneration) Assessment for ANR

Species recruitment during ANR

Monitoring (Growth & Development)

- Growth & development can be monitored either monthly or quarterly
- Similar data sheet bearing the original dimeter and height as presented above will be used
- Current diameter and height will be recorded to find out if there is an improvement in growth & development due to ANR

Similar analysis will be used for analysis result of locating and mapping of the individual NR species recruits

Frequency = $\frac{\text{No. of sampling units in which a species occurs}}{\text{Total number of sampled units established}}$

Density = $\frac{\text{Total no. of individuals in all sampling units}}{\text{Total number of sampled units established}}$

Abundance = $\frac{\text{Total No. of individuals in all sampling units}}{\text{Total number of sampled units established}}$

Topic No. 5 Re-entry Action Planning

To sustain the gains of the capacity building activity, participants shall be required to prepare an action plan on how the learnings shall be implemented in their respective area of assignments. The plan may include various activities such as re-echo trainings, establishment of ANR demonstration plot within their respective regions and actual development of an ANR site. The specific activities and corresponding estimated budgetary requirements shall likewise be specified in the re-entry plan.

Activity	Timeline	Responsible Office/ Person	Estimated Budgetary Requirement

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ANNEX 7

Capacity Building on the Application of Landscape Approach to Support the Sustainable Natural Resources Management in Brunei Darussalam, Indonesia, Philippines and Singapore
Cross Country Visit- Philippines

1. Background

This cooperation Project entitled **"Capacity Building on the Application of Landscape Approach to Support the Sustainable Natural Resources Management in Brunei Darussalam, Indonesia, Philippines and Singapore" (BIPS Project)"** is being implemented under the ASEAN-Republic of Korea (ROK) Forest Cooperation (AFoCo) Agreement. By virtue of the Memorandum of Understanding (MOU) between the Korea Forest Service (KFS) of the ROK and the Department of Environment and Natural Resources (DENR) of the Philippines, its implementation was formalized on 30 March 2016, with the Philippines as the lead implementing country.

The Project primarily aims to strengthen trans-boundary cooperation of respective forestry sector within ASEAN countries through the application of landscape approach in natural resources management. Specific to each BIPS country, said Project will be implemented within the context of differentiated environmental and developmental concerns which cut across the different ecosystems. In the instant case, the Philippines shall implement its In-Country Project Perspective on the **"Restoration of Degraded Forest Ecosystem through Assisted Natural Regeneration."**

In the Philippines, changing landscape can be attributed to changes in forest areas. This is due to massive forest deforestation and degradation from the past years and even until now. Varying interests among multi-stakeholders is also one of the main reasons why forest cover declined. In order to overcome the adverse effects of this situation, application of Assisted Natural Regeneration (ANR) has been a great opportunity to fulfill the country's commitment to sustainable natural resources management.

ANR is a restoration strategy that uses natural regeneration of forest trees found within the area, as assisted by human intervention to accelerate the growth of the species. The strategy offers a cost-effective technology for rehabilitation which produces a mixed and multi-layered vegetative cover with the objective to improve productive capacity, environmental functions, and biodiversity value of a certain degraded area. Said strategy can be more applicable if learning and experiential motivations can be attained especially on a landscape scale. With this, ANR strategy can balance trade-offs and plays an important role in landscape restoration approach.

Foregoing considered, the Philippines' activities under the regional project gave emphasis on establishing a demonstration site for the application of ANR technology to restore degraded forestland ecosystem.
Consistent with the provisions of the Project document and the approved activities under its Work and Budget Plan of the said Regional Project, **Cross Country Visit (CCV)** as avenue to share good practices, lessons and experiences of the Philippines which was attended by

all participating countries was held on 20-23 November 2018 in Zambales, Central Luzon, Region 3.

2. Cross-Country Visit in the Philippines

One of the components of the Regional Project is the Visit to selected Participating ASEAN Member State (AMS) or CCV. Said activity aims to share lessons and experiences between and among implementing AMS countries on Project learning and future directions. Before the Philippines, Indonesia already hosted its CCV on 25-28 September 2018 which was participated by DENR Region 3 personnel. Schedules of the visits in Brunei Darussalam and Singapore are tentatively by 1st Quarter of 2019.

Through collaborative efforts of the Technical Working Group (TWG) for the AFoCo-BIPS in FMB and DENR Region 3, five (5) delegates from each BIPS countries visited the 30-hectare Assisted Natural Regeneration demonstration learning sites (ANR-DLS) in Candelaria, Zambales including the constructed bunkhouse for the project.

3. Participants

Each of the participating countries having five (5) delegates were represented in the CCV i.e. Brunei Darussalam, Indonesia, Singapore and one (1) from the AFoCo Secretariat. Participants from the host country, Philippines came from Regional, Provincial, and Community field offices of DENR including staff from the Forest Management Bureau. See table 1 for the details.

Table. 1 The delegates from the ASEAN Member countries

NAME	DESIGNATION/ POSITION	OFFICE	COUNTRY
Dr. Seong Han Lee	Program Officer for Project Appraisal and Evaluation Development and Evaluation Team / Cooperation and Project Division	Secretariat for Asian Forest Cooperation Organization	AFoCO Secretariat
Mohammad Zukrina Bin Haji Daimun	Forestry Assistant, Forestry Department	Ministry of Primary Resources and Tourism	Brunei Darussalam
Liming Bin Daman	Assistant Forestry Officer Grade II, Forestry Department	Ministry of Primary Resources and Tourism	Brunei Darussalam
Mohamad Rozizan Bin Mohd	Forestry Assistant, Forestry Department	Ministry of Primary Resources and Tourism	Brunei Darussalam
Sufri Bin Piut	Forestry Assistant, Forestry Department	Ministry of Primary Resources and Tourism	Brunei Darussalam

Muhamad Arif Bin Haji Selamat	Assistant Forestry Officer Grade I, Forestry Department	Ministry of Primary Resources and Tourism	Brunei Darussalam
Tjuk Sasmito Hadi	Director of Befordi	Banjarbaru Environment and Forestry Research and Development Institute	Indonesia
Asep Hidayat	Reasearcher Forest Research and Development Centre, Forestry and Environmental Research, Development and Innovation Agency	Ministry of Environment and Forestry	Indonesia
Agustinus Tampubolon	Forest Research and Development Centre, Forestry and Environment Research and Development Agency	Ministry of Environment and Forestry	Indonesia
Pratiwi Warkiman Donosoekarto	Researcher (Forest Research and Development Center)	Ministry of Environment and Forestry	Indonesia
Purwanto Budi Santosa	Researcher/ Field Manager	Banjarbaru Environment and Forestry Research and Development Institute	Indonesia
Zebin Soh	Deputy Director/Parks	National Parks Board Singapore	Singapore
Hassan Ibrahim	Deputy Director/ International Biodiversity Conservation	National Parks Board (Ministry of National Development)	Singapore
May Pin Holly Joy Siow	Manager (Terrestrial)/ National Biodiversity Centre	National Parks Board (Ministry of National Development)	Singapore
Pin Chong Ooi	Senior Officer, Conservation	National Parks Board Singapore	Singapore
Meng Yang Neo	Manager/Parks	National Parks Board (Ministry of National Development)	Singapore
Orlando Panganiban	AFoCo Focal Person, Chief, Forest Resources Management Division	Forest Management Bureau, DENR	Philippines
Marlon Atienza	Project Manager/ Coordinator	Forest Management Bureau, DENR	Philippines
Arthur Salazar	Assistant regional Director for Technical Services	DENR Regional Office, R3	Philippines
Raymond Rivera	Provincial Environment and Natural Resources Officer	Provincial Environment and	Philippines

		Natural Resources Office of Zambales	
Ariel Mendoza	Community Environment and Natural Resources Officer	Community Environment and Natural Resources Office of Masinloc, Zambales	Philippines
Evelyn Grace	Chairperson	MALATAPU Livelihood Inc.	Philippines

4. Highlights of Cross-Country Activity

A brief discussion was convened to welcome the delegates and present the progress/status of the Regional and In-Country Project of Philippines including the principles of the ANR methodology used for the rehabilitation of the degraded upland area for the appreciation of the delegates. The discussion was led by the Project Coordinator, For. Marlon Atienza and followed by the greeting of Mayor Napoleon Edquid of Candelaria, Assistant Regional Director (ARD) Arthur Salazar, PENR Officer Raymond Rivera, CENR Officer Ariel Mendoza and Ms. Evelyn Grace of MALATAPI Livelihood Inc.. Necessary preparations including giving of kits for the hiking activity were also conducted for convenience and safety of the participants. *(Attached is the presentation used for the activity.)*

Figure 1. Photo of the delegates from Brunei Darussalam, Indonesia and Singapore

During the hiking and actual site visit on 23 November 2018, staff from CENR Office of Masinloc, PENR Office of Zambales and some members of PO partner joined the delegates in visiting the Demonstration Learning Site (DLS). The team was escorted by military personnel to ensure safety.

On the way to the site, discussions on implementation of ANR and Vegetation Assessment were initiated by the delegates and the Project Consultant. For better appreciation, delegates were brought to the sampling plots within the DLS to explain the effectiveness of ANR and how its application affects the quality of the forest area, as well as the characteristics of species present thereat. The delegates and participants also affixed their signatures on the provided

board as their symbol of commitment in the project implementation and sustainability of the DLS that will be used in the future.

Fig. 2 Discussion on ANR, observation in the demonstration plots and signing on the commitment wall by the delegates of BIPS Countries.

Fig.3 Photo of all participants and delegates in the ANR-Demonstration Learning Sites

5. Field Trip

After the healthy hiking and discussion on ANR and VA, the delegates were brought to the PO Multi-purpose hall/bunkhouse and to Magalawa Island for leisure time and explore the beauty of Zambales.

Fig.4 Discussion at the constructed PO Multipurpose hall/bunkhouse

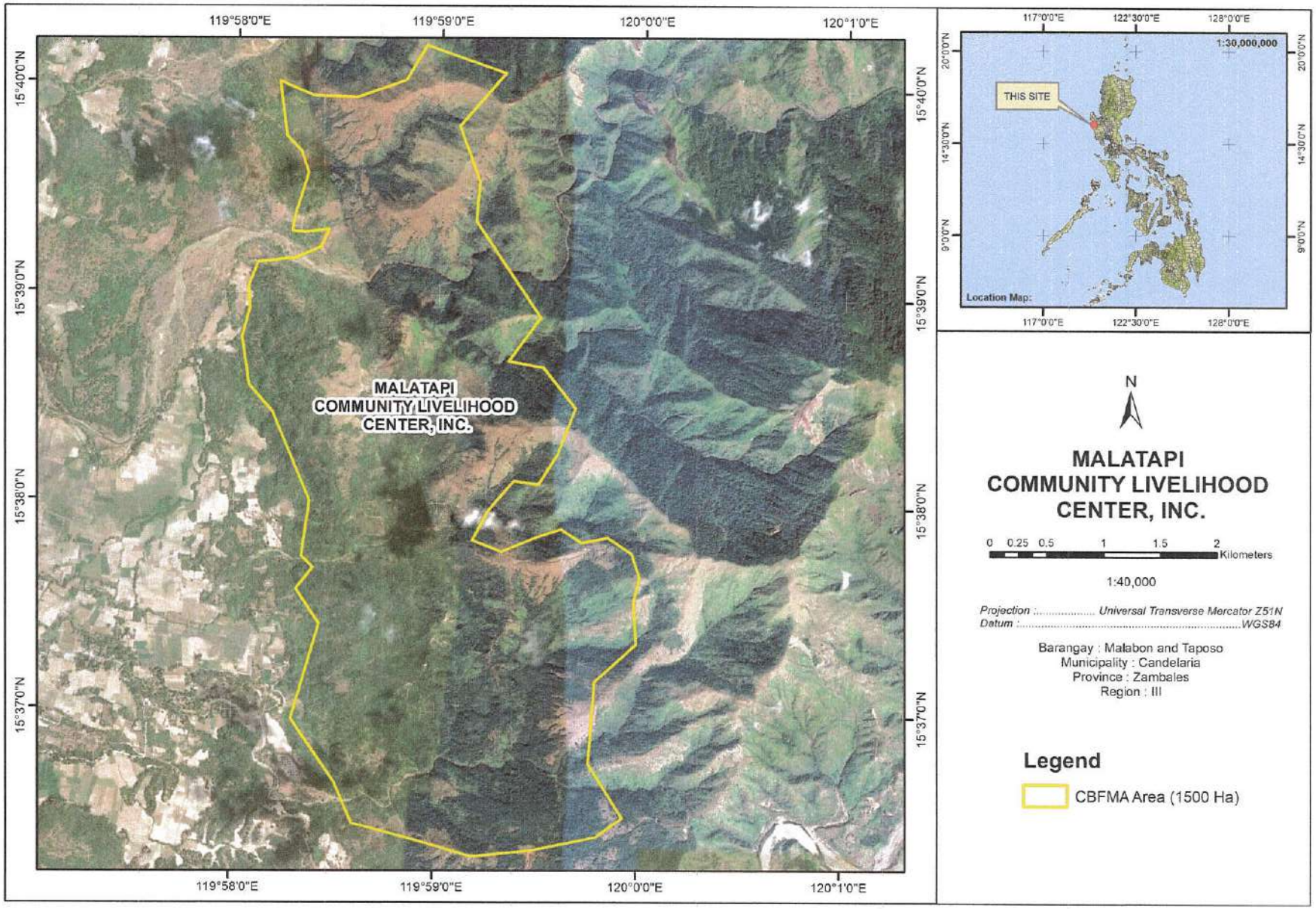
Fig.5 Leisure time of delegates in the Magalawa Island, Zambales

6. Way Forward and Closing Program

During farewell dinner, representative from each implementing country expressed their observations in the conducted activities and appreciation specifically on the connectivity of the ANR methodology/technology with respect to ridge to reef landscape approach of rehabilitation.

As a way forward, the participants were reminded of the forthcoming 2nd Project Coordination Committee (PCC) meeting to discuss the status/progress of In-Country and Regional Project implementation including the CY 2019 Work and Budget Plan (WBP) scheduled on 4-6 December 2018 at New World Hotel Manila Bay Hotel, Manila, Philippines.

ANNEX 8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120°1'0"E
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MALATAPI
COMMUNITY LIVELIHOOD
CENTER, INC.
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122°30'0"E
128°0'0"E
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14°30'0"N
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Location Map:
N
MALATAPI
COMMUNITY LIVELIHOOD
CENTER, INC.
0 0.25 0.5 1 1.5 2
Kilometers
1:40,000
Projection : Universal Transverse Mercator Z51N
Datum : WGS84
Barangay : Malabon and Taposo
Municipality : Candelaria
Province : Zambales
Region : III
Legend
CBFMA Area (1500 Ha)

ANNEX 9

Republic of the Philippines
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
Region III, Govt. Center, Maimpis, City of San Fernando, Pampanga.

RELEASED
Date: 22 MAY 2019
By:

MEMORANDUM

TO	:	**All PENROs and CENROs**
FROM	:	**The REGIONAL EXECUTIVE DIRECTOR**
SUBJECT	:	**ADOPTION OF THE 60 HECTARE ASSISTED NATURAL REGENERATION (ANR) DEMONSTRATION AREA IN CANDELARIA, ZAMBALES AS AN ANR MODEL SITE IN REGION 3**
DATE	:	MAY 14 2019

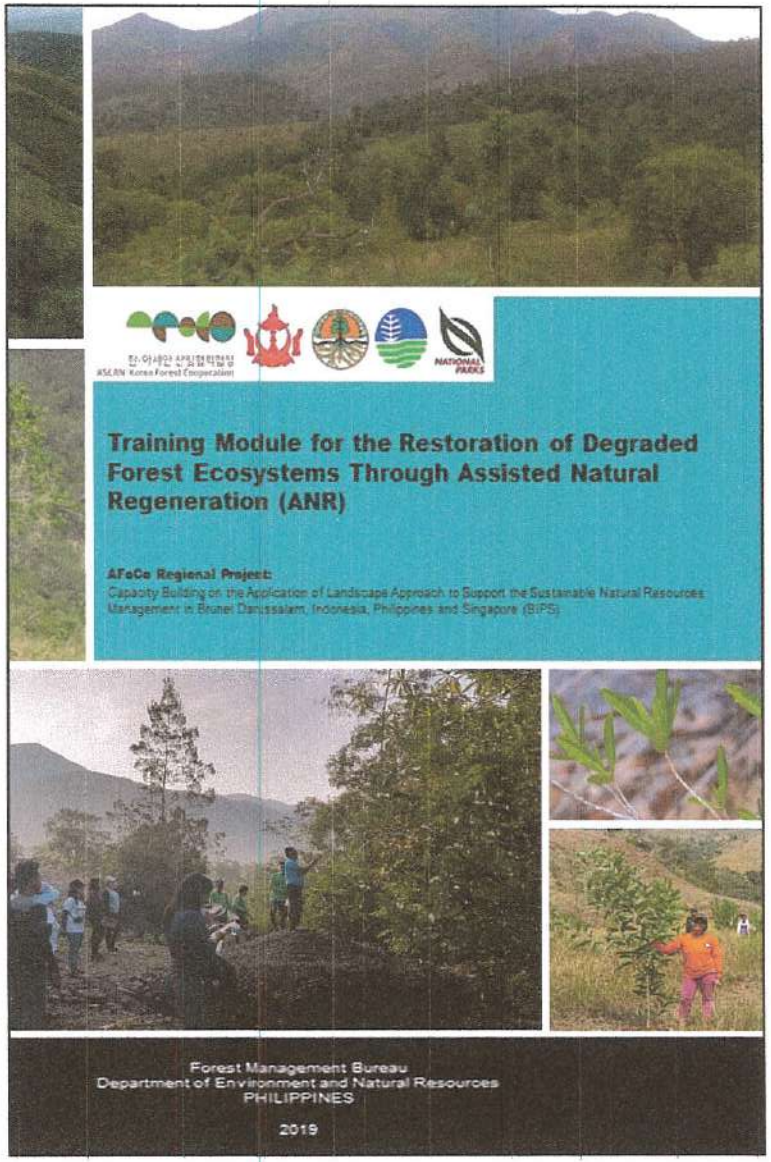
This pertains to the Assisted Natural Regeneration (ANR) demonstration area within the CBFM of MALATAPI Community Livelihood Center, Inc. (MCLCI), located in Barangays Malabon and Taposo, Candelaria Zambales, which was established through the regional project entitled **"Capacity Building on the Application of Landscape Approach to Support the Sustainable Natural Resources Management in Brunei Darussalam, Indonesia, Philippines and Singapore"** under the ASEAN-KOREA Forest Cooperation (AFoCo) Agreement.

Said ANR demonstration area was developed as a venue for actual experiential learnings vis-à-vis capacity building activities of the Project for both DENR technical personnel and the community with regards to the Reclamation, Restoration and Rehabilitation of Degraded Forest Ecosystems (RRR-DFE). In close coordination with the Forest Management Bureau (FMB) and the officers and members of MCLCI, the area has been earmarked for such purposes under the POs Community Resource Management Framework (CRMF) as was declared as "no other intervention area" per PO Board Resolution No. 2, Series of 2019.

Taking opportunity of the project results, DENR Region 3 is officially adopting the subject demonstration area as its official **ANR Model Site**. Accordingly, capacity building and otherrelated activities of the field offices are encouraged to be conducted in the area, taking reference of the best practices and lessons learned during implementation and other outputs/knowledge products derived from the Project.

FOR INFORMATION AND GUIDANCE OF ALL CONCERNED.

ENGR. PAQUITO T. MORENO, JR., *CESO III*



FOREST MANAGEMENT BUREAU

FOREWORD

With a mission to rehabilitate degraded forestland and to prevent deforestation and forest degradation in the context of sustainable forest management, AFoCO projects are focused on capacity building training programs, biodiversity conservation, community forestry, climate change mitigation, and forest restoration.

In the Philippines, these areas of concerns are likewise considered as the entry points of any development initiatives towards sustainable forest management, especially so in support of the priority programs of the DENR for the forestry sector, the National Greening Program and the National Forest Protection Program.

The AFoCO Project entitled "Capacity Building on the Application of Landscape Approach to Support the Sustainable Natural Resources Management in Brunei Darussalam, Indonesia, Philippines and Singapore" or simply the AFoCO-BIPS Project was launched in CY 2016 in line with our efforts to strengthen trans-boundary cooperation of forestry sectors within ASEAN countries.

Under said project, the Philippines implemented an In-country project perspective entitled "Restoration of Degraded Forest Ecosystem through Assisted Natural Regeneration" which aimed to capacitate DENR technicians/practitioners and concerned stakeholders within the identified project area in implementing ANR technologies as an approach/strategy to the restoration of degraded forestlands.

This training module published by the Forest Management Bureau provides relevant discussion on ANR principles, techniques and practices, including guidelines on the step by step procedure of ANR implementation. Moreover, it highlights the processes on the conduct of Vegetation Assessment (VA) which aims to determine the effects of ANR on the restoration/rehabilitation of degraded forestland area, as manifested by the changes in vegetation.

We acknowledge the contribution of the members of the project Technical Working Group (TWG) from the FMB & DENR Region 3, and Mr. Arman Palijon, project consultant, for the completion of information included in this publication.

FOR. NONITO M. TAMAYO, *CESO IV*
Director

The AFoCo - BIPS Project

The ASEAN-Republic of Korea Forest Cooperation (AFoCo) is a regional, inter-governmental cooperation mechanism in the forest sector which was formalized in August 2012. It is an agreement between the Republic of Korea and 10 ASEAN Member States (AMS) which aims to: 1) facilitate forest cooperation, undertake projects and translate sound forest policies into action with a mission to rehabilitate degraded forestland and to prevent deforestation and forest degradation in the context of sustainable forest management as well as under the broader scope of addressing the impact of climate change; and 2) to provide a platform for dialogue between the AMS and the ROK towards the establishment of the Asian Forest Cooperation Organization (AFoCO). The AFoCo Agreement has three categories of cooperation projects namely: Individual, Regional and Landmark Projects.

Under the said Agreement and by virtue of the Memorandum of Understanding (MOU) between the Korea Forest Service (KFS) of the ROK and the Department of Environment and Natural Resources (DENR) of the Philippines, a Regional Project entitled **"Capacity Building on the Application of Landscape Approach to Support the Sustainable Natural Resources Management in Brunei Darussalam, Indonesia, Philippines and Singapore (BIPS Project)"** is being implemented, with the Philippines as the lead implementing country. Said Project primarily aims to strengthen trans-boundary cooperation of respective forestry sector within ASEAN countries through the application of landscape approach in natural resources management.

Specific to each BIPS country, said Project is being implemented within the context of differentiated environmental and developmental concerns which cut across the different ecosystems. In the instant case, the Philippines is implementing its In-Country Project Perspective on the **"Restoration of Degraded Forest Ecosystem through Assisted Natural Regeneration (ANR)"**.

The Philippines' Project aims to facilitate the restoration of degraded forestland thru Assisted Natural Regeneration (ANR) by capacitating the concerned stakeholders within the identified Project Area. Specifically, the Project intends to achieve the following objectives, to wit;

1. Contribute to the restoration of degraded forestlands inside and adjacent to identified Project area;
2. Establishment of thirty (30) hectares of demonstration plots for Assisted Natural Regeneration inside the identified Project area;
3. Capacity building of stakeholders to enhance technical capability on Assisted Natural Regeneration: and
4. Document the initial findings and lessons learned from the activities using Assisted Natural Regeneration as approach to forest restoration.

Rationale

In pursuit of achieving the Project objectives particularly on capacity building, the four (4) batches of training on ANR and Vegetation Assessment (VA) shall be facilitated with the concerned stakeholders within the identified Project area, including DENR technical personnel from the Central and Regional/Field Offices.

Learning Objectives

The training aims to capacitate selected staff of DENR Central Office, Forest Management Bureau (FMB) and Field Offices (Regional Office, Provincial Environment and Natural Resources Office (PENRO) & Community Environment and Natural Resources Office (CENRO)) relative to ANR principles, techniques and practices, to include the VA for the characterization of the vegetation changes as influenced by ANR implementation.

Methodology

The training shall include classroom lectures and discussions and actual field work and experiential learnings on ANR technologies and activities, including VA.

Topics

1. The Philippines Forestry Scenario
2. ANR Basic Concepts and Principles and Implementation Status
3. ANR Step by Step Procedures
4. Vegetation Assessment
5. Re-entry Action Planning

Expected Outputs

At the end of the training activity, the following are expected to have been achieved:

1. Pool of experts comprised of at least 60 personnel from the DENR Central Office, Forest Management Bureau and Field Offices capacitated relative to ANR technologies and activities and VA; and

2. Participants re-entry plan on how learnings shall be implemented in their place of assignments.

Topic No. 1:

The Philippines Forestry Scenario

Over the years, the massive change in the Philippine landscape can be gleaned in relation to the changes in forest areas. The country suffers from severe deforestation which resulted to rapid decrease by nearly 50% in forest cover from 1970 to 2000 (Aquino et al, 2014).

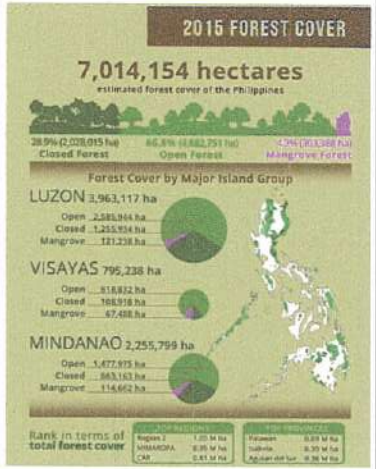
Second growth forests are the largest and most dynamic natural forest ecosystem in the Philippines covering about 83% (5 million hectares) of the total forest area (Lasco et al, 2001). They are the heavily exploited forest in the country since the implementation of logging ban in the primary forests in 1992 (Lasco et al, 2001), but their natural recovery just like other tropical forest areas subjected to intensive anthropogenic activities are usually slow due to soil degradation, recurring disturbances, and isolation from intact forests (Shono et al 2007). Hence, the need to manage them to accelerate their recovery and restore productivity, biodiversity and other values is widely recognized (Parotta et al, 1997).

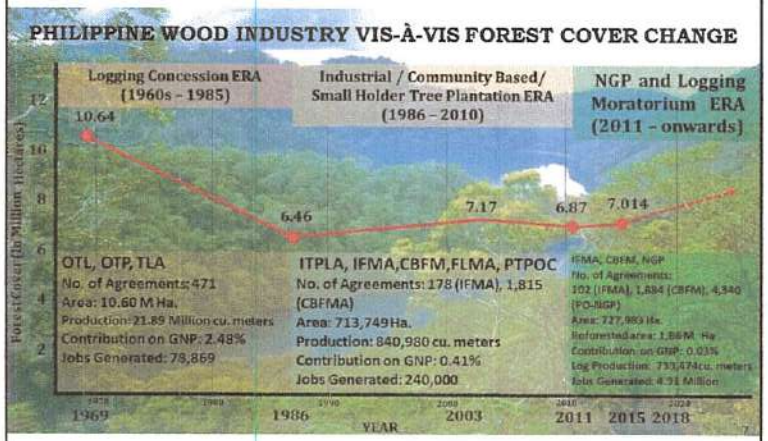
One of the unique features of forest resources is that multiple stakeholders are associated with its multiple uses and represent local to global interests. Efforts towards sustainable forest management need to consider these varying interests, without marginalizing the concerns of the local communities, especially those whose lives depend on these resources for survival. This calls for the development and institutionalization of social processes that will ensure that the local communities and other legitimate stakeholders are able to participate meaningfully in decision making concerning forest management and benefit sharing from forests (Rebugio et. al, 2010).

Moreover, in order to overcome the adverse effects of this situation, application of Assisted Natural Regeneration (ANR) has been a great opportunity to fulfill the country's commitment to sustainable natural resources management.

Assisted Natural Regeneration (ANR) is considered one of the most viable methods to restore degraded tropical forestlands and transform them into more productive forests (Carandang et al, 2007; Shono et al, 2007). The aim of ANR is to accelerate the trajectory of natural successional processes by reducing or removing barriers to natural forest regeneration such as competition to available resources by weed species; recurring disturbances like grazing, fire and wood harvesting; and marginal soil condition (Shono et al, 2007). ANR is most suited for areas where protection functions of forests is critical such as areas which are ecologically vulnerable, areas where conservation of biological diversity and soil and water are highly needed, among others (Sajise, 2003). Unlike to the conventional restoration methods that involve planting of nursery grown seedlings, ANR is said to offer significant cost advantages due to reduced costs associated with seedling propagation and transplanting (Shono et al, 2007) However, despite of its advantages, ANR techniques are still vastly under-appreciated and under-utilized in the Philippines (Ganz & Durst, 2003) perhaps for lack of effective promotion, government support, and/or published quantitative data to support its effectiveness. Although there are policies and guidelines already issued to prioritize application of ANR, published data of ANR effectiveness and extent of its application in the country are still limited (DENR 1989; cited by Carandang et al, 2007). Its continued implementation including documentation of restoration results and ecological requirements of natural regeneration should have provided opportunities to improve the application of ANR technology.

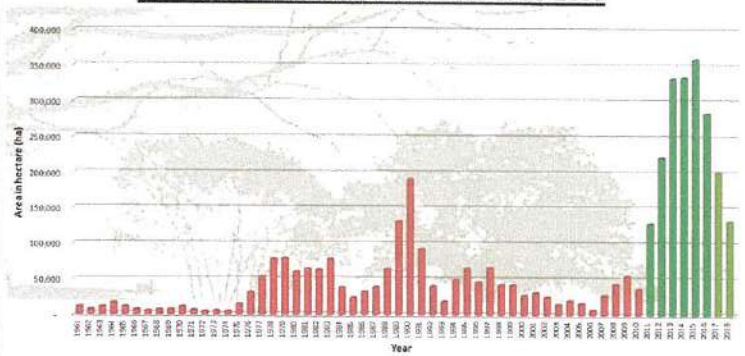
Statistical Information





Statistical Information

Annual Reforestation Data from 1960-2018



Major Policies and Initiatives for Forest Restoration

Revised Forestry Code of the Philippines (Presidential Decree No. 705, May 1975)

- The Law has provided the basis for the rehabilitation of forest lands to ensure their continuity in productive condition

National Integrated Protected Areas Systems Act (Republic Act 7586, 1992)

- The Law provides the legal framework for the establishment and management of protected areas

Community Based Forest Management Program (Executive Order No. 263, 1995)

- The program encourages reforestation and sustainable management of forests. Key to this strategy is the promotion of active and productive partnership between the government and forest communities in developing, rehabilitating and managing forestlands

Promoting Sustainable Forest Management (Executive Order No. 318, 2004)

- This decree provides the guiding principle for sustainable forest management with priority for rehabilitation and protection; it provides incentives for the private sectors' participation in forest development

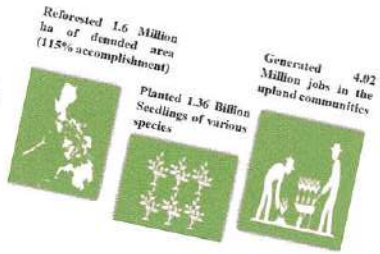
Major Policies and Initiatives for Forest Restoration

The National Greening Program (Executive Order No. 26, 2011)

- The NGP is a massive forest rehabilitation program of the government that seeks to grow 1.5 Billion trees in 1.5 Million hectares nationwide within a period of six years, from 2011-2016

Expanding the Coverage of the National Greening Program (Executive Order No. 193, 2015)

- Covers all the remaining unproductive, denuded and degraded forestlands to be managed for production and protection purposes as well as to achieve carbon neutrality
- It includes the development of new plantations and sustainable management of established plantations as well as protection of existing forests



Philippines Master Plan for Climate Change Resilient Forestry Development (January 2016-2028)

- One strategic policy measure is forest expansion to be achieved through afforestation/restoration in available barren and degraded lands, deforested areas and marginal lands, and to further extend tree planting in farmlands, grazing lands, recreation areas, and to support expansion of community forestry, farm forestry, etc.

Topic No. 2:

ANR Basic Concepts, Principles, and Implementation Status

ANR is a process of rehabilitating denuded forestlands by taking advantage of trees already growing in the area. This usually involves activities such as locating and releasing of indigenous trees, maintenance, augmentation planting and protection (Philippine Official Reference for Forest-Related Terms and Definitions ITTO PD 222/03 Rev. 1 (F). This was introduced for the rehabilitation and development of watersheds, protection and production forests being the most economical and cost-effective method that is feasible in any given situation. It also intends to accelerate the re-establishment of vegetative cover that approximates a natural forest in terms of species diversity and composition. It does not require further research and study about what suitable species should be planted in the area. In general, the objective for ANR is to improve productive capacity, environmental functions, and biodiversity value of a certain degraded area.

However, ANR was properly and effectively carried out in only a handful of cases and thereby, did not have a significant contribution to the over-all rehabilitation efforts of the government. Most were done through short term contracts that did not have any benefit of extended follow up maintenance and protection activities. Further, personnel assigned to monitor or carry-on ANR activities were eventually reassigned/transferred to other units or promoted to higher offices of DENR. After more than two decades since the institutionalization of ANR, many DENR field personnel have a vague understanding of ANR and commonly confuse with other rehabilitation methods.

As a conclusion, awareness regarding the advantages and effectiveness in the application of Assisted Natural Regeneration is very crucial. ANR can be more applicable if learning and experiential motivations can be attained especially on a landscape scale. With this, ANR strategy can balance trade-offs and plays an important role in landscape restoration approach.

Based on the Landscape Approach, ANR strategy is applied to support the sustainable natural resources management with basic principles that maybe related to the existing laws and regulations of the Philippines, to wit:

1. Plant diversity enhancement. Naturally-generated vegetation will almost always comprise a mixture of species. Therefore, ANR produces a more diverse and multi-layered vegetative cover. This diversity helps ensure environmental stability and is very desirable in areas intended for watersheds restoration;

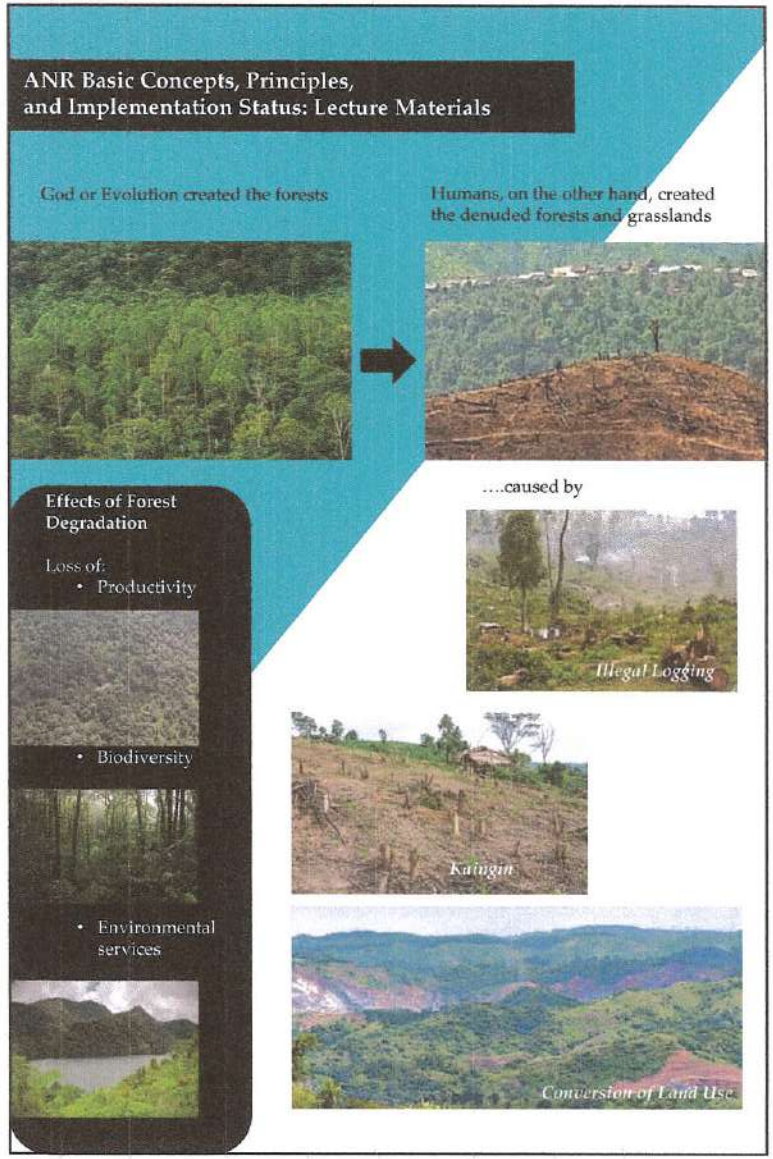
2. Acceleration of Forest Restoration. ANR takes advantage of wild seedlings already growing in an area. Root systems of these seedlings are already in place. Therefore, the seedlings can grow rapidly when competition is reduced or removed;

3. Reduction of Forest Restoration costs. ANR takes full advantage of existing regeneration on site, hence costs incurred in ANR for seedling production including site preparation and planting are eliminated, thereby, costs are lower. However, there may be some instances wherein planting with seedlings can be included in ANR; and

4. Community Participation or community-based participation. It has been proven that active community participation plays a vital role in promoting the sustainability of most development projects. Correspondingly, ANR implementation is likewise believed to be effective if it is widely supported by the communities.

Degraded Forest – a forest with decline productivity or ability to support natural ecosystems or types of agriculture

Grassland – area predominantly vegetated with grasses such as Imperata, Themeda, Saccharum spp., among others



ANR Basic Concepts, Principles, and Implementation Status: Lecture Materials

- ANR is a forest restoration approach popularized as early as the 80's
- Human protection and preservation of natural tree seedlings (wildlings) in forested areas
- Wildings are, in particular, protected from undergrowth & extremely flammable plants such as *Imperata* grass

Approaches to Forest Rehabilitation

PROGRAM

- Program for Forest Ecosystem Management (PROFEM)
- Family Approach
- Social Forestry
- Community Based Forest Management (CBFM)
- National Greening Program (NGP)

METHODS

- Reforestation
- Agroforestry
- Pioneer Climax Regeneration
- Accelerated Plant Succession
- Assisted Natural Regeneration (ANR)

ANR Basic Concepts, Principles, and Implementation Status: Lecture Materials

Related terms used in Forest Restoration Strategies

- ANR in Philippines
- Forest Restoration in Thailand
- Imitating nature in Brazil
- Accelerated Natural Regeneration

Sajise (2003)

Sajise 2003) simply describes it as

"Working with Nature"

ANR

- Described as "Simple, inexpensive and effective technique for converting *Imperata* areas to more productive forests

Ganz and Durst (2003-FAO RAPA)

ANR

a flexible approach to reforestation

1. Uses *natural regeneration* (NR) of forest trees .....

.. wildlings or naturally growing seedlings on site

2. Assists NR by preventing fire, pressing cogon (*Imperata*) and helping NR grows faster

3. Plant additional stocks when needed or wanted (augmentation or supplemental *planting*)

Natural Regeneration (NR)

- *"Pioneer"* tree species already growing in grasslands.

.... well established & adapted in the site

-ANR *stimulates* new NR from seeds coming from nearby forests

- Use of *existing* NR and enhancing *recruitment* of NR
- Avoids the concern of *matching species to the site*
- *Encouragement of NR* can help restore a *diverse natural native forest*

ANR Basic Concepts, Principles,
and Implementation Status: Lecture Materials

Applied in degraded forest & grasslands

- More particularly ....

Cogon
(*Imperata cylindrica*)

- Others grass species:
  - -*Miscanthus*
  - -*Themeda triandra*
  - -*Saccharum spontaneum*
  - -*Chrysopogon paniculatum*
  - -*Capillipedium parviflorum*

Other Areas for ANR

- Areas where enrichment planting is carried out, favoring natural & local species that are sources of premium wood or non-timber forest products such as rattan, resin, honey and other valuable products
- Areas where Agroforestry Production system is to be established

(Sajise, 2003)

Key elements of ANR in grasslands

- Control fire

- Suppress *Imperata* growth

- Restrict grazing

- Involve local

Why practice ANR?

- ANR promotes development of more diverse forests unlike conventional reforestation
- Have social, environmental and cost advantages

ANR Basic Concepts, Principles,
and Implementation Status: Lecture Materials

What are the potentials of ANR?

1. **Involve local people** in developing a forest to meet their needs which will likewise motivate them to conserve it.
2. **Reduce total reforestation costs** due to less site preparation, nursery establishment and enrichment planting
3. **Fit well with farmer's cropping** schedule since ANR concentrates on maintenance instead of planting
4. **Provide local employment**, if there is outside funding.
5. **Include species chosen by villagers**, thru enrichment planting

What are the potentials of ANR?

6. **Develop a forest with diverse native species** which provides habitat for diverse wildlife and reduces the risk of damage from pest and diseases
7. **Reclaim land for long term timber production** since it assists natural woody species that can be used as nurse trees for enrichment planting of high-value timber tree species
8. **Avoid soil erosion**. ANR include little or no cultivation. Pressed grass (cogon) continues to cover and protect the soil.
9. **Quickly restore forest cover** to watersheds. Forest to be developed is not only diverse but more importantly multistory with shrubs and herbaceous plants as undergrowth

Multistory forests control erosion and increase water infiltration. Restoration may take 2-7 yrs.

Benefits of ANR

- Equal or better than the traditional reforestation
- Cost of is much less than traditional reforestation
- Technologies are simple and easy to implement.
- Resulting forest is, biologically, highly diverse
- Benefits to local people are quite substantial.

Ganz and Durst (2003-FAO RAPA)

Advantages of ANR & other Forest Restoration strategies

- Faster & cheaper (no need for a nursery);
- Promotes and conserves biodiversity;
- Maintains the original vegetation stand and corresponding ecosystem functions;
- Maintains the integrity of the soil and involves minimum soil disturbance;
- Labor intensive and provides employment for the local community & promotes use of indigenous knowledge (IK);
- Can promote people empowerment if IK and traditional institutions are used and valued;
- Promotes hydrologic integrity and biotic functions.

(Sajise, 2003)

ANR Basic Concepts, Principles,
and Implementation Status: Lecture Materials

What are the constraints of ANR and recommended solutions?

1. Reluctance of people to participate ...

Better to plan the project with local people.

2. Conflicting laws and regulations: on land tenure

If communities are not legally allowed to own, enter, or manage their surrounding forests, then they will not cooperate with government on ANR's fire prevention and other maintenance activities

Negotiate land tenure as part of the project to give people long term interest in ANR

What are the constraints of ANR?

3. Poverty-

Local people must provide for their short term needs. Their time and possibly the ANR area is needed for food production.

Consider food and farming needs first. Negotiate pay for local people's labor if the project serves regional goals or subsidize...

4. Labor scarcity-

ANR is labor intensive. Labor often becomes limiting factor since ANR is usually applied in remote grassland areas with low population densities.

Encourage community participation

What are the constraints of ANR?

5. Inadequate extension staff

ANR activities are spread throughout the year, thus the project staff may not be able to supervise all activities and therefore must put more responsibility in the hands of the villagers.

Solution:

Train local people in ANR techniques; plan adequate resources for the training

What are the constraints of ANR?

6. Planning uncertainties

Total nursery costs, maintenance activities & production are difficult to predict due to uncertainties in the number of seedlings needed for enrichment planting, the time period for the natural woody species to close canopy, and the composition and volume of the secondary forest vegetation that will eventually emerge.

Conduct inventories of species present on the site. Acknowledge uncertainties in targets and budgets: plan flexibly. Monitor results and learn from experience

7. Fire, uncontrolled burning and grazing, firewood collection and charcoal making

The community should take the lead in solving such concerns/issues

ANR Basic Concepts, Principles,
and Implementation Status: Lecture Materials

Technological, bio-physical & socio-cultural dimensions of ANR

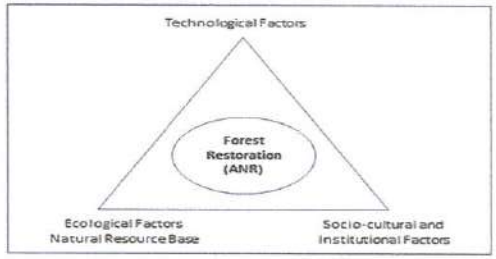


Figure 1: Conceptual Framework of ANR Strategy for forest rehabilitation

The 3-dimensions must work in a complementary manner to ensure success.
(Sajise, 2003)

Ecological principles as basis for ANR

- Basic assumptions inherent to plant community succession...

  1. ***Species replacement*** during succession occurs because ***populations tend to modify the environment***, making conditions ***less favorable for their own existence***, thus leading to ***progressive substitutions***; and

  2. **Climax** is the end point consisting of a plant community that is ***self-perpetuating*** and ***in equilibrium***.

Ecological Succession as basis for ANR

- **Ecological succession**
  -is an apparently orderly process of community changes, which is directional and often predictable.

e.g.
Plant succession or simply changes in plant community

Classification of Succession

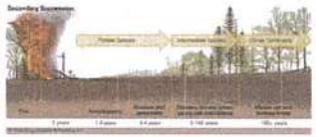
- **Primary succession**

- Begins on bare rock and reaches a climax

- **Secondary succession**

-Occurs after the disruptionof a previously well-developed community

- Mostly observed in the Tropics.



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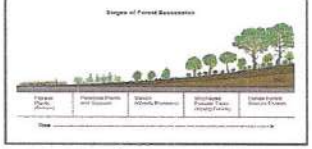
Types of succession

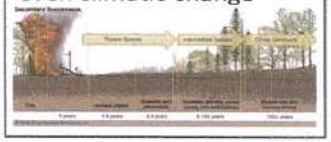
- **Autogenic**

-Changes are internally generated or self-propelled



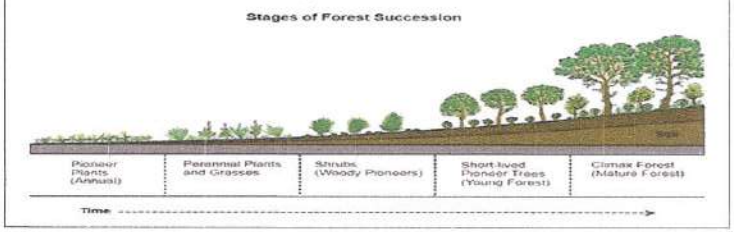
- **Allogenic**

-Changes are brought about by external factors such as fire, volcanic eruption, earthquakes & even climatic change



Stages in Plant Succession(PS)

- Seral Stages -Distinct & recognizable stages of PS
- Climax -Final steady state of PS e.g. TRF
  -The function of the prevailing climate or edaphic conditions.



Plant succession (PS) process

- **Depending on the level of degradation,**

PS will involve the replacement of:

annuals (have a relatively short life cycle)

by **perennials** and **pioneer or gap**

species (have longer life cycle)

then finally by **climax-**

based tree species

Biotic & Abiotic Interaction

- *Ecological succession (ES)* as an ecological process is not only confined to *changes in plant community composition* in an area.
- During such ES, interactions between and among biotic components as well as with their abiotic environment
- Biotic: plants, animals, microbial organisms & other living organisms
- Abiotic: Climatic, edaphic, physiographic conditions

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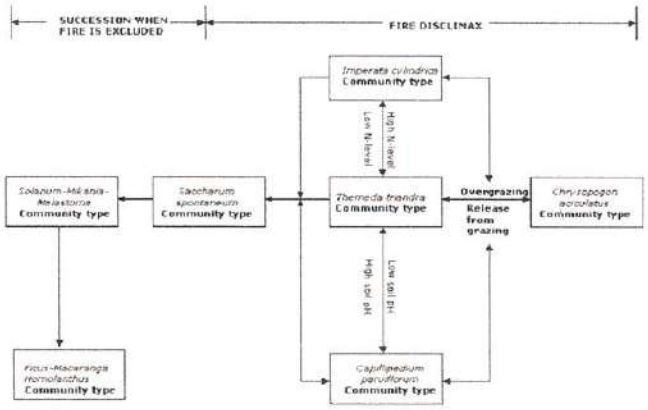
Disruptions in Plant Succession

Climax is not reached due to occurrence of dominant external factors:

- Grazing
- Burning (fire)
- Indiscriminate harvesting (firewood & charcoal)

Resultant plant community will persist i.e. very different from climatic or edaphic climax

Fire
Disclimax



Disruptions in Plant Succession

- ***Human induced***.... to enhance plant succession reach climatic or edaphic climax, the *human induced disturbances must be prevented. How?*

-Through ***human interventions***

Human Interventions

- The decision on the kind of human intervention be pursued depends on:
  - ➢Knowledge (both indigenous & formal)
  - ➢Technological availability
  - ➢Cultural beliefs & practices
  - ➢Economic incentives or disincentives
  - ➢Prevailing policy including the effectiveness of its implementation

ANR Basic Concepts, Principles,
and Implementation Status: Lecture Materials

CHALLENGES IN THE MAINSTREAMING OF ANR

- ANR method is not well recognized for large-scale restoration due to limited technical personnel with knowledge and skills to demonstrate the actual ANR application *in situ*.
- ANR is commonly confuse with other rehabilitation methods such as enrichment planting, timber stand improvement, etc.
- ANR method is a complex matter that needs a thorough understanding of the biophysical, technological, socio-economic and cultural condition prevailing in the area.

Status of ANR as an approach to rehabilitate grasslands

- Great opportunities to diversify strategies and to expand restoration work.
- Low cost & numerous benefits from ANR, can make ANR acceptable for application
- ANR techniques are still vastly under-appreciated & under-utilized
- Why? Few efforts have been made to promote ANR.

Ganz and Durst (2003-FAO RAPA)

Priority programs related to rehabilitation of degraded forests and grasslands

- Upland watershed development
- Developing biological diversity
- Amelioration of environmental problems: soil erosion, flooding & drought

- Providing forest products: fuelwood & fodder for local communities
- Reducing subsistence pressures on other forests

Source: Chokkalingam, 2001and Sajise (2003)

Efforts to promote ANR in ASIA-Pacific Region

- Regional office for ASIA-Pacific of UN-FAO

-Co-organized with DENR a Regional Workshop & Study Tour for ANR in 2002

With support from: IPGRI, CIFOR & ICRAF

Aim: promote ANR in the region thru:

-Discussion
-Exchange of information re: ANR application and implementation
-Formulating recommendations for broader ANR applications

Topic No. 3:

ANR Step by Step Procedure

Topic No. 3

ANR Step by Step Procedure

Assisted Natural Regeneration (ANR) is based on the principles of ecological succession and is best applied if there are patches of natural forest or trees mixed within the grassland. Its basic concept emphasizes protection and nurturing tree seedlings and saplings already growing on degraded sites, rather than establishment of entire new forest plantations.

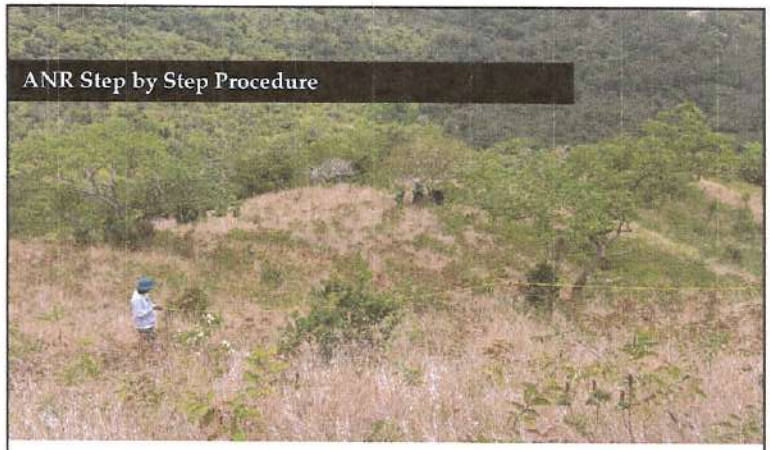
The Major preliminary step to implement ANR is to clarify its goals and objectives.

ANR Goals and Objectives:

- Must be clear
- Can be done by farmers & communities on their own
- Can be promoted and subsidized by a regional or national program re: watershed & timber production goals
- Broad goals need to be negotiated & agreed upon between community and assistance-providing institutions
- Must understand that not all goals are compatible, thus, misunderstanding must be avoided
- Specific objectives must be decided upon ahead of time

Once these goals and objectives have been clarified and agreement between the community and assisting institution have been reached, then application of ANR can proceed.

Goals/ Objectives	Community	Outside Program
Compatible long term goals	Get access to land for non-timber forest products, fuelwood and poles Get legal tenure to nearby or ancestral forest lands Practice shifting cultivation	Produce high-value timber for concessions Improve watershed conditions by reforesting and preventing fires Guide shifting cultivators to use *Imperata* grasslands & secondary forest land instead of primary forest land
Conflicting long term goals	Use the land later for shifting agriculture	Be sure that the area will be managed as forest in the future
Compatible short term goals	Get help while road access and marketing for farm and forest products	Provide roads to facilitate reforestation activities
Conflicting short term goals	Earn cash income for labor on the project	Keep project costs low by expecting villagers to invest labor in ANR in expectation of later products



A. Development of ANR Sites

Step 1: Site Validation, Assessment and Planning

Conduct actual ground survey of the identified area using GPS receiver; Prepare map of the area in a scale of 1:10,000 projected using GIS of ArcGIS, ArcView or Manifold software; and Take geotagged photos of the area (i.e. panoramic view or landscape area).

Criteria for selection must be formulated & followed:

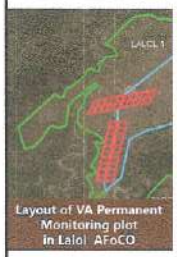
- Interest & acceptance of the community
- Community's goals and objectives can be achieved with ANR
- Community people's willingness to organize and be major actor in preventing fire, minimizing activities detrimental to the success of ANR like grazing, poaching, charcoal making & others
- Lands identified by the villagers
- Sites that match the ANR's goals and objectives or goals and objectives that match the sites
- Site is very accessible to the community

Better to know the site well:

- Understand the local people
- History of the area
- Local plant species
- Environmental conditions
  - ✓ Edaphic
  - ✓ Physiographic
  - ✓ Climatic
  - ✓ Etc.

ANR Step by Step Procedure

Site	Objectives
Areas available to villages where villagers have tenure or harvest rights	Produce forest and tree products for local and sale
Areas bordering villages or where shifting cultivation is practiced	Improve fallows Use land for AF in the future
Steep slopes	Reduce the threats Reduce flow of water from area during the rainy season
Areas subject to erosion because of regular burning of *Imperata* cover	Reduce soil erosion and siltation Reduce flow of water from area during rainy season
Land under timber concession	Establish nurse trees for timber species at low cost
Areas in or near national parks, game refuges and natural reserves	Restore native forest species Improve wildlife habitat



Layout of VA Permanent Monitoring plot in Lalol AFoCO

Layout of VA Permanent Monitoring Plot in Tapuso AFoCO DLS

Using the technology, google, GPS, Total Station and other surveying and mapping, the ANR site map can be easily prepared.

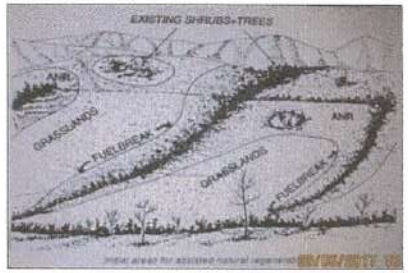
However, it is important that we encourage the villagers to do the community mapping showing the land uses including the ANR site.

Using the Vegetation Assessment (VA), areas can be divided into priority ANR site that needs augmentation or supplemental planting. This depends on the number of vegetation per hectare.

ANR Step by Step Procedure

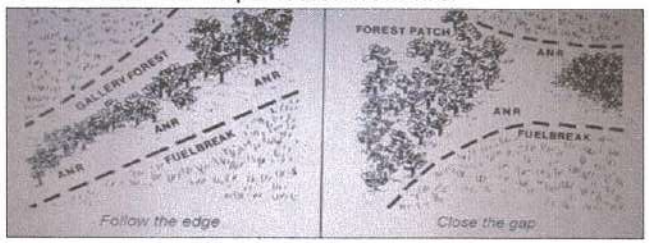
Priority ANR patches in the selected site

- Consider the stage of plant succession
- Segregate areas with >600 NRs from those with <600 NRs
- >600 NRs apply ANR
- < 600 NRs, may use conventional reforestation



Where to start ANR work?

In areas that can be protected from fire.



Consideration: labor available to monitor & control fire & to establish & maintain firebreaks

ANR Step by Step Procedure

In areas close to forest

- Gallery forest
- Forest Edges
- Forest patches

-Have seed bearing trees and seed dispersing wildlife

-Will increase the number of NR coming into the ANR area

-Soil and other environmental conditions are more favorable near these adjoining forests

Grasslands far from adjoining forests and have been burned and grazed for a long time do not have enough NR to make ANR successful

ANR for areas with ***advanced*** Plant Succession

- Areas with close canopy & trees are 2m tall or more,
  - -Use appropriate silvicultural treatments like Timber Stand Improvement (TSI)
  - -Aim: Improve the G&D of residuals or NR.

ANR Step by Step Procedure

ANR in areas where NRs are present, decide what areas to prioritize

Mixed brushland with scattered trees and grasses	Degraded grasslands with at least 200 wildings/ha
-Probably less fire risk	-Probably more fire risk
-Early success and confidence	-Longer time to reach objectives
-Shade tolerant enrichment planting	-Sun-loving enrichment plantings
-ANR gives moderate environmental benefits	-ANR gives high environmental benefits

Guidelines in choice of site, objectives and ANR type in areas w/ well spread NR regardless of slope

Woody plants/ha	Timber, watershed objectives	Nature reserves, areas near forest edges, wet sites not prone to fire
Less than 200/ ha (wider than 7x7 m)	Use conventional Refo or AF	Use conventional Refo or AF
200-600/ha (7x7 m to 4x4 m)	Use conventional Refo or AF	Use ANR with enrichment planting
600-700/ha (4.1 x 4.1 m to 3.8 x3.8 m)	Use ANR with enrichment planting so that canopy closure takes place w/n 3-5 yrs	Use ANR with enrichment planting so that canopy closure takes place w/n 3-5 yrs
Over 700/ha (narrower than 3.8 x 3.8m)	Use ANR for timber production; enrich by planting to achieve desired stocking	Use ANR

ANR Step by Step Procedure

A. Development of ANR Sites

Step 2: Locating and Marking of Regenerants or Wildlings

Walk through the area and look for regenerants or wildlings within and under the grasses; Mark the regenerants with stakes. The stakes should be about 1.5-3 cm in diameter and 1.5 m in height. Use stakes pruned from large trees. Do not cut existing vegetation to be used as stakes.

Locate and mark all existing woody wildlings hidden in the grass so that these can be protected during grass pressing & patch or ring clearing.

Two (2) workers to do the work:

- One is marking the wildlings with stake
- The other does the ring weeding or pressing the grass & other weeds using the foot

ANR Step by Step Procedure

A. Development of ANR Sites

Step 3: Ring Weeding

Remove all competing vegetation, such as grass and vines within at least one half meter radius around the marked regenerants. Hand cultivate around the tree and remove grass rhizomes. Slashing may be done also if it will be repeated often. Place the cut grasses into the base of the wildlings to protect it from direct exposure to sunlight and to serve as fertilizer over time. The initial ring weeding treatment should be implemented at the onset of the rainy season so that the liberated seedlings will have the full growing season of accelerated growth.

- Uproot weeds within ½ meters from the base of the wildlings: ferns, climbing vines, other weeds
- Avoid damage to stems & roots of wildlings
- Cultivate the soil around the wildlings
- Remove grass rhizomes, up to ½ meters diameter if labor is available

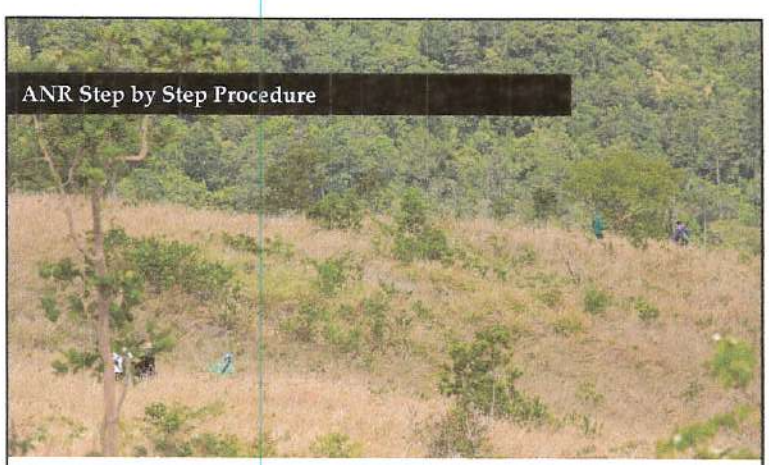
Step 4: Suppressing the Grasses

Suppress the surrounding grasses through pressing or lodging using wooden board. When pressing, loop the rope over your shoulder as you lift the board from one location to the next. The rope should be long enough to ensure that the board lays flat on the ground when you are standing upright. Adjust the length according to your height by knotting the rope. Pull the board up with the use of the ropes when moving forward. Lay the board on top of the grass and press down by stepping on it. Ensure that the surrounding regenerants will not be damaged. Pressing should be done at the beginning and end of the rainy season when the grass stems are soft.

- Herbicides can be considered if labor is limited

Purposes in ANR:

1. Reduce fuel hazard – press at the beginning of the dry season and whenever the grass is tall and dry
2. Control *Imperata* growth and reduce competition with the vegetation – press during the rainy season when leguminous cover crops & woody species emerge rapidly
3. Make it easier and faster to move around and work in the ANR area – press anytime of the year
4. Prepare enrichment planting areas – press before the planting season



B. Protection and Maintenance of Established ANR Site

Step 5: Establishment of Firelines or Firebreaks/Greenbreaks in Fire-Prone Areas

Establish firelines or firebreaks/ greenbreaks of at least 8 meters wide or about 10% of the total ANR area, strategically located on the boundary and/or top of ridges as barrier to slow or stop the progress of fire. All combustible materials from within the firelines or firebreaks/greenbreaks, such as grasses, should be removed. In the case of firebreaks/ greenbreaks, fire-resistant species may be planted such as kakawate, banana, abaca, coffee, malunggay, or cash crops which can provide immediate source of income or food.

- Most critical activity in ANR
- At least a month before dry season begins, make plan and organize a firefighting team; Review plans and roles of each member of the team
- During dry season, patrol the area to prevent fire occurrence

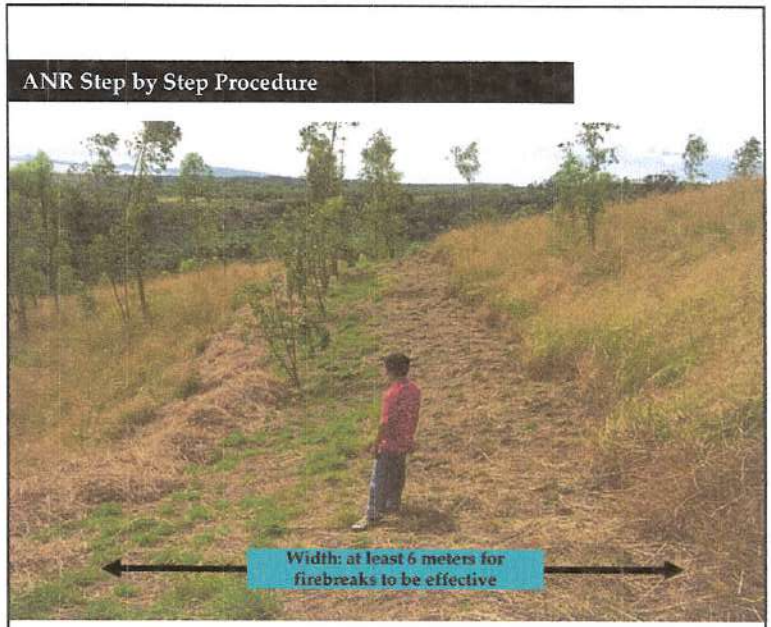
FUEL BREAKS

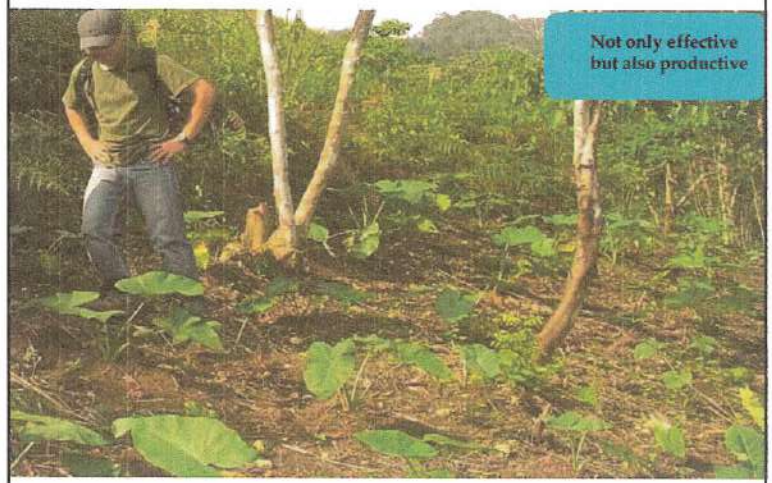
Size of each block with fuel breaks depends on:

- **Terrain** – the flatter the area, the slower the fire to spread than on slopes, thus blocks are larger
- **Amount of volatile material** – the more flammable fuel, the smaller will be the block

General Rule: 4 blocks/ha for Philippine grasslands

- Priority ANR area follows the forest edges which should be bounded by the fuel break
- If there are gaps between forest patches, better close the gaps, with fuel breaks on both sides of the forest edges





ANR Step by Step Procedure

B. Protection and Maintenance of Established ANR Site

Step 6: Continue Ring Weeding and Pressing of Grasses

Conduct two to three passes of ring weeding and pressing of grasses every year when grasses begin to compete with wildlings for light and nutrients. During weeding and pressing, watch for new regenerants to be marked and ring weeded.

- During rainy season, do and repeat the operations at least every 1 ½ months
- During dry season, do pressing usually every 2-3 months if grass begins to grow tall
- Mark new wildlings as they come into the ANR area especially along forest edges. Similarly apply cultural practices, as needed

Step 7: Conduct augmentation (enrichment) planting with indigenous wildlings found within or nearby vicinities if there is not enough natural regeneration that survived in the area

The objectives of enrichment planting are: (1) Fill gaps to shade out *Imperata* and to convert the whole area to forest; (2) Increase density so that the canopy will close sooner; (3) Add trees of species valued for timber, fruit, nuts or other products; and (4) Add Nitrogen-fixing species as an improved fallow.

Plants for enrichment planting can include cover crops, orchard trees, and plantation trees, including nurse trees.

Step 8: Conduct patrol work and monitoring activities around the ANR area

DO NOT....

- CULTIVATION OR PLOWING – this will expose the land to erosion on steep slopes. It may also destroy existing woody plants.
- CONTROLLED BURNING – makes regrowth of *Imperata* more rapid. Woody species may killed or damaged. Soil is exposed to erosion.
- BRUSHING/SLASHING – takes more work than pressing. It stimulates more regrowth of *Imperata*.

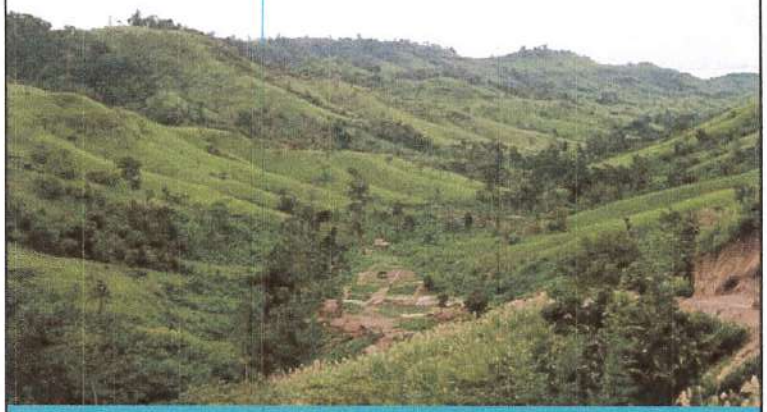
ANR Step by Step Procedure

Progress of ANR after 2 years of implementation

Progress of ANR after >3 years of implementation

Other maintenance & protection activities:

- **Protect the area from grazing** – fence the area or assign guards to protect the site from such activity. However, animals may help in seed dispersal. Make a 1 year test and determine whether grazing can increase vegetation or otherwise.
- **Press grass near forests** – temperature, moisture and soils are more favorable than in open areas. It stimulate seed germination.
- **Pull down or slash vines** – to encourage to produce fruits/seeds.
- **Protect wildlife** – educate the community. Birds, bats, and wild pigs can carry seeds into the grasslands.
- **Apply fertilizer** – it depends on species, size of vegetation, soil, fire risk, plantation value, etc.
- **Do thinning** – thin the one that is smaller, unhealthy or less desirable species.
- **Thin and transplant** – during rainy season, transplant healthy thinned plant in nearby areas with similar soil, light & moisture.



Topic No. 4:

Vegetation (Natural Regeneration) Assessment for ANR

Vegetation Assessment (VA) training module will primarily delve on the procedures of the conduct of VA that will be done in three phases. The main aim is to determine the effects of ANR on the restoration/rehabilitation of the grassland area into a forest as manifested by the changes in vegetation in terms of growth and development of existing Natural Regeneration (NR) and addition of NR through species recruitment process. The 3 phases of VA are: before the implementation of ANR (BI-ANR); during ANR Implementation (D-ANR-I) and after ANR implementation (A-ANR-I).

BI-ANR is a basic requirement in order to have baseline information of the natural regeneration (wildlings which will include the natural growing seedlings and wildlings of forest tree species in the area). Prior to the conduct of VA-BI-ANR, information on the biological (vegetation which will include forest patches, gallery and sporadically distributed remnant trees and pioneers; fauna like birds; etc), physical (climate, soil, physiography), social conditions and other relevant information are necessary not only in the conduct of the three phases of VA but in outlining the ANR approaches/methodologies that are most suited to the site. These biophysical and social factors will be emphasized during the training since the outcome of ANR implementation will be influenced by them. The procedures in the conduct of VA-BI-ANR will be discussed and demonstrated thoroughly.

The protocol for VA like transect lines and plots will be introduced during the training. The density of transect lines and plots will be determined based on the intensity of sampling and configuration of the site. The transect lines and plots, in this case, will be established permanently in the site since the progress and outcome of ANR implementation during and after ANR implementation will be continuously monitored and analysed. Procedures on geotagging/geo-referencing of each plot along transect line and locating and marking of the NR in the plot will be included in the training. Tally sheets will be used to record the species and attributes (diameter at base of trunk and height) of the NR.

The conduct of VA D-ANR-I (i.e., 1 ½ years after) will use the same transect lines and plots. Tally sheets indicating the original list of species and attributes of NR will be used to monitor the growth in diameter and height. In addition, recruitment or coming in of NR (their species and attributes) into the site will be recorded in the tally sheet. This VA during this stage of ANR implementation will be important to determine the progress of ANR implementation as indicated in the growth and development of existing NR and addition or recruitment of NR.

The conduct of VA A-ANR-I (i.e., 3 years after) will likewise use the same transect lines and plots and the tally sheets for monitoring the growth and development of the existing species and recruits in VA D-ANR-I. This VA will be the culminating activity that will finally determine the effects of ANR implementation.

VA will not be complete unless data are collated and analysed. The training will include the methodologies in data analysis. Diversity, frequency, density, dominance and other ecological indicators of vegetation that can be applied for NR data analysis will be used. Established formula for each will be presented during the training. More importantly, analysis of the growth and development of existing NR and recruits will be included in the training. Preparation of chart maps and reports on VA during the 3 stages of ANR implementation will be provided to the participants.

Natural Regeneration *refers to naturally growing seedlings/saplings, (wildlings) whether in primary, secondary, abandoned/denuded forests or grasslands.*

Vegetation (Natural Regeneration) Assessment for ANR

Sampling

OBJECTIVES

1. Identify Species, Density & Distribution of NR in proposed ANR site
2. Determine the ANR approach based on the information gathered in Objective No.1
3. Assess ANR effects on restoration of the site based on Growth & Development of the existing NR and recruitment of additional NR during and after ANR.

PROCEDURES

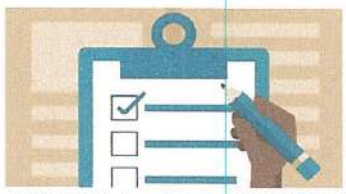
1. Select/design sampling method
2. Establishment of plots and transects
3. Vegetation survey
4. Data encoding and storage
5. Data analysis and reporting
6. Monitoring

Vegetation (Natural Regeneration) Assessment for ANR

Sampling

FACTORS AFFECTING SAMPLING PROCEDURE:

1. Project & Sampling Objectives



Ref: http://ref.data.fao.org/photo?entryId=1bdfcbf3-f71d-4733-a937-22ca872dbe3c

2. Site Homogeneity

3. Budget

Ref: https://image.shutterstock.com/image-vector/cartoon-vector-illustration-cash-coins-260nw-45014608.jpg

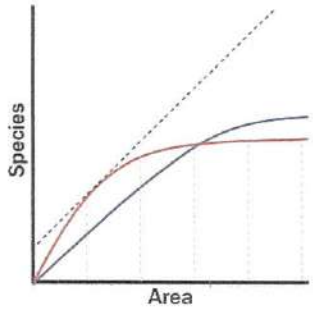
4. Logistics

Ref: http://lbxsolutions.com/wp-content/uploads/2017/05/Inbound-Logistics.jpg

Vegetation (Natural Regeneration) Assessment for ANR

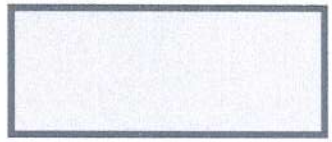
Sampling

SAMPLING INTENSITY - Size of the sample area e.g. Sample size of a 30-ha area at a 10% sampling intensity is 3 ha



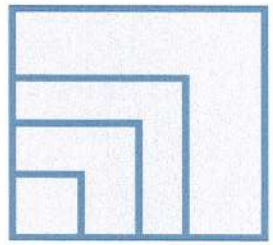
PLOT TYPE:

Shape – Rectangular or Square



Size:

- 100 x 100
- 50 x 50
- 20 x 20
- 20 x 50
- 10 x 25



Vegetation (Natural Regeneration) Assessment for ANR

Sampling

3-1 ha plots distributed in the area capturing the physiological feature i.e., top, middle, and low portion of the slope

Plots laid out along the transects established along the slope

10% sampling – 3 has for 30 has thus, for 20x20m = 75 plots and for 10x25m = 120 plots will be needed.

Vegetation (Natural Regeneration) Assessment for ANR

Plot Establishment

Transect Lines and Plots

Transect lines

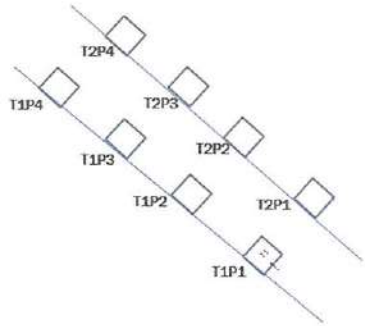
- Must be laid out not so near to the ANR boundary
- Must be equally spaced
- Number will be dependent on the length & width of the ANR site and the number of plots for 10% sampling

Plots

- Must be distributed equally along the transect lines
- The number of plots on the transect line will be dependent on length of the transect line and on the number of the plots required for 10% sampling

Transect & Plots must be permanent

- Since the intention is to monitor the effect of ANR, each plot should be geo-tagged.
- Transects and plots are chronologically numbered.
- Durable markers must be installed.



Vegetation (Natural Regeneration) Assessment for ANR

Plot Establishment

Locating and Marking NR (Wildlings)

- In each plot, woody plants including wildlings and saplings (15-200cm tall) will be located and marked;
- Clump of wildlings within $1m^2$ is counted as one plant;
- Markers must be visible and durable to last for the 3-yr monitoring period;
- The wildlings and saplings will be numbered consecutively as indicated below:

Transect 1 Plot No. 1

ID No.	Species	Dia at base	Ht	Remarks
P11				
P12				
P13				
P14				
P15				
P1n				
P1total				

Transect 1 Plot No. 2

ID No.	Species	Dia at base	Ht	Remarks
P21				
P22				
P23				
P24				
P25				
P2n				
P1total				

Vegetation (Natural Regeneration) Assessment for ANR

Advantages of transects and small plots for sampling

- Can be used to segregate the areas with >600 NRs from those with <600 NRs
- Provide info for the kind of ANR methods to use.
- e.g., -simple continuous pressing or may need augmentation planting

Data Analysis of Natural Regeneration is a result of locating and mapping of the individual trees of the species.

Frequency = No. of sampling units in which a species occurs / Total number of sampled units established

Density = Total no. of individuals in all sampling units / Total number of sampled units established

Abundance = Total No. of individuals in all sampling units / Total number of sampled units established

Vegetation (Natural Regeneration) Assessment for ANR

Monitoring of growth & development of NR during ANR implementation

- Growth & development can be monitored either monthly or quarterly
- Similar data sheet bearing the original dimeter and height as presented above will be used
- Current diameter and height will be recorded to find out if there is an improvement in growth & development due to ANR

Growth & Development Monitoring

Monthly: _____ or Quarterly _____

Transect 1 Plot No. 1

ID No.	Species	Dia at base 1	2	3	4	Ht 1	2	3	4	Remarks
P11										
P12										
P13										
P14										
P15										
P1n										
P1total										

Monthly: _____ or Quarterly _____

Transect 1 Plot No. 2

ID No.	Species	Dia at base 1	2	3	4	Ht 1	2	3	4	Remarks
P21										
P22										
P23										
P24										
P25										
P2n										
P2total										

Vegetation (Natural Regeneration) Assessment for ANR

Monitoring of growth & development of NR during ANR implementation

Growth & Development Monitoring

Year 1

Transect 1 Summary

Plot No.	Species	Increase in dia	Increase in Ht	Remarks
P1	Sp 1			
P1 Sp 1 total				
P1	Sp 2			
P1 Sp2 total				
P1	Sp n			
P1 Sp n total				
P1 all spp total				
P2	Sp 1			
P2 Sp 1 total				
P2	Sp 2			
P2 Sp2 total				
P2	Sp n			
P2 Sp n total				
P2 all spp total				

Vegetation (Natural Regeneration) Assessment for ANR

Species recruitment during ANR

Some seeds dispersed by birds & other animals, wind & other agents from adjoining patch, gallery forests or remnant trees (climax or pioneer) may:

- germinate and become an additional NR in the area;
- their location will be marked and will likewise be given an ID no. as species recruit 1, 2, 3; and
- their species, diameter and height will be recorded and monitored

See Table below:

Transect 1 Plot No. 1

ID No.	Species	Dia at base	Ht	Remarks
P1SR1				
P1SR2				
P1SR3				
P1SR4				
P1SR5				
P1SRn				
P1SRtotal				

Transect 1 Plot No. 2

ID No.	Species	Dia at base	Ht	Remarks
P2SR1				
P2SR2				
P2SR3				
P2SR4				
P2SR5				
P2SRn				
P1SRtotal				

Vegetation (Natural Regeneration) Assessment for ANR

Species recruitment during ANR

Species recruitment

Transect 1 Summary

Plot No.	Species	Ave Dia at base	Ave Ht	Total	Remarks
P1	SpR 1				
P1 SpR 1 total					
P1	SpR 2				
P1 SpR2 total					
P1	SpR n				
P1 SpR n total					
P1 all spp Rtotal					
P2	SpR 1				
P2 Sp R1 total					
P2	SpR 2				
P2 Sp2R total					
P2	SpR n				
P2 Sp nR total					
P2 all spp Rtotal					

Species Recruitment

Summary for all transect and plots and species

Species R	Total	Ave Dia at base	Ave Ht	Total/ha (no of individuals x 10000/plot size m²)
1				
2				
3 n				
Total				

Vegetation (Natural Regeneration) Assessment for ANR

Species recruitment during ANR

Monitoring (Growth & Development)

- Growth & development can be monitored either monthly or quarterly
- Similar data sheet bearing the original dimeter and height as presented above will be used
- Current diameter and height will be recorded to find out if there is an improvement in growth & development due to ANR

Similar analysis will be used for analysis result of locating and mapping of the individual NR species recruits

Frequency = $\frac{\text{No. of sampling units in which a species occurs}}{\text{Total number of sampled units established}}$

Density = $\frac{\text{Total no. of individuals in all sampling units}}{\text{Total number of sampled units established}}$

Abundance = $\frac{\text{Total No. of individuals in all sampling units}}{\text{Total number of sampled units established}}$

Topic No. 5 Re-entry Action Planning

To sustain the gains of the capacity building activity, participants shall be required to prepare an action plan on how the learnings shall be implemented in their respective area of assignments. The plan may include various activities such as re-echo trainings, establishment of ANR demonstration plot within their respective regions and actual development of an ANR site. The specific activities and corresponding estimated budgetary requirements shall likewise be specified in the re-entry plan.

Activity	Timeline	Responsible Office/ Person	Estimated Budgetary Requirement

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PROJECT COMPLETION REPORT
SINGAPORE

AFoCo Regional Project entitled "Capacity Building on the Application of Landscape Approach to Support the Sustainable Natural Resources Management in Brunei Darussalam, Indonesia, Philippines and Singapore"

<Implementing Agency Profile>

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Contents

Summary

Singapore completed two activities through the duration of the AFoCo Regional Project entitled “Capacity Building on the Application of Landscape Approach to Support the Sustainable Natural Resources Management in Brunei Darussalam, Indonesia, Philippines and Singapore” (herewith known as the BIPS Project), hosting a Workshop on Urban Forestry and Biodiversity Conservation, and holding a Cross-Country Visit to habitat enhancement sites in Singapore. These activities aimed to develop capabilities in urban forest management and biodiversity conservation, discussed various perspectives and issues related to urban forest management faced by ASEAN Member States (AMS), and showcased Singapore’s habitat enhancement sites so as to offer perspectives of habitat enhancement, forest restoration and rehabilitation efforts within highly urbanized environments. The activities were carried out by the National Parks Board (NParks) as Implementing Agency of BIPS Project. NParks is the lead agency providing and enhancing the greenery and nature conservation in Singapore. We also hosted a Special Project Coordination Committee meeting back-to-back with the Cross-Country Visit to Singapore to discuss updates and resolve outstanding issues and concerns in relation to the BIPS Project.

The sharing of experiences during the activities organized by Singapore, which included unique country-specific problems and considerations, benefited all parties – including host country Singapore, NParks’ nature reserve and parks managers, and participants from the different AMS who attended the Workshop on Urban Forestry and Biodiversity Conservation as well as the Cross-Country Visit.

All activities went according to plan. An excess of slightly over SGD15,000 over the budget remains in our account at the end of the BIPS Project; and this remaining sum will be returned to the Secretariat of the Asian Forest Cooperation Organization (AFoCO Secretariat).

1. Introduction

Singapore's participation in the AFoCo Regional Project entitled "Capacity Building on the Application of Landscape Approach to Support the Sustainable Natural Resources Management in Brunei Darussalam, Indonesia, Philippines and Singapore" (herewith known as the BIPS Project) was to hold a Workshop on Urban Forestry and Biodiversity Conservation. This workshop took place between 14 and 16 February 2017. Although the workshop was targeted for Implementing Countries (namely Brunei Darussalam, Indonesia and the Philippines) to the BIPS Project, it was also extended to other ASEAN Member States (AMS) in order to benefit all members. Altogether, 24 participants from nine AMS attended and participated in the workshop.

At the 1st Project Coordination Committee meeting in December 2017, held in Manila, Philippines, it was proposed that Singapore conducts a second activity to fully utilize the allocated budget. In this respect, Singapore agreed to host a Cross-Country Visit (CCV) to showcase Singapore's experience in habitat enhancement efforts. The CCV was conducted on 26 and 27 February 2019, where 20 participants from the BIPS Project's Implementing Countries and Secretariat of the Asian Forest Cooperation Organization (AFoCO Secretariat) were brought to various habitat enhancement sites representing different ecosystems managed by the National Parks Board (NParks) in Singapore.

During the 2nd Project Coordination Committee in December 2018, Singapore also confirmed that it could host a Special Project Coordination Committee meeting back to back with the Cross-Country Visit. At this meeting, held on 28 February 2019, representatives from the Implementing ASEAN Member States of the Project and Secretariat of the Asian Forest Cooperation Organization (AFoCO) deliberated on issues and concerns pertaining to the finalization of the BIPS Project.

2. Background and Objectives

The objectives of the Workshop on Urban Forestry and Biodiversity Conservation were as follows:

(i) To develop capabilities in urban forest management and biodiversity conservation, using case studies from technical officers from Singapore.

(ii) To understand various perspectives and issues related to urban forest management faced by ASEAN Member States.

The objective of the Cross-Country Visit was:

(i) To showcase and share with other Implementing Countries some of Singapore's biodiversity conservation efforts to restore, manage and enhance Singapore's urban landscapes and ecosystems.

3. Project Management

3.1. Management structure

NParks is the focal agency for AFoCo/AFoCO-related issues, and the implementing body for the activities under the BIPS Project in Singapore. Implementation of activities were carried out by the Project Manager. No additional staff were hired for the implementation of activities under this project.

3.2. Work plan and schedule

Output and Activity	Outputs/Key Activities	Q1 FY2016	Q2 FY2016	Q3 FY2016	Q4 FY2016	Q1 FY2017	Q2 FY2017	Q3 FY2017	Q4 FY2017	Q1 FY2018	Q2 FY2018	Q3 FY2018	Q4 FY2018
A.	Inception Meeting among implementing countries												
B.	Establishment and maintenance of demonstration plots/learning sites												
C.	Capacity Building Activities												
D.	Trainers Training on Urban Forestry and Biodiversity Conservation												
E.	Regional Workshop for the sharing of experiences and lessons learned among implementing AMS countries												
F.	Visit to selected Participating AMS												
G	Project Management and Supervision												
G.1.	Staff Resources (Allowance /Honorarium of Project Staff)												
G.2.	Management Support for Operations												
G.3	Project Coordination Committee Meeting												
G.4	External Audit												
G.5	Contingency												

Figure 1 Table showing activities organized by Singapore in the duration of the project. Note: Q4FY2016 refers to the period of January to March 2017. The Workshop on Urban Forestry and Biodiversity Conservation took place in February 2017, which falls under Q4FY2016. Similarly, the CCV in Singapore was conducted in February 2019, which falls under Q4FY2018.

4. Performance

4.1. Planned vs. actual implementation

The activities planned for Singapore under the BIPS Project took place according to plan.

4.2. Planned vs. actual budget

Budget	Amount in USD
Initial Allocated Budget prior to implementation of project	100,086.00
Revised Budget Reflected in Jan 2019 Work and Budget Plan	75,017.00
Total Sum Disbursed to Singapore over two tranches	72,478.00
Surplus Budget	~11,212.00

At the start of the BIPS Project, the budgeted amount allocated to Singapore was USD 100,086.00. However, there were revisions made to the budgets following consultations with lead country Philippines and AFoCO Secretariat. The budgeted amount was finally revised to USD 75,017, which was also the amount reflected in Singapore's latest Work and Budget Plan of January 2019. Disbursement of funds was provided to Singapore over two tranches. The first amount, transferred in December 2016, amounted to USD 54,997, and the second, in February 2019, amounted to USD 17,481. This amounts to a total of USD 72,478. The total sum disbursed was lower than the revised budgeted amount due to a further revision in funds requested.

Upon completion of the project, surplus allocated funds for Singapore amounted to SGD15,496.86 (about USD 11,212 – based on NPark's internal exchange rate of 1.38208 for USD for the month of October 2019, final amount to be confirmed). This sum will be returned to the AFoCO Secretariat. Underutilization of the budget was due in part to being able to find more affordable options for meeting venues and transport than what was budgeted for, as well as contingency sums that were budgeted for but not utilized. NParks also has a standard policy to issue a fixed amount of subsistence allowance for any travels as stipulated by the Government of Singapore. Hence, any money received in the form of subsistence allowance from host countries for attendance in project coordination committee meetings or from cross-country visits to Brunei Darussalam, Indonesia and Philippines was credited back to account set up for the BIPS Project.

4.3. Implementation issues and constraints

Singapore's position in the BIPS Project is rather unique and differ from that of the other Implementing Countries. Unlike the case of Brunei Darussalam, Indonesia and the Philippines, Singapore had no demonstration plots, and our main role was that of capacity building and

showcasing Singapore's experience on forest rehabilitation and restoration mainly through habitat enhancement efforts.

5. Impact Analysis

5.1. Outputs and outcomes

The Workshop on Urban Forestry and Biodiversity Conservation was attended by 24 participants. Singapore extended the workshop not only to Implementing Countries under the BIPS Project but also to other AMS: Cambodia, Lao PDR, Malaysia, Myanmar, Thailand, and Vietnam. Unfortunately, Malaysia was not able to participate in the event.

At the workshop, Singapore offered our experiences in urban forest management through presentations by officials from the various departments of NParks as the government agency in Singapore that manages the nature reserves, urban parks and streetscapes, as well as the Singapore Botanic Gardens (SBG), which is Singapore's only UNESCO World Heritage Site. We also included a segment on research projects from the Centre for Urban Greenery and Ecology (CUGE), as well as taxonomic studies conducted by SBG, all of which contribute towards developing this city-state as a biophilic city. Participants from the Implementing Countries (Brunei Darussalam, Indonesia, and the Philippines) were given the chance to present on urban biodiversity conservation from the context of their respective countries or cities. Other AMS participating also provided relevant inputs on their country's experience on the same thematic.

The workshop also consisted of several field trips, where site managers of SBG, Bukit Timah Nature Reserve, Bishan-Ang Mo Kio Park and Pasir Ris Park gave an overview of operational concerns with the management of the sites. On the third day, participants gathered together to conduct an urban master planning exercise of a theoretical city, using skills and knowledge they had gained over the previous days, and inculcating elements of nature in the urban design.

The Cross-Country Visit to Singapore, attended by 20 participants from the three Implementing Countries and a representative from the AFoCO Secretariat, involved site visits to several habitat enhancement sites with different ecosystems in Singapore, namely Kranji Marshes, Marsiling Park, Tyersall Learning Forest, and Pulau Ubin. Managers from each of these sites explained the history and cultural values of the area, the reasons for habitat enhancement, and the targets for each of their habitat enhancement projects, which include looking at biodiversity improvements of both fauna and flora of the sites. The participants were

then given a guided tour through the habitat enhancement sites.

5.2. Internal & external impacts

During the workshop, each country was asked to prepare a presentation on urban forestry and biodiversity conservation in their home country. The sharing of experiences, including unique problems and considerations, from each participants' country or city added depth to discussions and benefited all participants of the workshop.

The Cross-Country Visit catered for discussions among park managers and participants, which allowed both parks managers and participants to gain insights on the management of urban habitats.

5.3. Local applicability

The Cross-Country Visits organized by Brunei Darussalam, Indonesia, and the Philippines were useful in developing capacity for Singapore participants. The activities carried out at the respective demonstration plots of each Implementing Countries gave an insight into the various challenges and constraints as well as community partnership that each country has. The activities held by Singapore also created the opportunity for active discussion on best practices in the management of restored sites, and gave NParks' staff the opportunity to interact with many participants with experience from the other countries.

5.4. Sustainability

Singapore did not establish any demonstration plot for the BIPS Project, and our main contribution was towards capacity building on urban forestry and biodiversity conservation in an urban landscape. As such, there may be potential of extending our experiences on management of vegetation in urban landscapes at future capacity-building platforms.

6. Challenges and Lessons Learned

6.1. Project formulation aspect

The formulation of the BIPS Project took much longer than expected. Due to issues during the formulation phase, the BIPS Project was shelved after being formed, then restored again with

some amendments. Given its size and land constraints, Singapore was unable to propose any demonstration plots, as this would greatly limit its scope. As such, Singapore maintained its role and participation solely on the provision of capacity building.

6.2. Operational aspect

Due to very strict financial and procurement processes in accordance to the policies of the Singapore government, the planning of activities required very strict timelines and restrictions. For example, registration from participants had to be received early in order to be able to make necessary logistical arrangements including the arrangement for the disbursement of funds to participating countries. Participants from Singapore were also not allowed to keep any subsistence allowances received by host countries. Any amount received were surrendered to NParks' Finance department. NParks issues a fixed amount of subsistence allowance stipulated by the Government of Singapore, and all money received from host countries were credited back to Singapore's account set up for the BIPS Project.

7. Conclusion and Recommendations

Singapore had a varied role in this Project compared to the other Implementing Countries. With no demonstration plots, Singapore's main role was on capacity building, through the hosting of a Workshop on Urban Forestry and Biodiversity Conservation, and subsequently an additional activity through a Cross-Country Visit to habitat enhancement sites.

There were no major limitations in implementing Singapore's part of the project. Activities organized by Singapore were useful platforms for learning, both for the Implementing Countries of the BIPS Project, as well as staff of NParks.

We thank all the people who have helped, especially Lead Country Philippines, and to the other Implementing Countries Brunei Darussalam and Indonesia for all their contributions towards the success of this BIPS Project. We are also grateful to AFoCO Secretariat for their relentless and proactive efforts in ensuring that the activities carried out for the BIPS Project were according to plan. This regional project showcased the excellent working relationship amongst our ASEAN Member States, focusing on forest rehabilitation and restoration towards a Green Asia.

8. Photo records

Figure 2: Participants of the Workshop on Urban Forestry and Biodiversity Conservation held on 14-16 February 2017.

Figure 3: Participants at Pasir Ris Nature Area during the field trip segment of the Workshop on Urban Forestry and Biodiversity Conservation.

Figure 4: Participants presenting group work during the Workshop on Urban Forestry and Biodiversity Conservation.

Figure 5: Participants visiting Marsiling Park, one of the habitat enhancement sites, during the Cross-Country Visit conducted from 26-27 February 2019. The city park focused on the restoration of its mangrove vegetation and surrounding terrestrial greenery to elevate visitors' experience in a managed landscaped.

Figure 6: Participants at a site visit to Kranji Marshes, another location in Singapore with ongoing habitat enhancement efforts, during the Cross-Country Visit.

10. Appendices

[Note: we will attach our financial and budget reports as appendices to this document].