Asia-Pacific Network for Sustainable Forest Management and Rehabilitation

Integrated Forest Ecosystem Management Planning and Demonstration Project in Greater Mekong Sub-region (Myanmar)

PROJECT PROPOSAL

[Forest Research Institute]

January 2018

Asia-Pacific Network for Sustainable Forest Management and Rehabilitation

Project title	**Integrated Forest Ecosystem Management Planning and Demonstration Project in Greater Mekong Sub-region (**Myanmar**)**	
Supervision department	Forest Department	
Executive agency	Forest Research Institute	
Project period	Jan. 2017 - Dec. 2021 60 months	
Project location: Paung Laung Reserved Forest, Pin Laung Township, Shan State and Forest Research Institute Compound, Yezin, Naypyitaw		
Total budget(US$)	**APFNet(US$)**	**Counterpart Contribution (US$)**
1,412,477	1,120,807	291,670

Outline of the Project:

The project site of integrated watershed management is located at Paung Laung Reserved Forest, Pin Laung Township, Shan State and Arboretum will be established in Forest Research Institute compound, Yezin, Naypyitaw. Planning area of the project is 50 ha watershed agroforestry plantation and 25 ha of Arboretum. The total budget is US$ 1,412,477, among which, APFNet's grant is US$ 1,120,807 and counterpart contribution from FRI is US$ 291,670.

Project Goal:

The overall goal of the project is to conserve forest germplasm resources and rehabilitate forest ecological services and forest productivity through establishment of arboretum in Forest Research Institute and implementing integrated watershed forest management in Palaung watershed area, Southern Shan State in Myanmar, so as to contribute to sustainable forest management in the Greater Mekong Sub-region.

Project Objectives:

(1) To conserve and improve forest germplasm resources though construction of Arboretum in FRI;

(2) To demonstrate integrated watershed management practice in Paung Luang Watershed;

(3) To enhance the capacity and knowledge of local community, local government and staff through capacity building programs, which will make sure to sustain the management activities after the project is accomplished.

Project Outputs:

- Output 1 "Construction Plan of FRI Arboretum" formulated
- Output 2 Forest germplasm resources introduction and breeding nursery constructed
- Output 3 9ha native forest ecological conservation zone established
- Output 4 16ha thematic gardens (plantation and exhibition zone) established
- Output 5 Accessory facilities for arboretum constructed
- Output 6 Integrated watershed management plan formulated
- Output 7 Demonstration of integrated watershed management practices established
- Output 8 An integrated forest management technology assembled and a technical

handbook formulated

- Output 9 Training course for project stakeholders
- Output 10 International exchange on sustainable forest management conducted

Abbreviations and acronym

APFNet	Asia-Pacific Network for Sustainable Forest Management and Rehabilitation
FRI	Forest Research Institute
FD	Forest Department

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1. Background and Rationale

1.1 Background

The target region is located in the eco-region of Lanchang-Mekong River Basin in Great Mekong Sub-region. The area is situated in the central part of Myanmar, consisting of two townships namely Pyninmana and Pinlaung. It encompasses ranges of Shan plateau, undulated with steep slopes, 153 meter to 1677 meters above sea level. The region has a tropic and sub-tropic monsoon mountainous climate. Commercial exploitation of non-timber forest products are widely found in the region. Major livelihoods are found to be highly dependent on the forest which is charcoal making, shifting cultivation and home-garden.

The following policies of Myanmar are synergies with the Project's goals and activities.

Forest policy: Forest Policy was adopted in 1995 in order to formalize the commitment of the Government for ensuring the sustainable development of the forest resource both for environmental and economic purposes. The Policy identifies six imperatives, namely Protection, Sustainability, Basic Needs, Efficiency, Participation, and Public Awareness. Forest policy highlights an intervention should adequately address the socio-economic issues of the people and political environment. It focuses on ensuring ecological balance, environmental stability and enhancing the contribution of the forestry sector towards socio-economic development of Myanmar in a sustainable manner.

National Watershed Management Policy: Forest Department set up a special division namely watershed management division in order to effectively manage the forests in watershed areas of the country. The division is implementing watershed management activities with the National watershed management policy. In order to implement the policy, the following main activities are developed to be carried out:

(1) Formulation of a National Watershed Management Programme and Establishment of a Coordinating Mechanism

(2) Effective Extension and Incentive Schemes

(3) Professional Staff and Training

(4) Research

(5) Database and Monitoring

(6) Stakeholders Awareness and Participation

(7) Appropriate land use.

Strategies for Implementation of the Watershed Policy at the National Level have been set up and the mentioned activities are currently being implemented through developed strategies.

National Forestry Master Plan (2001-02 to 2030-31): In 1998, Forest Department initiated to develop National Forestry Master Plan for 30 years period. The plan was formulated for the purpose of country's economic development, livelihood improvement of rural communities and poverty alleviation. To fulfill the purposes, the plan focuses on

establishment of forest plantations, community forestry development, energy supply from forest, non-timber forest products production and capacity development through extension activities. According to the plan, Permanent Forest Estate (PFE) which are Reserved Forests and Protected Public Forests are targeted to expand up to 30% of the country by the end of 2030.

Myanmar Reforestation and Rehabilitation Programme (MRRP): As Forest Department realized massive deforestation and forest degradation throughout the country, Myanmar Reforestation and Rehabilitation Programme has been developed after a series of workshops with many stakeholders including policy makers to solve the deforestation issue in 2016. The Programme is a 10 years plan starting from 2017-18 to 2026-27 to maintain the forest cover of the country. The ultimate goals of the Programme are to restore the forest ecosystem, to mitigate climate change, to support the socio-economic development and to contribute the sustainable forest governance of the country. The objectives of the program are

- to restore and rehabilitate the forest with the appropriate methods,
- to strengthen the investment of large and small scale private plantation,
- to support the community forestry and agroforestry practices,
- to formulate the plantation policy through consultation with relevant stakeholders, and
- to encourage the participation of all relevant stakeholders in restoration and rehabilitation programme.

The main activities include formulation of the forest plantation policy, establishment of state and private owned forest plantations, assisted natural regeneration, conservation of natural forests in dry zone area, establishment of community forests and expansion of permanent forest estate up to 30% of the country, capacity building of local people and staff.

National REDD+ Programme of Myanmar: In order to reduce emission from deforestation and forest degradation, and to enhance forest carbon stocks, Myanmar formulated the REDD+ Readiness Roadmap in 2013. Currently, an action plan for National Forest Monitoring system and FREL/ FRL has been developed with the support of FAO. Furthermore, UN-REDD Programme has been implementing readiness activities at National level REDD+ Progarmme. Under the National level REDD+ Programme, “Stakeholder Engagement Guideline” and “Communication and Knowledge Management Strategies” has been developed by the coordination between the technical working group of safeguard development and UN-REDD. A safeguard roadmap and the drafted REDD+ strategy for Myanmar are still under consultation processes.

Intended Nationally Determined Contributions- INDC: In 2015, Myanmar submitted Intended Nationally Determined Contributions to UNFCCC for climate change mitigation. It was enforced into Nationally Determined Contributions by the Paris Agreement

ratification. In INDC document, Forest sector is a crucial part for increasing carbon stocks of Myanmar in order to contribute to REDD+ and climate change. Myanmar committed to meet the Permanent Forest Estate target which is 30 % of the country area in line with the National Forestry Master Plan by 2030.

1.2. Problem Statement

In Myanmar, more than 80 plant species are already included in IUCN red list. Forest genetic resources are essential for forest-depending communities as their livelihoods heavily rely on timber and non-timber forest products for food security, subsistence and income generation. These resources are also the basis for large-scale wood production in planted forests to satisfy the need for timber and paper. Genetic resources of several important timber, fruit and other non-timber tree species are conserved ex situ in genebanks or maintained in field collections. Nevertheless, in situ conservation in forests and on farms is in the case of most tree species the most important measure to protect their genetic resources. Although botanical gardens have been established in Myanmar, in-situ conservation activities in the form of arboretum development have not yet been done in order to conserve genetic resources of forest tree species.

During 2001 and 2010, the net forest loss of Shan State becomes the highest among the regions of the country. The annual rate of deforestation is 0.93% in the region. As consequences, many environmental and social issues such as land degradation and soil erosion, lower water quality and poverty become vicious cycle. In addition, population growth, limited alternative livelihood opportunities, technological knowledge and support, and poor environmental awareness increase forest dependency, deforestation and forest degradation by practicing shifting cultivation, which results in worsening the situation. Hence, how to implement the integrated watershed forest management by enhancing the social benefit while rehabilitating the watershed land and securing the environmental stability is becoming a critical question for forest management in Shan State.

1.3. Project site selection

In order to fulfill the objective of establishing an arboretum, the existing secondary natural forest in Forest Research Institute (FRI), Yezin, Naypyitaw, is selected. As the area is state owned land and located in the compound of FRI, to open for public recreation and conducting research and education activities can be carried out without any constraint. The area is around 25 ha and covered with mixed deciduous forest species. A medicinal garden is already established in the area and is planned to be upgraded with the project support.

The project area for watershed management is located in Shan State, specifically where Latitudes 19° 20' to 20°35' north and longitudes 96° 15' to 97°00' east meets. The

area is also a watershed area of Paung Laung Dam and Yezin Dam which produce mini-hydropower from the stream by local communities. The area is covered by semi-evergreen and mixed deciduous forest species. The species includes *Shorea obtusa* (Thitya),*Shorea siamensis* (Ingyin), *Xylia xylocarpa* (Pyinkado), *Pterocarpus macrocarpus* (Padauk), *Dalbergia oliveri* (Tamanlan) and *Mitragyna rotundifolia* (Binga) which are commercially important and rare.

The area is not only a watershed area but also an area where the local people rely heavily on the forest for their livelihood. Currently, the environmental and ecological conditions of the area has been threatened by many problems which are high deforestation, forest degradation, soil erosion and declining water quality in downstream area. The major causes of the threats are legal and illegal logging, shifting cultivation, and high dependence on forest resources and non-timber forest products as a consequence of limited livelihood opportunities.

Furthermore, the causes are inter-related each other. Poverty and a lack of alternative income generating activities led the local people to heavily rely on forest resources for their livelihood. As a consequence, it causes deforestation and forest degradation and the local people become victims of the environmental problems induced by degradation. By this means, local people are under the vicious circle of poverty related to forest resources. It is urgently needed to demonstrate how to achieve socioeconomic development of rural community through participatory watershed management and forest conservation. Up until now, the local people in the proposed area did not have any opportunities to implement the sustainable watershed management activities through socio-economic development strategies and the problems have not been tackled in the area.

2. Significance and Necessity

The proposed project will be able to conserve endangered germplasm resources, educate public different functions of forest and its importance, demonstrate the sustainable forest management practices, enhance the existing agroforestry practices and improve the knowledge and capacity of the local people. By implementing the arboretum, important genetic resources from throughout the country will be conserved. Arboretum will be an education center as well as a place where people connect to nature. Through demonstration activities of the project in Paung laung watershed by using bamboo, economic trees, ornamental plant, rare and endangered tree, precious timber tree species collected in the arboretum, the local people can obtain the livelihood alternatives and opportunities through the capacity building activities. At the same time, the demonstrated sustainable forest management practices can contribute the solutions on the issues of environmental degradation in the watershed area. Furthermore, the existing traditional knowledge and practices will be conserved and promoted in a proper way to contribute

sustainability of the watershed area. By this means, problems related to the poverty and environmental degradation will be solved by the project. The project area will be a demonstration site to show the successful experiences, practices and lessons learned for sustainable forest management in watershed areas.

Furthermore, the aim of the project is synergy with the aim and priories of the APFNet which is to practice and promote sustainable forest management and rehabilitation of degraded areas. The project will also contribute to poverty reduction which is one of the country's current priorities, by enhancing local people capacities to promote their livelihood through trainings and sustainable forest management practices. The outcome of the project will not only greatly support the forestry sector of the country and region by conserving genetic resources, exploring and demonstrating the proper forest management system for sustainability of watersheds but also help policy makers to develop guidelines and regulations for management of watershed areas in a sustainable manner.

Currently, the forest department is planning and implementing many activities for the country's reforestation. Demonstrating sustainable watershed management practices will be a stepping stone for the forestry sector of the county in finding solutions of environmental as well as socio-economic issues in the watershed areas. Due to limited financial and technical support, the strategy of demonstrations and experiments on how to manage watershed areas in a sustainable way could not be implemented in the country up until now. Therefore, implementing the strategy as a project with the support of APFNet will be an opportunity for the country, forestry sector and local people.

3. Project Goal and Objectives

3.1 Goal

The overall goal of the project is to conserve forest germplasm resources and rehabilitate forest ecological services and forest productivity through establishment of arboretum in FRI and implementing integrated watershed forest management in Palaung watershed area, Southern Shan State in Myanmar, so as to contribute to sustainable forest management in the Greater Mekong Sub-region.

3.2 Specific objectives

(1) To conserve and improve forest germplasm resources though construction of Arboretum in FRI;

(2) To demonstrate integrated watershed management practice in Paung Luang Watershed;

(3) To enhance the capacity and knowledge of local community, local government and staff through capacity building programs, which will make sure to sustain the management activities after the project is accomplished.

4. Expected Output and Major Activities

Objective 1 To conserve and improve forest germplasm resources though construction of Arboretum in FRI

Forest germplasm resources are important un-renewable natural resources which are seriously threatened by rapid economic development. Arboretum can be served as a shelter for precious forest genetic resources. The project will be conducted in the Forest Research Institute Campus, to support the development of proper management guidelines for conservation of plant species in the area and to present the new records of more endemic and endangered plant resources in the study area. The main objective is to collect forest genetic resources in Myanmar and other tropical countries; protect, conserve and manage forest biodiversity on sustainable basis; domesticate and improve forest germplasm resources; popularizes and disseminate forestry knowledge and environment awareness; exhibit forest landscape, forest tree resources; and provide a recreation site for the public.

Four major functional components in arboretum are designed as:

1) Genetic resources introduction and breeding zone: Nursery for propagation of collected plant species;
2) Ecological conservation zone: Native vegetation conservation and restoration;
3) Thematic gardens: 16ha Plantation and exhibition zones of 7 thematic gardens of bamboo garden, ornamental plant garden, medicinal plant garden, rare and endangered tree species garden, economic trees garden, precious timber tree garden and aquatics garden;
4) Accessory facilities: Entrance and road system, drainage and irrigation system, plant identification system, hygienic and leisure facilities (pavilions) and, fire control & maintenance system are included.

Total area：25ha

Output 1 "Construction Plan of FRI Arboretum" formulated

Activity 1.1 Survey on current conditions of FRI Arboretum

Activity 1.2 Development of "Construction Plan of FRI Arboretum" include nursery upgrading, native forest ecological conservation zone, 7 thematic gardens, and accessory facilities

Activity 1.3 Evaluation and finalization of "Construction Plan of FRI Arboretum"

Output 2 Forest germplasm resources introduction and breeding nursery constructed

Total area of ha1ha for tree species introduction and breeding nursery will be expanded and upgraded, with annual seedling production capacity of 200,000 seedlings. The nursery is designed mainly for production of the self-used seedlings in the arboretum

and other commercial seedlings.

Activity 2.1 Upgrading and reconstruction of nursery, include construction of seedling bed, shading system, irrigation system, and fence

Activity 2.2 Forest germplasm resources collection

Activity 2.3 Seedling raising

Output 3 9ha Native forest ecological conservation zone established

The ecological conservation zone is going to be built for native vegetation-- tropical mixed deciduous forest conservation and restoration. The total area of the ecological conservation zone is 9 ha. Natural regeneration and promoted natural regeneration (enrichment planting of key species) will be adopted to conserve and recover secondary native forest vegetation, and enhance natural forest succession towards its climax community.

Activity 3.1 Demonstration of enrichment planting of key species

Activity 3.2 Maintenance of the forest ecological conservation zone

Output 4 16ha thematic gardens (plantation and exhibition zone) established

Activity 4.1 Establishment of 3ha bamboo garden (50 species, 5 seedlings/species, 150 plants/ha)

Activity 4.2 Establishment of 3ha ornamental plant garden (100 species, 10 seedling/species, 450trees/ha)

Activity 4.3 Establishment of 2ha medicinal plant garden (<100species)

Activity 4.4 Establishment of 2ha rare and endangered tree species garden (50 species, 10 seedling/species, 450trees/ha)

Activity 4.5 Establishment of 2ha economic tree garden (50 species, 10 seedling/species, 450trees/ha)

Activity 4.6 Establishment of 2ha precious timber tree garden (50 species, 5 seedling/species, 450trees/ha)

Activity 4.7 Establishment of 2ha aquatics garden

Output 5 Accessory facilities for arboretum constructed

Activity 5.1 Construction of arboretum entrance

Activity 5.2 Construction of 3812m road/trail system (equals to 4690m^2)

Activity 5.3 Construction of 1982m irrigation system

Activity 5.4 Establishment of tree identification system

Activity 5.5 Construction of 3650m forest fire control line

Objective 2 To demonstrate integrated watershed management practice in PaungLuang Watershed

Significance

Limited alternative livelihood opportunities make the project area depend heavily on forest and forest resources, which increase deforestation and soil and water erosion by

practicing shifting cultivation. Hence, to implement the integrated watershed forest management (the integration of forest conservation, degraded forest restoration and community development) by introducing fruit trees and precious timber trees plantation will be a solution to enhance the social benefit while rehabilitating the watershed land and securing the environmental stability in Shan State.

Output 6 Integrated watershed management plan formulated

Activity 6.1 Baseline investigation include social economic situation, threats for forest degradation

Activity 6.2 Development of participatory integrated watershed co-management plan

Output 7 Demonstration of integrated watershed management practices established

Activity 7.1 Seedlings preparation for integrated watershed management practices

Activity 7.2 Land preparation of demonstration site

Activity 7.3 Demonstration establishment of fruit tree

Activity 7.4 Demonstration establishment of timber tree

Activity 7.5 Maintenance and monitoring of demonstration sites of integrated watershed management practice

Output 8 An integrated forest management technology assembled and a technical handbook formulated

Activity 8.1 Summarizing technologies and experience of integrated watershed management practices

Activity 8.2 Development of technical handbooks on integrated watershed management

Objective 3 To enhance the capacity and knowledge of local community, local government and staff through capacity building programs, which will make sure to sustain the management activities after the project is accomplished

Significance

Carrying out different trainings for the researchers, project staff and local communities with an emphasis on relevant topic will improve the management capacity of the project activities, and facilitate long term sustainability of the project.

Output 9 Training course for project stakeholders

Activity 9.1 Training for young researchers on integrated forest management technology and rehabilitation of degraded forest (15person/training)

Activity 9.2 Training courses for local officials and local leaders on integrated forest

watershed management (10person/training)

Activity 9.3 Training courses for local farmers on tree seedling raising, planting, agroforestry, organic farming, maintenance of fruit orchard and tree plantation, fruit processing and marketing (80-100 person/training)

Activity9.4 Formulation of a Training ManualOutput 10 International exchange on sustainable forest management conducted

Activity 10.1 Exchange study visit to other 2 GMS project sites to share and learn project experiences (4-5 person, 8 days)

Activity 10.2 Participating in international workshop (2 person, 8 days)

5. Budget and Financial Management

5.1 Budget and Source

The total budget is US$ 1,412,477, APFNet's grant is US$ 1,120,807 and counterpart contribution from FRI is US$ 291,670.

5.2 Assets management

5.2.1 Fixed assets management

To simplify the process and improve the efficiency, the purchase of fixed assets will use inquiry purchase approach and are determined by office meeting of FRI. The files of fixed asset will be established and managed by staff pointed with clear responsibility. The department in charge of the project should carry out an inventory of fixed assets at least once a year.

5.2.2 Current assets management

Current assets include cash, bank deposits and low value consumables. FRI should set up a special account for this project, the fund only can be used by this project and the special account will be accounted separately. After each activity finished, the handling personnel should fill in the account application form, after audited by the finance department and signed by project director, the fund could be paid.

5.2.3 Audit

The administrative department will inspect the project financial situation. Executive agency should submit financial report annually to APFNet. An independent project audit will be carried out each year by qualified audit organizations.

6. Project Monitoring and Evaluation

The Project Steering Committee (PSC) and external evaluation experts are responsible for external inspection of the project. PSC will carry out an inspection every year after the start of the project. External evaluation experts will carry out project evaluation in the middle of the project and after the completion of the project according to the requirements of APF-Net.

PSC and project administrative department are responsible for the supervision and guidance on the project implementation. The project office shall submit annual progress report, annual work plan and budget to PSC. In addition, the project office will carry out continuous project monitoring, regularly submit the internal assessment report to APF-Net, this report explains the achievements of the project, implementation status, budget management, potential risks on management. If the project activities cannot be carried out in accordance with the project plan and implementation plan, or the existence of major issues affecting the progress of the project, the project director shall put forward the inspection application for APF-Net in order to find out the causes of the problem and the solution.

Project executive agency FRI and technical support agency will jointly carry out an internal evaluation at 3 months before the end of the project, mainly to evaluate the effectiveness and efficiency of project implementation, the participation of stakeholders, project impact, project risk and how to ease / loss the risk, experience and lessons, evaluation methods, relevant data, material and information will be obtained through on-the-spot investigation, interview and questionnaire. The evaluation report will submitted to as the attachment of the completion report.

7. Dissemination and Sustainability

7.1 Project dissemination

The outputs and results in the process of project implementation will be publicized by many forms of newspaper, TV, internet, media, publishing guide, CD-ROM and publications.

(1) Media: through Forestry Journal, Myanmar's light newspaper and other domestic newspapers and magazines. The objectives, content, funding agencies of the project, achievements, experience and practice of the project will be publicized.

(2) Project publicity sign: The publicity sign of demonstration project will be set up at significant position of the project activity demonstration areas, the promotional contents include the construction units, the basic situation of project, measures, implementation time, specific practices and funding agencies.

(3) Internet: The implementation progress and progressive achievement will be shown at the websites of FRI and Forest Department, Ministry of Natural Resources and Environmental Conservation and APFNet.

(4) Guideline and brochure: Guideline of sustainable watershed forest management and project brochures will provide the reference for the similar project area, which will be applied combining with forest management practice.

(5) Publication: Staged results will be released through the publication of paper and other materials. The main object includes forestry technicians, local forestry

authorities, and international organizations and so on.

The details will be found in Annex A-7.

7.2 Project sustainability

(1) Social and economic sustainability

The project implementation will hire local labors, increasing employment and income; moreover, all the activities of project demonstration are carried out on the forestland of Forest Department, where all the benefit goes to. Once forest farmers can benefit from the integrated watershed management model developed by the project, more forest farmers will be willing to accept the technology demonstrated and promoted by the project so as to boost the economic development of Paung Laung watershed area.

(2) Environmental resources sustainability

The project is committed to promoting the integrated watershed forest management, so will not have negative impact on the environment. Applying improved fallow system through agroforestry design, the project will contribute to reduce soil erosion, improve water quality and less sedimentation. The introduction of forest tree in crop land will facilitate the reduction of deforestation and forest degradation from shifting cultivation and will increase the long term sustainability of productivity comparing with the pure crop farm.

(3) Administration system and strategy sustainability

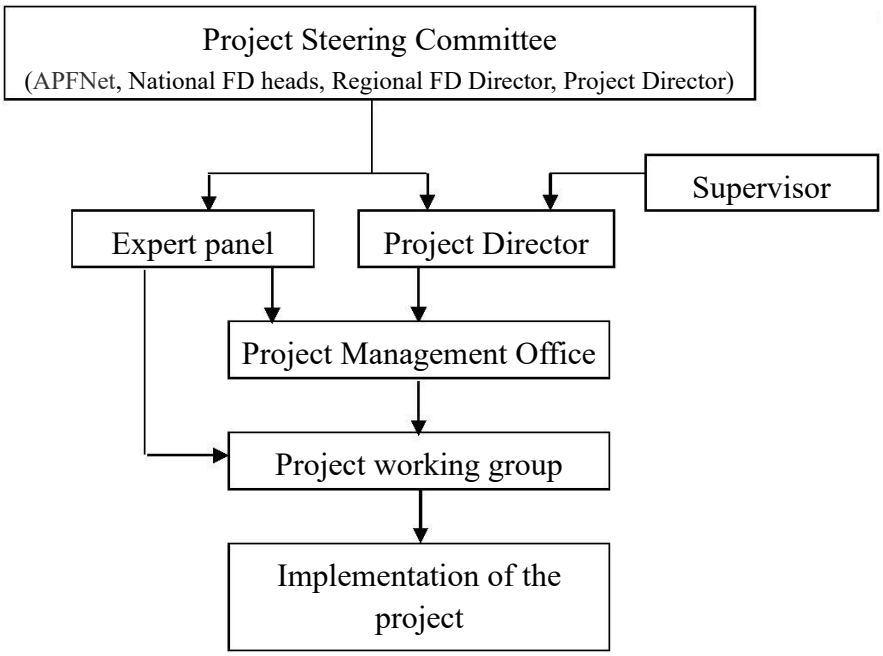
The project administrative and management system consists of APFNet, Forest Research Institute (project executive agency), national Forest Department, local Forest Department and project technical support team. The project conforms to policies and regulations, guidance and development planning on forest ecosystem protection of central governments; at the same time, the project land belongs to state-owned forest with clear ownership. FRI's commitments for project cooperation are unlikely reversal or major changes during the implementation of the project.

The project is relatively harmonious, compatible in the economy and environment, economy and society, society and environment, institutions and policies, with low risk in conflicts and contradictions, so the overall sustainability of the project is good.

8. Guarantee System

8.1 Human resource

To guarantee the successful project implementation, a project management system will be established consisting of a project steering committee, a project monitoring committee, a project technical support team and a project management office. The Project organizational chart is illustrated as follows:



The Project organizational chart

8.1.1 Project Steering Committee

A Project Steering Committee (PSC) is composed of forestry administrative departments at the level of national and regional and as well as Forest Research Institute. PSC will inspect annual work plan and activity report, carry out necessary inspection and assessment of project process, research and guide the important issues during the project implementation.

8.1.2 Project Supervisor Panel

A Project supervisor panel is composed of the Head of Forest Department, Regional Government and different functional departments, to carry out necessary inspection of the project.

8.1.3 Project technical support team

A project technical support team is composed of the experts from FRI, who are specialized in forest management, community based forest governance, agroforestry techniques, forest protection, etc., to prepare annual project plans and progress reports. The project chief expert is responsible for developing the project proposal, providing technical consultancy and guidance on key technical problems and internal evaluation, etc.

8.1.4 Project implementation office

A project management office will be set up in FRI and is mainly responsible for the project organization, coordination and implementation work. The main work contents include: assisted by the project technical supporting team to prepare and submit annual project plans and progress reports, interim assessment and project acceptance; organizing

project implementation; financial accounting; communication and coordination.

8.2 Material resource

8.2.1 Clear ownership of forest land and trees in project area

The state-owned forest zone of project site belongs to independent management field of FRI and FD, Paung Laung Reserved forest. The ownership of forest land and trees is clear and with no controversy.

8.2.2 FRI with a certain infrastructures

FRI is located in urban area of Yezin, Naypyitaw and has well-grounded infrastructure, convenient access to transportation and communications. The project area also has well accessibility for transportation and communication.

8.3 Strategies and regulations

This project emphasizes on establishment of Arboretum, and the integrated planning and demonstration of the watershed forest which will enormously promote sustainable forest management, restoration and rehabilitation of shifting cultivated area, improve the quality and efficiency of forest land and optimize forestry ecological, economic and social function. The project completely conforms to the relevant laws, regulations, rules and development planning of Forest Department.

8.4 Organization ability

Project executive agency FRI, has 3 main divisions responsible for daily management, operation, administration, finance, planning and design, and medicinal garden. Currently, there are 210 staffs, among of which, 52 staffs are researchers with qualified technical expertise. FRI produces and manages orderly and has completed several projects on ecological restoration, afforestation, REDD+, planning and design and so on.

9. Risk Assessment

Risks and corresponding mitigating measures are as follows.

Risk	Measure
1 Coordination problems between participant agencies which influence the implementation of project activity	1.1 Clarify the responsibility, right, interest of each agency; 1.2 Strengthen the communication between project agencies; 1.3 Coordinate through project leading team.
2 Integrated watershed forest management measures may not coincide with the existing forest management practices, so that the project activities may be limited	2.1 Coordinate to get approval through PSC and local forestry administrative departments; 2.2 Separately implement activities which greatly impact forest, to reduce its impact area and intensity.
3 During the 5 years of the project implementation, the factors of rising price may result in the budget shortfall	3.1 Save costs as far as possible in the process of project implementation process, do not waste; 3.2 In the initial stage of the project, each outsourcing task will be fixed in the way of the contract to reduce the effect of the price rise; 3.3 Implement the project and purchase the equipment as early as possible.
4 Project execution agency lacks of technical strength which impacts the project results	4.1Strengthen the training for project technicians on key techniques before the beginning of each project activity; 4.2 Strengthen technical support agencies' participation; ensure application of scientific and technological measures.
5 Poor forest management affects the effectiveness of demonstration forest	5.1 Organize a patrol to improve management; 5.2 Enhance education and publicity on forest protection awareness; 5.3 Build fire isolation belt and livestock fence at key sites.

After a comprehensive assessment, the overall risk of project can be controlled, and project implementation is necessary and feasible.

Annex

Annex A Table

Annex B Project Area Map

Basic information of project sites

Annex A-1

No.	Project activity and number	Name of site (Town-village)	Accessibility (Transportation)	Total area（hm2）	Forest area(hm2)	Population （person）	Agricultural population （households）	Major indigenous tree species	Note
1	Activity 2.1. Upgrading and reconstruction of nursery, include construction of seedling bed, shading system, irrigation system, and fence	FRI	in FRI compound	2 ha					
2	Activity3.1 Demonstration of enrichment planting of key species	FRI	in FRI compound	9 ha	9 ha			*Pterocarpus macrocarpus, Terminalia crenulata, Lannea coromandelica, Buchanania lanzan, Tectona hamiltoniana and Cratoxylum ligustrinum.*	
3	Activity 3.2 Maintenance of the forest ecological conservation zone	FRI	in FRI compound	9 ha	9 ha			*Pterocarpus macrocarpus, Terminalia crenulata, Lannea coromandelica, Buchanania lanzan, Tectona hamiltoniana and Cratoxylum ligustrinum.*	
4	Activity 4.1 Establishment of 3ha bamboo garden	FRI	in FRI compound	3 ha	3 ha			*Bambosa polymorpha* and *Bambosa tolda*	

5	Activity 4.2 Establishment of 3 ha ornamental plant garden	FRI	in FRI compound	3 ha	3 ha			Lagerstroemia speciosa (L.) Pers.Tectona grandis L.f, Cassia mimosoides L., Tectona hamiltoniana Wall., Leucaena leucocephala (Lam.) De Wit., Cratoxylum ligustrinum Blume.	
6	Activity 4.3 Construction of 2ha medicinal plant garden	FRI	in FRI compound	2ha	2ha			403 medicinal species planted and conserved	
7	Activity 4.4 Construction of 2ha Rare and endangered tree species garden	FRI	in FRI compound	2ha	2ha			*Tectona hamiltoniana* , *Eucalyptus camaldulensis* , *Leucaena leucocephala* , *Cassia mimosoides*. *Pterocarpus macrocarpus* , *Chukrasia velutina*. . *Heterophragma sulfureum* , *Pterocarpus macrocarpus* , *Buchanania lanzan* , *Lannea coromandelica* , *Stereospermum suaveolens*, *Vitex limonifolia* , *Eucalyptus camaldulensis,*	
8	Activity 4.5 Estabshment of 2ha economic tree garden	FRI	in FRI compound	2ha	2ha				

								Cratoxylum ligustrinum	
9	Activity 4.6 Estabshment of 2ha precious timber tree garden	FRI	in FRI compound	2ha	2ha			Heterophragma sulfureum , Pterocarpus macrocarpus, Buchanania lanzan, Lannea coromandelica, Stereospermum suaveolens . Vitex limonifolia , Eucalyptus camaldulensis, Cratoxylum ligustrinum	
10	Activity 4.7 Estabshment of 2ha aquatics garden	FRI	in FRI compound	2ha	2ha				
11	Activity 7.3 Demonstration establishment of fruit tree	Paung laung watershed area	next to highway	36 ha		825	165	Fallow land and shifting cultivated area	
12	Activity 7.4 Demonstration establishment of timber tree	Paung laung watershed area	next to highway	17 ha		825	165	Fallow land and shifting cultivated area	

Annex A-2

Compartment information of project

No.		Location	Soil type	Soil depth (cm)	Groundwater level (m)	Direction of slope	Gradient	Annual precipitation (mm)	Major wind direction	Major historical tree species
1	Arboretum	FRI	Sandy Loam	25 cm-50cm	-	Northwest		980.04mm	northeast, northwest	*Pterocarpus macrocarpus, Terminalia crenulata, Lannea coromandelica, Buchanania lanzan, Tectona hamiltoniana and Cratoxylum ligustrinum.*
2	Paung laund watershed area project site	Paung Laung Reserved Forest/ compartment 62 and 138	Sandy Loam or Clay Loam (PH 6-7)	25 cm-50cm	-	Northwest		mm	northeast, northwest	*Swintonia floribunda*

Location of the Project Activity

Annex A-3

No.	Project activity	Location	Geographic coordinates		Area(ha)	Note
			Latitude	Longitude		
1	Activity 2.1. Upgrading and reconstruction of nursery, include construction of seedling bed, shading system, irrigation system, and fence	FRI	19°50′31.32″N	96°16′59.84″E	2ha	
2	Activity3.1 Demonstration of enrichment planting of key species	FRI	19°50′22.03″N	96°17′07.39″E	9ha	
3	Activity 3.2 Maintenance of the forest ecological conservation zone	FRI	19°50′22.03″N	96°17′07.39″E	9ha	
4	Activity 4.1 Establishment of 3ha bamboo garden	FRI	19°50′30.38″N	96°16′44.28″E	3ha	
5	Activity 4.2 Establishment of 3 ha ornamental plant garden	FRI	19°50′29.35″N	96°17′00.10″E	3ha	
6	Activity 4.3 Construction of 2ha medicinal plant garden	FRI	19°50′33.26″N	96°16′42.90″E	2ha	
7	Activity 4.4 Construction of 2ha Rare and endangered tree species garden	FRI	19°50′23.70″N	96°16′57.22″E	2ha	
8	Activity 4.5 Estabshment of 2ha economic tree garden	FRI	19°50′24.86″N	96°16′51.39″E	2ha	
9	Activity 4.6 Estabshment of 2ha precious timber tree garden	FRI	19°50′23.52″N	96°16′44.36″E	2ha	
10	Activity 4.7 Estabshment of 2ha aquatics garden	FRI	19°50′32.85″N	96°16′37.84″E	2ha	
11	Activity 7.3 Demonstration establishment of fruit tree	Paung laung watershed area	19°59′00.99″N	96°37′23.86″E	36ha	
12	Activity 7.4 Demonstration establishment of timber tree	Paung laung watershed area	19°59′00.99″N	96°36′53.07"E	17 ha	

Project Logical Framework				
Annex A-4				
Items	**Intervention logic**	**Objectively verifiable indicators of achievement**	**Sources of information and means of verification**	**Assumptions**
Target	(1) To conserve and improve forest germplasm resources though construction of Arboretum in FRI; (2) To demonstrate integrated watershed management practice in Paung Luang Watershed; (3) To enhance the capacity and knowledge of local community, local government and staff through capacity building programs	1 25ha of Arboretum established. 2 50 ha of integrated watershed managmend demonstration plantaiton established; 3 Improved capacity of project staff and community	1 Project report 2 Technical report 3 Evaluation report 4 Investigation 5 Interview 6 Meeting material 7Photo	1 Fund on time 2 Coordination between different departments 3 International/national experts in posion on time 4 Avoid the risk occuring in the process of project implementation 5 Active particition of the project partners,local goverments
Expected output				
Output 1	**"Construction Plan of FRI Arboretum" formulated**	Construction Plan of FRI completed.	1 Project design report 2 Assessment report 3. Meeting mateiral 4 Photo 5. Investigation	1 Fund on time 2 International/national experts in posion on time
Activity1.1	"Survey current conditions of FRI Arboretum"	Assessment report of current report of FRI Arboretum is submitted.		
Activity 1.2	Designing of "Construction Plan of FRI Arboretum" include nursery upgrading, native forest ecological conservation zone, 7 thematic gardens, and accessory facilities"	Drafted design of FRI Arboretum.		
Activity 1.3	Evaluate and finalize "Construction Plan of FRI Arboretum"	Construction Plan of FRI completed.		
Output2	Forest germplasm resources introduction and breeding nursery constructed	Complete construction of Nursery.	1Project completion report 2 Evaluation report 3 Investigation 4 Photo and video	1 Fund on time 2 International/national experts in posion on time 3Avoid the risk occuring in the process of project implementation 4 Close cooperation of local goverments and forestry departments
Activity 2.1	2.1 Upgrading and reconstruction of nursery, include construction of seedling bed, shading system, irrigation system, and fence	Nursery is well upgraded in line with agreed design.		

Output3	**9ha native forest ecological conservation zone established**	9ha native forest ecological conservation zone established	1Project design report 2Project completion report 3 Project technical report 4 Evaluation report 5 Investigation 6 Meeting mateiral 7 Photo and video	1 Fund on time 2 International/national experts in posion on time 3Avoid the risk occuring in the process of project implementation 4 Close cooperation of local goverments and forestry departments
Activity3.1	Demonstration of enrichment planting of key species	9h of enrichment planting in natural secondary forest established.		
Activity3.2	Maintenance of the forest ecological conservation zone	9ha native forest ecological conservation zone well maintained.		
Output4	**16ha thematic gardens (plantation and exhibition zone) established**	16ha thematic gardens (plantation and exhibition zone) established.	1Project design report 2Project completion report 3 Project technical report 4 Evaluation report 5 Investigation 6 Photo and video	1 Fund on time 2 International/national experts in posion on time 3Avoid the risk occuring in the process of project implementation 4 Close cooperation of local goverments and forestry departments
Activity4.1	Establishment of 3ha bamboo garden	3ha bamboo garden established.		
Activity4.2	Establishment of 3 ha ornamental plant garden	3ha of namental plant garden established.		
Activity4.3	Construction of 2ha medicinal plant garden	2ha medicinal plant garden established.		
Activity4.4	Construction of 2ha Rare and endangered tree species garden	2 ha of Rare and endangered tree species garden established.		
Activity4.5	Establishment of 2ha economic tree garden	2 ha of precious timber established.		
Activity4.6	Establishment of 2ha precious timber tree garden	2ha precious timber tree garden established.		
Activity4.7	Establishment of 2ha aquatics garden	2ha aquatics garden established.		
Output5	**Accessory facilities for arboretum constructed**		1Project design report 2Project completion report 3 Evaluation report 4 Investigation 5 Photo and video	1 Fund on time 2 International/national experts in posion on time 3Avoid the risk occuring in the process of project implementation 4 Close cooperation of local goverments and forestry departments
Activity5.1	5.1 Construction of arboretum entrance	Arboretum entrance constructed.		
Activity5.2	5.2 Construction of 3812m road/trail system	3812m of road/trail system established.		
Activity5.3	5.3. Construction of 1982m irrigation system	1982 m irrigation system established.		
Activity5.4	5.4 Establishment of tree identification system	Tree identification system established.		
Activity5.5	5.5 Construction of 3650m forest fire control line	3650 m of forest firecontrol line is constructed.		

Output 6:	**Integrated watershed management plan formulated**	Integrated watershed management plan is formulated.	1Project design report 2. Comanagement plan 3. Baseline survey report 4 Evaluation report 5 Interviews 6 Photo and video	1 Fund on time 2 International/national experts in posion on time 3Avoid the risk occuring in the process of project implementation 4 Close cooperation of local goverments, community and forestry departments
Activity 6.1	Conducting baseline investigation including social economic situation and threats for forest degradation	Social and economic situation and threats for forest degradation is investigated through survey.		
Activity 6.2	Formulating participatory integrated watershed co-management plan.	Praticipatory integrated watershed management plan is formulated.		
Output 7.	**Demonstration of integrated watershed management practices established**	Integrated watershed management practices are demonstrated.	1 Contract with individual households 2. Intergared watershed mangement plan 3 Project completion report 4 Evaluation report 5 Investigation 6 Photo and video	1 Fund on time 2 International/national experts in posion on time 3Avoid the risk occuring in the process of project implementation 4 Close cooperation of local goverments and forestry departments
Activity 7.1	Seedlings preparation for integrated watershed management practices	24768 seedlings are produced to implement integrated wtershed management practices.		
Activity 7.2	Land preparation of demonstration site	50 ha of shifting cultivated watershed area is prepared for plantation.		
Activity 7.3	Demonstration establishment of fruit trees	35 ha of shifting cultivated farm land is intercropped with fruit trees		
Activity 7.4	Demonstration establishment of timber tree plantation	15 ha of shifting cultivated farm land is intercropped with timber trees.		
Activity 7.5	Maintenance and monitoring of demonstration sites of integrated watershed management practice	50 ha of shifting cultivated watershed area is well monitored.		
Output 8.	**An integrated forest management technology assembled and a technical handbook formulated**	An integrated forest management technology assembled and a technical handbook formulated and at least 500 copies are produced and distributed.	1. Completion report 2. Handbook 3. Photo	1 Fund on time 2 International/national experts in posion on time 3Avoid the risk occuring in the process of project implementation 4 Close cooperation of local goverments and forestry departments
Activity 8.1	Summarize technologies and experience of integrated watershed management practices.	Technologies and experience of integrated watershed		

		management practices are summarized.		
Activity 8.2	Formulate technical handbooks on integrated watershed management	Technical handbooks on integrated watershed management is formualted.		
Output9	**Training course for project stakeholders**	Two times trainings for young researchers and local officials are trained.	1Project completion report 2. Assessment before and after training. 3 Project technical report 4 Evaluation report 5. Photo and video 6. Training materials	1 Fund on time 2. Cooperation of local governments
Activity 9.1	9.1. Training for young researchers on integrated forest management technology and rehabilitation of degraded forest;	Two time 3 days trainings, 15 young researchers are trained per training.		
Activity 9.2	9.2 Training courses for local officials and local leaders on integrated forest watershed management	Two time 3 days trainings, 10 local officials and local leaders are trained per training.		
Output 10.	**International exchange on sustainable forest management conducted**		1 Completion report 2 Training material 3 Meeting material 4 Photo and video 5. Study report	1 Fund on time 2Normal diplomatic relations of visit county 3 Cooperation of visit country's government and forestry department
Activity 10.1	Exchange study visit to other 2 GMS project sites to share and learn project experiences	5persons, 8 days visit to project sites of other GMS countries		
Activity 10.2	Attend international workshop	2 persons, 8 days attend international workshop		

Project Publicity

Annex A-6-1

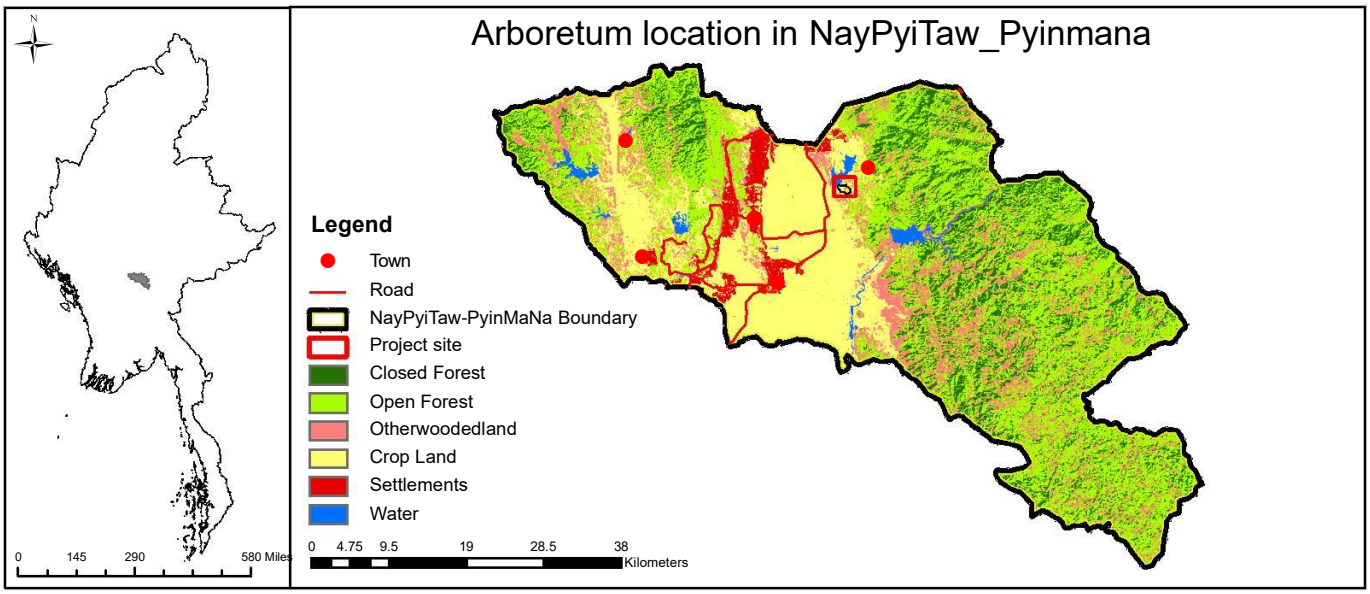
Objectives	Target audience	Key message	Communication tools	
			Products/Tools	Media/Channels/Activities
To promote awareness to the stakeholders on the issues conserving forest germplasm resources and rehabilitating forest ecological services and forest productivity. The inception workshop will also make the stakeholders aware of what the project intends to achieve.	Local governments, relevant forestry departments,residents of forest zone and forestry workers	Project significance, objective, content, fund agency	Power Point/Slide Presentation; Maps	Holding of inception meeting to inform the stakeholders about the project and Conservation needs of Mekong river; Use of Multi Media; FRI Website
To conserve and improve forest germplasm resources though construction of Arboretum in FRI	FRI, local governments, relevant forestry departments,residents of forest zone and forestry workers	Different gardens in Arboretum applying different management methods	billboard,brochures, academic journals	trainings, newspaper,Tv,Internet
To disseminate best integrated watershed management practices	Local governments, relevant forestry departments,residents of forest zone and forestry workers, relevant organizations	Integrated watershed management plan formulated	billboards,brochures, academic journals; Maps	trainings, newspaper,Tv,Internet
To enhance the capacity and knowledge of local community, local government and staff through capacity building programs, which will make sure to sustain the management activities after the project is accomplished	Students, Community-based Organizations, NGOs, International Visitors	Lessons learned from project implementation; showcasing the technology	Video Presentations, Slide Presentations, Leaflets/Posters	Dissemination of best practices; Forum; Site Visit; Holding of End of Project Workshop; FRI Website

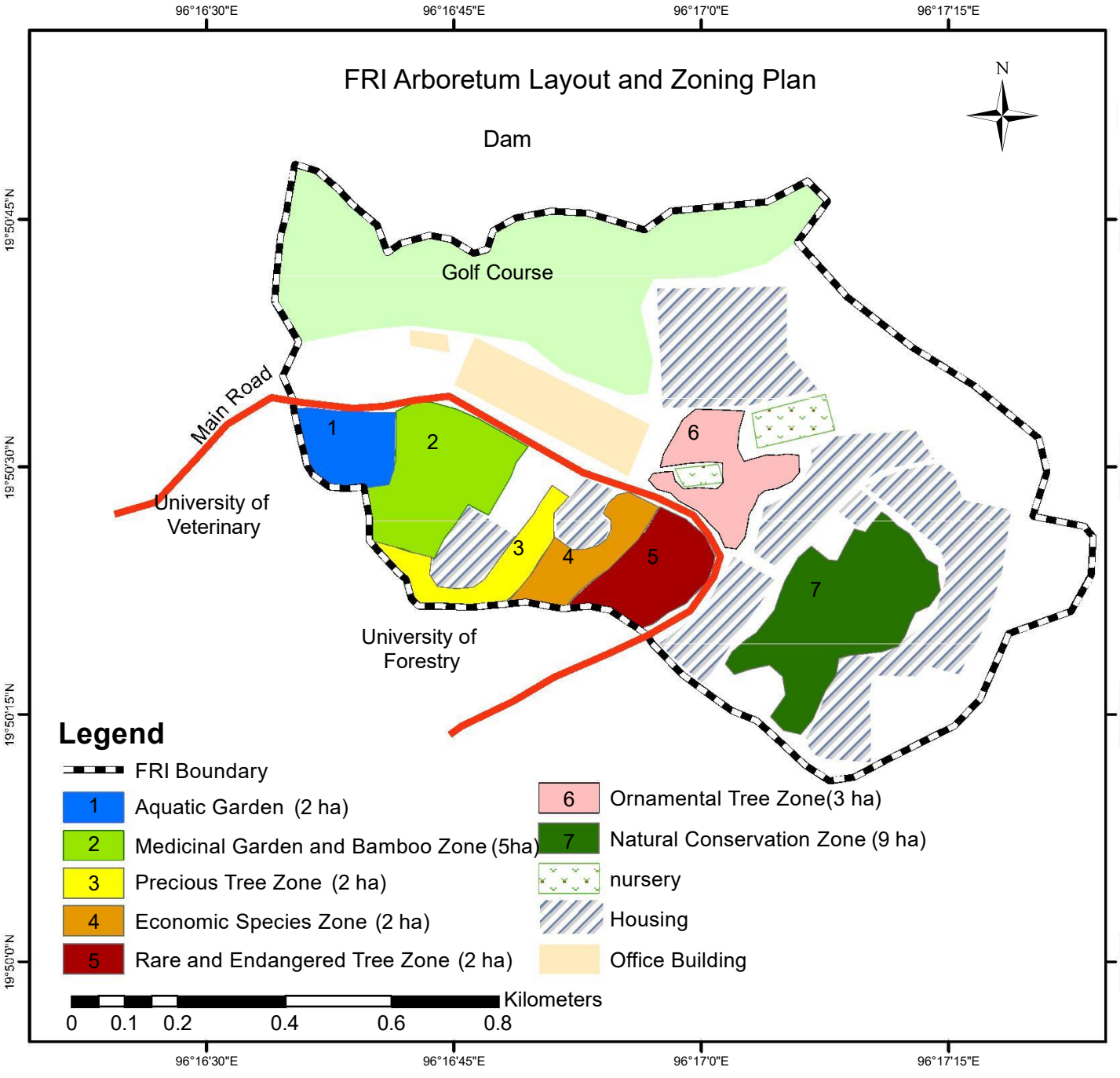
Publicity Monitoring and Evaluation

Annex A-6-3

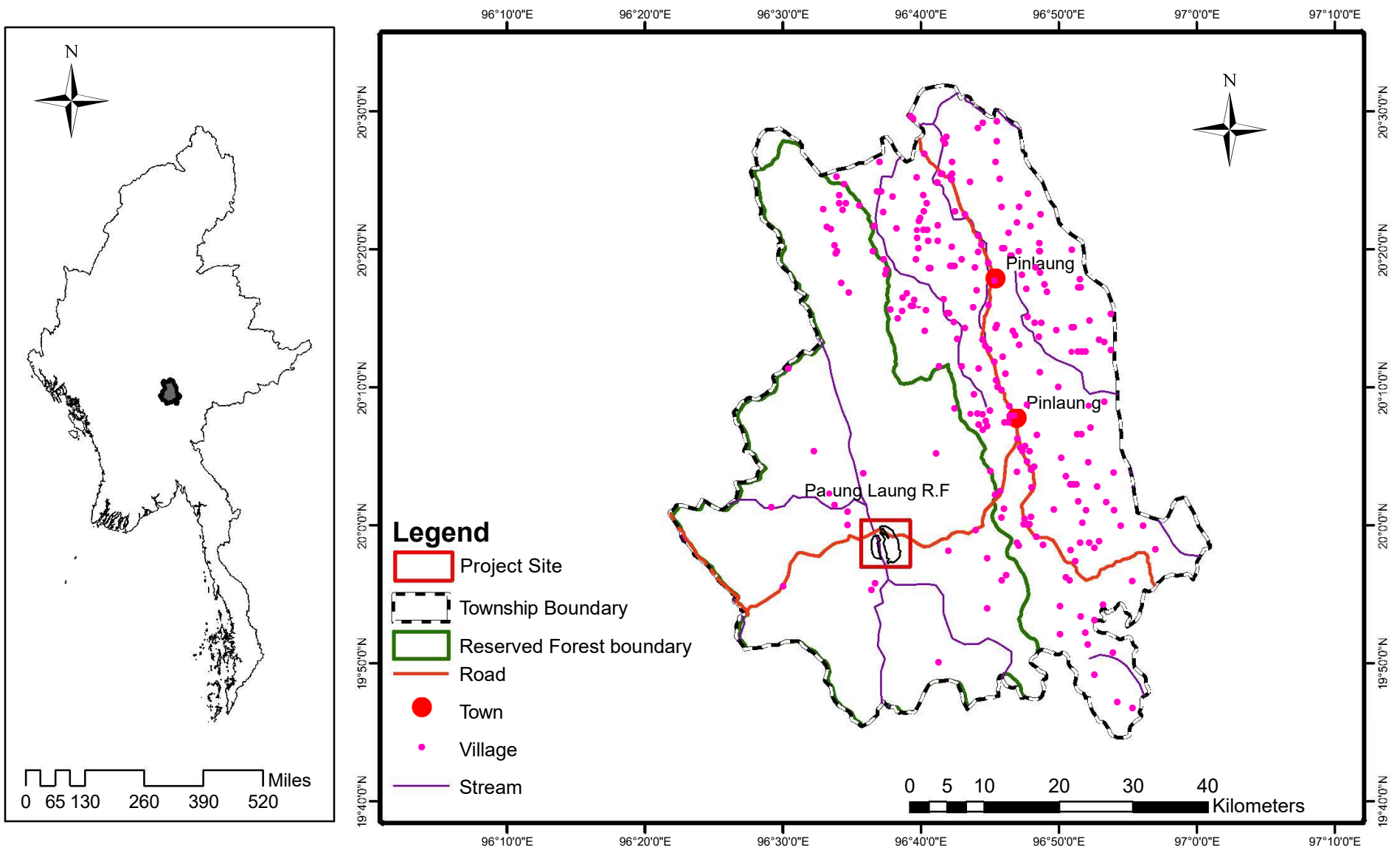
Communication objectives	Success indicators	What information to collect	How to collect information	Who will collect the information	When to collect information
To promote awareness to the stakeholders on the issues conserving forest germplasm resources and rehabilitating forest ecological services and forest productivity. The inception workshop will also make the stakeholders aware of what the project intends to achieve.	Awareness of the group about the project	Physical Developments of the project; whether the target group are aware of the project and the situation in the field	Periodic surveying or tracking, stakeholder surveys given to peers, focus groups	FRI	The Baseline will be conducted on year 1 while the Mid Term and final evaluation will be conducted on Year 3 and Year 5 respectively.
To conserve and improve forest germplasm resources though construction of Arboretum in FRI	Billboards installed	Physical presence of the billboard	Photographs	Project Staff; Consultant	Quarter 2 of Year 1
To disseminate best integrated watershed management practices	Billboards installed	Actual site development	Field Visit	Field Staff	Quarter 1 of Year 1
To enhance the capacity and knowledge of local community, local government and staff through capacity building programs, which will make sure to sustain the management activities after the project is accomplished	(1) Change on the level of awareness of communities; (2) Improvement of the capacity of the FRI	Result of pre-and post-training evaluation	Through survey and interview	Project Staff; Consultant	To be conducted on Q4 of Year 1; Q4 of Year 3; and Quarter 3 and Quarter 4 of year 4
	Information dissemination conducted; Forums conducted; Information materials distributed	Documents produced; Proceedings of meetings	Documentary review	Project Staff; Consultant	Years 1, 2, 3, 4 and 5
	(1) technical trainings; (2) attended by 50 participants	Feedback from the participants about the project	Evaluation	Project Staff	Q3, Year 5
	Forums with site visit conducted	Feedback from the participants	Through facilitation	part of documentation of the proceedings	Years 1, 2, 3, 4 and 5

Annex B-1: Project site (Arboretum) Location and layout Map





Annex B-2: Location Map of Project site in Paung Laung Reserved Forest



Bamboo Species to be planted in Bamboo Zone (Bambusetum) of FRI's Arboretum

Sr. No	Scientific Name	Myanmar Name
1.	*Bambusa affinis* Munro	Wa-byauk
2.	*Bambusa bambos* (L.) Voss	Kyakhat-wa
3.	*Bambusa burmanica* Gamble.	Thaik-wa-gyi
4.	*Bambusa longisoiculata* Gamble ex Brandis	Ta-bin-daing-wa
5.	*Bambusa polymorpha* Munro	Kyathaung-wa
6.	*Bambusa sinthana* E.G.Camus	Sinthna-wa
7.	*Bambusa tulda* Roxb.	Thaik-wa
8.	*Bambusa vulgaris* Schardex J.C. Wendl	Wa-net
9.	*Bambusa vulgaris* var. *strita*	Shwe-wa
10.	*Bambusa vulgaris* var. *wamin*	Wa-min
11.	*Cephalostachyum burmanicum* R.Parker &C.E. Parkinson	Kyat-wa
12.	*Cephalostachyum capitatum* Munro	
13.	*Cephalostachyum latifolium* Munro	Gya-wa
14.	*Cephalostachyum pallia* Munro	Wa-tin-kha
15.	*Cephalostachyum pregricle* Munro	Tin-wa
16.	*Cephalostachyum viragatum*Kurz	Wa-kha
17.	*Dendrocalamus asper* (Schult. & Schult.f) Backer ex K, Heyne	Kalway-wa
18.	*Dendrocalamus brandisii* A. Cumus	Kyalo-wa
19.	*Dendrocalamus calostachyus* (Kurz) Kurz	Wa-gyi
20.	*Dendrocalamus giganteus* Wall. ex Munro	Wa-bo
21.	*Dendrocalamus hamiltonii* Nees & Arn.ex Munro	Wab- myet-san-gye
22.	*Dendrocalamus latiflorus* Munro	Wa-ni
23.	*Dendrocalamus longifimbritus* Gamble	Wa-myin
24.	*Dendrocalamus longispathus* (Kurz) Kurz	Wa-ba
25.	*Dendrocalamus strictus* (roxb.) Nees	Hmyin-wa
26.	*Dinochloa andamanica* Kurz	Wa-nwe
27.	*Dinochloa maclellandii* (Munro) P.C. Keng	Wa-nwe
28.	*Gigantochloa apus* (Schult. & Schult.f.) Kurz	Wa-do
29.	*Giganchloa compressa* R. Parker	Talagu-wa
30.	*Gigantochloa macrostachya* Kurz	Wa-bauk
31.	*Gigantochloa nigrociliata* (Buse) Kurz	Wa-ya
32.	*Melocalamus compactiflorus* (Kurz) Benth.	Wa-nwe-gok
33.	*Melocanna baccifera* (Roxb.) Kurz	Khayin-wa
34.	*Phyllostachys mannii* Gamble.	Ba-wa, Sedan-wa
35.	*Phyllostachys sedan* E.G.Camus	Sedan-wa
36.	*Neohouzeaua dulloa* (Gamble) A.Camus	Wa-zun
37.	*Neohouzeaua helferi* (Munro) Gamble	Wa-tha-but
38.	*Neohouxeaua tavoyana* Gamble.	Dawe-wa
39.	*Thrysoatachys oliveri* Gamble	Tha-nut-wa
40.	*Thrysostachys siamensis* (Kurz ex Munro) Gamble	Hti-yo-wa

Rare and endangered species to be planted in Conservation zone of FRI's Arboretum

Sr. No	Scientific Name	Myanmar Name
1.	*Anisoptera scaphula*	Taung-sagaing
2.	*Dipterocarpus baudii*	Kanyin
3.	*Dipterocarpus grandiflorus*	Kanyin
4.	*Dipterocarpus turbinatus*	Kanyi-ni
5.	*Hopea helferi*	Thingyan-net
6.	*Parashorea stellata*	Thingadu
7.	*Afzelia xylocarpa*	Pyinpadauk
8.	*Anisoptera costata*	Kaban
9.	*Dalbergia oliveri*	Tamalan
10.	*Dipterocarpus alatus*	Kanyin-phyu
11.	*Dipterocarpus costatus*	Kanyin-ni
12.	*Pongamia pinnata*	Thinwin-phyu
13.	*Millettia pendula*	Thinwin
14.	*Podocarpus nerrifolius*	Thitmin
15.	*Magnolia champaca*	Sagawa
16.	*Hollarrhena pubescens*	Lethtok-gyi
17.	*Erythrina variegate*	Pinle-kathit
18.	*Dolichandeone spathacea*	Hinngut
19.	*Dalbergia ovata*	Madama
20.	*Dalbergia remosa*	Dauk-talon
21.	*Betula alnoides*	Busabut
22.	*Bauhinia purpurea*	Swedaw-ni
23.	*Bauhinia variegate*	Swedaw
24.	*Alnus nepalensis*	Mibaw
25.	*Tetrameles nudiflora*	Thitpok
26.	*Shorea obtuse*	Thitya
27.	*Shorea siamensis*	Ingyin
28.	*Caesalpinia sappan*	Teinnyet, Sunlettthe
29.	*Calophylla inophylla*	Ponnyet
30.	*Cordia subcordata*	Thanut
31.	*Cratoxylum arborescens*	Bebya
32.	*Dipterocarpus obtusifolius*	Inpho
33.	*Engelhardtia serrata*	Thit-swele
34.	*Lopopetalum wightianum*	Yethabye
35.	*Aglaia argentes*	Thitto
36.	*Alstonia scho;aris*	Letpan-kha, Taung-meok
37.	*Agalia odorata*	Thanut-kha-pan
38.	*Bauhinia diphylla*	Phalan-nwe
39.	*Dalbergia cultrata*	Yindaik
40.	*Dalbergia fusca*	Yinsat
41.	*Pterocarpus indicus*	Panpadauk
42.	*Hopea odorata*	Thingyun

43.	*Intsis bijiga*	Sagalun
44.	*Aqualaria malaccensis*	Thit-hmwe
45.	*Chukrasia velutina*	Yinma
46.	*Terminalia oliveri*	Than
47.	*Acacia catechu*	Sha
48.	*Homalia tomentosa*	Kyaukshaw
49.	*Swintinia floribunda*	Taung-thayet
50	*Amherstia nobilia*	Thawka-gyi

Asia-Pacific Network for Sustainable Forest Management and Rehabilitation

Annex D

Integrated Forest Ecosystem Management Planning and Demonstration Project in Greater Mekong Sub-region

(Myanmar**)**

Project Implementation Plan

[Forest Research Institute]

October 2017

Contents

The overall goal of the project is to conserve forest germplasm resources and rehabilitate forest ecological services and forest productivity through establishment of arboretum in FRI and implementing integrated watershed forest management in Palaung watershed area, Southern Shan State in Myanmar, so as to contribute to sustainable forest management in the Greater Mekong Sub-region. To fulfill the overall goal of the project, the following three specific objectives need to be achieved.

Objective 1: To conserve and improve forest germplasm resources though construction of Arboretum in FRI

Forest germplasm resources are important un-renewable natural resources which are seriously threatened by rapid economic development. Arboretum can be served as a shelter for precious forest genetic resources. Furthermore, different functions and usefulness of forest will be demonstrated through Arboretum to the public. The project will be conducted in the Forest Research Institute Campus, to support the development of proper management guidelines for conservation of plant species in the area and to present the new records of more endemic and endangered plant resources in the study area. The main objective is to collect forest genetic resources in Myanmar and other tropical countries; protect, conserve and manage forest biodiversity on sustainable basis; domesticate and improve forest germplasm resources; popularizes and disseminate forestry knowledge and environment awareness; exhibit forest landscape, forest tree resources; and provide a recreation site for the public.

Four major functional components in arboretum are designed as:

1) Genetic resources introduction and breeding zone. Nursery for propagation of collected plant species;

2) Ecological conservation zone. Native vegetation conservation and restoration;

3) Thematic gardens. 16ha Plantation and exhibition zones of 7 thematic gardens of bamboo garden, ornamental plant garden, medicinal plant garden, rare and endangered tree species garden, economic trees garden, precious timber tree garden and, aquatics garden.

4) Accessory facilities. Entrance and road system, drainage and irrigation system, plant identification system, hygienic and leisure facilities (pavilions) and, fire control & maintenance system are included.

Output 1 “Construction Plan of FRI Arboretum” formulated

Significance

Survey on the current situation of the planned area is crucial to access the current vegetation, geographical features and status of the forest. The survey results will support the zonation system for different thematic garden and accessories and facilities. Surveys on existing forest status of planned FRI Arboretum contribute directly to the design planning of the Arboretum which will facilitate and enhance the management patterns.

Activity 1.1 Survey on current conditions of FRI Arboretum

(1) Basic information: The tentative place of arboretum, with an area of 25 ha, is situated in the Forest Research Institute compound, Yezin, Naypyitaw. The area is covered with secondary natural forest which is mixed deciduous forest type. The area is enriched with 103 species under 71 genera of 31 families. Families that are represented by the largest number of individuals are Anacardiaceae, Mimosaceae, Verbenaceae, Dipterocarpaceae, Fabaceae, Combretaceae, Meliaceae, Rubiaceae, Bignoniaceae and Caesalpiniaceae.

(2) Measures: Although the overall species composition and richness data are available in the planned area of arboretum, the detail information of species in accordance to different parts of arboretum is still missing. As the arboretum intends to be divided into different zones, the vegetation types and density with an emphasis of the location, the geographical features and the current status of forest will be surveyed by researchers. The gathered data will be analyzed and the results will be explained by producing a report.

(3) Investigation area: the total area of arboretum is 25 ha, all area is owned by Forest Research Institute.

(4) Schedule: Jan-Feb 2018

(5) Total budget: $ 5000 all invested by FRI.

1) Vegetation survey total cost: $3000, 5 persons * 20 days* $ 30 per day:

2) Data analysis and writing report: $2000

(6) Responsible party: FRI

Activity 1.2 Development of "Construction Plan of FRI Arboretum" include nursery upgrading, native forest ecological conservation zone, 7 thematic gardens, and accessory facilities"

(1) Basic information: The design planning will be carried out in the planned Arboretum area which is 25 ha.

(2) Measures: Based on the surveyed data of the planned area of the Arboretum, the design planning will be carried out to make the FRI Arboretum more scientificalness and esthetics, operability. The designing of different zones will be considered mainly based on the existing vegetation status, species and geographical features. The existing nursery will be designed to be able to produce 200,000 seedlings at the same time. Designing accessory facilities will also be one main components including designs of trails, bridges and recreation places.

(3) Investigation precision: third class investigation.

(4) Planning area: 25 ha and upgrading nursery.

(5) Schedule: Feb- June 2018

(6) Budget: $18300. Design planning will be done by cooperation with local agency and project staffs under supervision of international consultants.

1) Design planning cost: $6500 for local company, ($3500: $500 per thematic

zone * 7 zone and$ 3000 for road and bridge design),

2) Design planning cost: $2400 contributed by FRI. (5 persons * 16 days* $30/person day)

3) International consultancy cost: $ 9400. International travel: $1000 ($500/person *2), Food and lodging: $2800 ($200/day *7 days* 2persons); consulting fee: $5600($400*7 days* 2persons).

(7) Responsible party: FRI

Activity 1.3 Evaluation and finalization of "Construction Plan of FRI Arboretum"

(1) Basic information: The planned area is 25 ha. FRI together with international and national consultancy once developed a designing plan of the Arboretum, but will not carry out the plan simultaneously.

(2) Measures: After the design plan of the Arboretum is produced, it will be evaluated and approved by the national experts and international consultants through one day meeting. Based on the comments of the approval meeting, the plan will be finalized and used in the following Arboretum remodeling.

(3) Planning area: 25 ha

(4) Schedule: June 2018

(5) Budget: $ 1700.

Meeting room: 200 per day (counterpart by FRI), approval experts $ 1000 (10 persons *100/day), food $500 (20 participants, $25/day)

(6) Responsible party: FRI

Output 2 Forest germplasm resources introduction and breeding nursery constructed

Significance

Total area of 1ha for tree species introduction and breeding nursery will be expanded and upgraded based on existing nursery, with annual seedling production capacity of 200,000 seedlings. The nursery is designed mainly for production of the self-used seedlings in the arboretum and other commercial seedlings.

Activity 2.1 Upgrading and reconstruction of nursery, include construction of seedling bed, shading system, irrigation system, and fence

(1) Basic information: The area of existing nursery to be upgraded is around 1 ha. The current nursery has capacity to produce 50,000 seedlings at the same time. The nursery was established in 2007 and the structure is made of wooden. It is necessary to upgrade to enhance capacity since the condition of the nursery is out dated, at the same time, the water storage and irrigation system is needed to be updated in lines with the structure and capacity of the nursery.

(2) Measures:

1) Nursery construction with a capacity to produce 200,000 seedlings per time: the number of seed Beds: 40, size of seed bed: 7m x1.2m x0.3 size of shading system 50m*50m, all these will be reconstructed by a local company

2) Water tank: 2000 gallons capacity

3) Greenhouse: Steel structure greenhouse using aluminum frame with dimension of 7m*10m*4m

(3) Area of the nursery: 2 ha

(4) Location: Forest Research Institute compound

(5) Planning period: 2 years

(6) Work plan

1) Jan- Dec 2018: construction of nursery, water tank and greenhouse.

2) Dec. 2021: accomplish completion report

(7) Budget: $ 33,000

Construction of nursery (200,000 seedlings) capacity: $10000,

Water tank $3000,

Greening House: $ 20000 (70 square meter * 4m high)

(8) Responsible party: FRI

Activity 2.2 Forest germplasm resources collection

(1) Basic information: The current nursery already collected forest germplasm resources from all over the country, and every year it also raises the seedlings according to the need of government.

(2) Measures: The nursery will continue to collect the forest germplasm from both here and abroad

(3) Location: Forest Research Institute

(4) Planning period: 2 years

(5) Work plan

Jan, 2018- Dec 2020: collect the forest germplasm resources from both here and abroad.

(6) Budget: $ 40000

Collect 50 species of forest germplasm, each species for $80, total cost: $4000

(7) Responsible party: FRI

Activity 2.3 Seedling raising

(1) Basic information: The current nursery has capacity to produce 50,000 seedlings. The nursery was established in 2007 and the structure is made of wooden. The tree species of seedlings are decided by the strategy of forestry department and will be sent to local forest farmers and relevant afforestation agencies.

(2) Measures: The updated nursery will continue produce seedlings every year.

(3) Area of the nursery: 2 ha

(4) Location: Forest Research Institute compound

(5) Planning period: 2 years

(6) Work plan

Jan, 2018- Dec. 2021: seedling raising

(7) Budget: $ 8,000

Raising the seedlings of 50 species of forest germplasm, each species for $160, total cost: $8000

(8) Responsible party: FRI

Output 3 9ha native forest ecological conservation zone established

Significance

The ecological conservation zone is going to be built for native vegetation-- tropical mixed deciduous forest conservation and restoration. The total area of the ecological conservation zone is 9haha. Natural regeneration and promoted natural regeneration (enrichment planting of key species) will be adopted to conserve and recover secondary native forest vegetation, and to enhance natural forest succession towards its climax community.

Activity 3.1 Demonstration of enrichment planting of key species

(1) Description: In the planned area of conservation of natural forest, more than 29 tree species are found. The area is mainly dominated by *Pterocarpus macrocarpus, Terminalia crenulata, Lannea coromandelica, Buchanania lanzan, Tectona hamiltoniana* and *Cratoxylum ligustrinum*. Although the area is mainly intended for natural conservation, enrichment planting will be carried out in order to improve the species composition and density.

(2) Measures: Enrichment planting will be carried out in the gaps within the zones in order to enhance the species composition. 100 seedlings will be planted in each hectare of the zone.

(3) Area of demonstration: 9 ha

(4) Planting intensity: 100 trees/ ha

(5) Planning period: 5 years

(6) Schedule:

1) Every June- August 2018 and 2019: Planting of seedlings in the gap within the zone,
2) July and Sep of 2018: Weeding will be carried out.
3) Every Dec of 2019 and 2020: Tree identification system will be set up.

(7) Budget: $18600. All invested by APF Net.

1) Planting of seedlings: $2700 (900 seedlings*$3)
2) Weeding for fire protection: $14400 ($200/ha*9ha*2 times*4 yr)
3) Labeling: $1500 (300 trees * $5 per tree)

(8) Responsible party: FRI

Activity 3.2 Maintenance of the forest ecological conservation zone

(1) Description: The area of conservation zone is situated around the valley which is covered by secondary natural forest. More than 29 species of trees are found in the zone. The area is also a habitat for birds including nearly endangered and threatened species.

(2) Measures: the ecological conservation zone (9ha) will be monitored from human disturbances, fire and maintained the planted seedlings such as watering and weeding and fertilizing.

(3) Area of demonstration: 9 ha

(4) Work plan

1) June 2018 to December 2021: maintenance of planted trees and natural forests in the zone.

2) Dec. 2021: To accomplish completion report.

(5) Budget: $9072.

All invested by APF Net. It is estimated to use 3 person-days/ha/month as the area is mainly for natural conservation which does not need intensive maintenance. (3 person *$7/person.day* 48months* 9ha).

(6) Responsible party: FRI

Output 4 16ha thematic gardens (plantation and exhibition zone) established

Activity 4.1 Establishment of 3ha bamboo garden

(1) The condition of the area: The intended area is located next the medicinal garden. *Bambosa polymorpha* and *bambosa tolda* have already grown in the area.

(2) Measures: Collection of Bamboo species with a target of up to 50 species from thorough the country will be conducted. The collected seeds and seedlings will be raised in the nursery around four months. The bamboo seedlings will be planted with a spacing of 20 m x 3 m (~150 clums per ha). The bamboo zone will be maintained with the labour capacity of 30 man.days per month.

(3) Area of demonstration: 3 ha

(4) Planting intensity: The total area of demonstration plot will be 3 ha. Cutting brush: remove the shrub and liana with negative impact, and promote the growth of target plants.

(5) Work plan

1) Every January of 2018 and 2019: Collection of bamboo seeds and seedlings

2) Every February- May of 2018, 2019 and 2020: Preparing seedlings in the nursery and land preparation for planting in the planned area

3) Every June – August of 2018, 2019 and 2020: Planting of bamboo seedlings

4) July and September of 2018: intensive weeding within the zone.

5) Every Dec of 2019 and 2020: labeling of bamboo species.

6) From Jan 2018 till Dec 2021: Maintenance activities will be done within the zone.

7) Dec. 2021: completion report.

(6) Investment budget: $30290 all invested by APFNet.

1) 50 bamboo species will be collected from throughout the country. 120 days of collection time is estimated (4 person, 30 days). Total cost$13700: $ 13200 (Travel expenses+food+lodging. $110/person.day* 120 persons), seed cost: $500(50 species* $10/species)

2) Land preparation cost: total $ 1500 ($ 500 / ha* 3ha)

3) Nursery cost: 200 seedlings will be raised each year for four months. Total cost $ 1260(15 labour days/month* $7/person.day * 4month)* 3 years

4) Planting $ 1800 (600seedlings*$3)

5) Labeling: 3clum per species, total cost: $ 750 (150 clums*5)

6) Maintenance: total cost: $10080 (30 labour days/ month* 12months* 4 yrs* $7/person.day)

7) Weeding: $1200 ($200/ha *3ha*2)4.2 Establishment of 3 ha ornamental plant garden

(7) Responsible party: FRI

Activity 4.2 Establishment of 3 ha ornamental plant garden

(1) The current situation: The tentative area of the garden is situated beside the roadside. A recreation place including sport tools and a small playing ground is already set up in the area. The existing vegetation in the area is dominated by *Lagerstroemia speciosa* (L.) Pers.*Tectona grandis* L.f, *Cassia mimosoides* L., *Tectona hamiltoniana* Wall., *Leucaena leucocephala* (Lam.) De Wit., *Cratoxylum ligustrinum* Blume.

(2) Measures: Collection of ornamental species with a target of up to 100 species from thorough the country will be conducted. The collected seeds and seedlings will be raised in the nursery around four months. The seedlings will be planted 1350 trees within the zone. Maintenance activities will be carried out through the year within the zone.

(3) Planning area: 3 ha

(4) Planning Schedule:

1) Every January of 2018 and 2019: Collection of ornamental seeds and seedlings up to 100 species.

2) Every February- May of 2018, 2019 and 2020: Preparing seedlings in the nursery and land preparation for planting in the planned area

3) Every June – August of 2018, 2019 and 2020: Planting of seedlings

4) July and September of 2018: intensive weeding within the zone.

5) Every Dec of 2019 and 2020: labeling of species

6) Dec. 2021: completion report.

(5) Planting intensity: 450 trees per ha with the spacing of 3m *7m

(6) Investment budget: $29,170: all invested by APFNet.

1) 100 ornamental species will be collected from throughout the country. 40 days of collection time is estimated. Total cost: $10000 (Travel expenses+food+lodging:$225/day/person* 40days), seed cost: 100species *$10/species)

2) Land preparation cost: total $ 1500 ($ 500 / ha* 3ha)

3) Nursery cost: 750 seedlings will be raised each year for four months. Total cost: $ 840 (15 labour days per month* $7 * 4month)* 2 years

4) Planting: $ 4050 (1350seedlings*$3)

5) Labeling: 3 trees per species, total cost: $ 1500 (300 trees*5)

6) Maintenance and monitoring: total cost: $10080 (30 labor days per month* 12months* 4 yrs* $7)

7) Weeding: Total cost $ 1200 ($200/ha*3*2)

(7) Responsible party: FRI

Activity 4.3 Establishment of 2ha medicinal plant garden

(1) The current condition: The current medicinal garden is planned to be upgraded. Currently, the area of the medicinal garden is around 1.5 ha demonstrating and conserving more than 400 species. Although around 10 beds of medicinal plants and two orchid houses have been established, the overall medicinal garden is outdated which need to be upgraded to maintain the collected species and conserve more medicinal plant species across the country to provide well functions to the public.

(2) Measures: Collection of different medicinal plant species up to100 species, planting of medicinal plants, construction of shade, shelves and seed bed for each plant family. Maintenance of medicinal plants will be carried out throughout the year.

(3) Planning area: 2 ha

(4) Planning schedule:

1) Every Jan- Feb of 2018 and 2019: Collection or purchase of medicinal plants

2) Every March- May of 2018 and 2019: Raising seedlings in the nursery or in the current medicinal garden.
3) Every Dec of 2018 and 2019: Labelling of medicinal plant species will be carried out.
4) From Jan 2018 till Dec 2021: Maintenance activities of medicinal plants and garden area will be conducted throughout the year.

(5) Investment budget: $44,160 all invested by APFNet. At least 100 medicinal species will be raised.
1) Purchase of medicinal plants: $ 3500 (100 species*$ 35)
2) Construction of shelves, seed beds, shading: $ 20,000
3) Labeling: $ 500 (100 species*$5)
4) Maintenance and monitoring: $20160 (60 labor days per month* 12months* 4 yrs.* $7)

(6) Responsible party: FRI

Activity 4.4 Establishment of 2ha rare and endangered tree species garden

(1) The current condition: The proposed area for thematic garden of rare and endangered species is situated near the main entrance of FRI and along the road site. The area is enriched by 31 tree species which is mainly covered with *Tectona hamiltoniana* Wall, *Eucalyptus camaldulensis* Dehnh, *Leucaena leucocephala* (Lam.) De Wit, *Cassia mimosoides* L,*Pterocarpus macrocarpus* Kurz and *Chukrasia velutina* Roem. . *Tectona hamiltoniana* Wall and *Eucalyptus camaldulensis* Dehnh are planted as a form of road site plantation since 1978.

(2) Measures: Collection of rare and endangered species with a target of up to 50 species from thorough the country will be conducted. The collected seeds and seedlings will be raised in the nursery around four months. The seedlings will be planted 900 trees within the zone. Maintenance activities will be carried out through the year within the zone.

(3) Planting intensity: 450 trees per ha

(4) Planning area: 2 ha

(5) Planning schedule:

1) Every January of 2018 and 2019: Collection of rare and endangered seeds and seedlings up to 50 species.

2) Every February- May of 2018 and 2019: Preparing seedlings in the nursery and land preparation for planting in the planned area

3) Every June – August of 2018 and 2019: Planting of seedlings

4) July and September of 2018: intensive weeding within the zone.

5) Dec of 2019: labeling of species

6) From Jan 2018 till Dec 2021: Maintenance activities of the planted species and planned zone will be conducted.

7) Dec. 2021: completion report.

(6)Investment budget: $ 39570, all invested by APFNet.

1） 50 rare and endangered species will be collected from throughout the country. 60 days of collection time is estimated. Total cost: $ 14000 (Travel expenses+food+lodging$13500:$225/day/person* 60days, seed cost$500: $50*$10/species)

2) Land preparation cost: $ 1000 ($ 500/ha* 2ha)

3) Nursery cost: Total cost ： $ 840 (15 labor days per month* $7 * 4months)* 2 years. 500 seedlings will be raised each year for four months.

4) Planting: $ 2700 (900seedlings*$3)

5) Labeling: 3 trees per species, total cost: $ 750 (150 trees*$5)

6) Maintenance and monitoring: total cost: $10080 (30 labor days per month* 12months* 4 yrs* $7)

7) Weeding: Total cost $ 800 ($200/ha*2ha*2yrs)

8) International consultancy cost:$9400: International Travel: $1000 ($500/person*2persons); Food and lodging: $2800 ($200*7 days* 2persons); consulting fee$5600($400*7 days* 2persons).

(7) Responsible party: FRI

Activity 4.5 Establishment of 2ha economic tree garden

(1) The current situation: The area is enriched by more than 32 species and dominated by *Heterophragma sulfureum* Kurz, *Pterocarpus macrocarpus* Kurz, *Buchanania lanzan* Spreng, *Lannea coromandelica* (Houtt.) Merr, *Stereospermum suaveolens* DC.,*Vitex limonifolia* Wall., *Eucalyptus camaldulensis* Dehnh and *Cratoxylum ligustrinum* Blume.

(2) Measure: Collection of economic species with a target of up to 50 species from thorough the country will be conducted. The seedlings of 900 trees will be planted within the zone. Maintenance activities will be carried out through the year within the zone.

(3) Planting intensity: 450 trees per hectare (at least 10 seedlings per specie)

(4) Planning area: 2 ha

(5) Planning schedule:

1) Every May of 2018 and 2019: Collection or purchase economic seeds and seedlings up to 50 species (1000 seedlings including 10% surplus)

2) Every June – August of 2018 and 2019: Planting of seedlings

4) July and September of 2018: intensive weeding within the zone.

5) Every Dec of 2019: labeling of species

6) From Jan 2018 till Dec 2021: Maintenance activities of the planted species and planned zone will be conducted.

7) Dec. 2021: completion report.

(6) Investment budget: $ 18630. All invested by APFNet.

1) Purchase of seedlings: total cost $3300: seedlings$2500 ($2.5 * 1000)and transportation cost: $800 ($80 for 100 seedlings)
2) land preparation cost: $ 1000 ($ 500 per ha* 2ha)
3) Planting: $ 2700 (900seedlings*$3)
4) Labeling: 3 trees per species, total cost: $ 750 (150 trees*$5)
5) Maintenance and monitoring: total cost: $10080 (30 labor days per month* 12months* 4 yrs* $7)

6) Weeding: Total cost $ 800 ($200/ha*2yrs*2ha)

(7) Responsible party: FRI

Activity 4.6 Establishment of 2ha precious timber tree garden

(1) The current condition: The area is currently covered by more than 30 species and dominated by *Heterophragma sulfureum* Kurz, *Pterocarpus macrocarpus* Kurz,*Buchanania lanzan* Spreng, *Lannea coromandelica,*(Houtt.) Merr. *Stereospermum suaveolens* DC. *Vitex limonifolia* Wall, *Eucalyptus camaldulensis* Dehnh.and *Cratoxylum ligustrinum* Blume.

(2) Measures: Collection of precious timber species with a target of up to 50 species from thorough the country will be conducted. The collected seeds and seedlings will be raised in the nursery around four months. The 900 seedlings will be planted within the zone. Maintenance activities will be carried out through the year within the zone.

(3) Planting intensity: 450 trees per ha

(4) Planning area: 2 ha

(5) Planning schedule:

1) Every January of 2018 and 2019: Collection of precious timber seeds and seedlings up to 50 species.

2) Every February- May of 2018 and 2019: Preparing seedlings in the nursery and land preparation for planting in the planned area

3) Every June – August of 2018 and 2019: Planting of seedlings

4) July and September of 2018: intensive weeding within the zone.

5) Dec of 2019: labeling of species

6) From Jan 2018 till Dec 2021: Maintenance activities of the planted species and planned zone will be conducted.

7) Dec. 2021: completion report.

(6) Investment budget: $ 37370, and 3all invested by APFNet.

1） 50 precious species will be collected from throughout the country. 100days of

collection time is estimated. Total cost&11500: Travel cost:$ 11000 (Travel expenses+food+lodging. $110/day/person* 100days), seed cost: $500(50species*$10/species)

2) Land preparation cost: total $ 1000 ($ 500 per ha* 2ha)

3) Nursery cost: Total cost $ 840: (15 labour days per month* $7 * 4month)* 2 years. 500 seedlings will be raised each year for four months.

4) Planting: $3000 (1000seedlings*$3)

5) Labeling: 3 trees per species, total cost: $ 750(150 trees*5)

6) Maintenance and monitoring: $10080 (30 labor days per month* 12 months* 4 yrs* $7/person.day)

7) Weeding (2 times per year): Total cost $ 800 ($200/ha*2ha*2yrs)

8) International consultancy cost:$9400: International Travel: $1000 ($500/person*2persons); Food and lodging: $2800 ($200*7 days* 2persons); consulting fee$5600($400*7 days* 2persons).

(7) Responsible party: FRI

Activity 4.7 Establishment of 2ha aquatics garden

(1) The current condition: The area is a shallow pond which is filled with water all year round. The place is an important habitat for bird species especially for Chinese pond-heron, Indian pond heron, lesser whistling duck and Eastern cattle egret.

(2) Measures: Preparation of land (pond), collection or purchase of aquatic plant species and planting will be carried out within the zone. Maintenance activities will be carried out through the year within the zone.

(3) Planning area: 2 ha

(4) Planning schedule:

1) From Jan 2018: Land preparation (Digging)

2) Feb- March 2018: Collection of aquatic species

3) April 2018: Planting of plants

(5) Budget: $7350: All invested by APF Net

1) Land preparation: $5000 (digging service lumpsum cost)
2) Buying aquatic plants/seeds: $2000
3) Planting: $ 350 (50 labour.days *$7)

(6) Responsible party: FRI

Output 5 Accessory facilities for arboretum constructed

Significance

Construction of accessory facilities is one of the main supporting activities of Arboretum establishment as one of the purposes of Arboretum is for public recreation as well as for education.

Activity 5.1 Construction of arboretum entrance

(1) The main entrance of the Arboretum with a well-designed signboard will be constructed to highlight the existence of Arboretum, to enhance the aesthetic value and to express the coordination between the funded donor, APF Net and FRI.

(2) Measures: Construction of the entrance by a local company service through a legal contract. Guest house: 90 square meter * 4 meter

(3) Planned dimension: 7m x 6m for the entrance concrete frame and 7m x 1m for the signboard with metal frame

(5) Planning schedule: July, 2018 to Dec 2018

(6) Investment budget: $45000, all invested by APF Net, Construction cost (including materials and design): $25000. Guest house and signboard: $20000

(7) Responsible party: FRI

Activity 5.2 Construction of 3812m road/trail system

(1) The road and trials construction is one of the main accessories and facilities as it will play a main role to reflect the impressions from the Arboretum. The road and trials will bring visitors to different zones of the Arboretum providing knowledge related to each thematic garden and recreational value.

(2) Measures: Concrete trails will be set up to connect different zones of the arboretum. The main road with 2 m width will be constructed to provide a quick overview of the arboretum by a drive. The periphery trails will be designed for visiting by foot.

(3) Total Length: 3812 m, total constructed area will be 4690 m^2 (877 m x 2m width for main road, 2935m x 1m width for foot trails)

(4) Planning area: 25 ha

(5) Planning schedule: July 2018 – Dec 2019 : construction of the main road and peripheral foot trails

(6) Investment budget: $93800 All invested by APFNet.

(4690 m^2*$17 per square meter). (877m length * 2m width + 2935m length * 1m width equals to 4690m^2)

(7) Responsible party: FRI

Activity 5.3 Construction of 1982m irrigation system

(1) The current condition: Although the current irrigation system has been established in the FRI area, the pipeline structure is still limited and outdated in the planned Arboretum area. The updated structure will be set up in the Arboretum area to be able to distribute water throughout the Arboretum area covering all different thematic garden necessities.

(2) Measures: Irrigation system using PVC pipe lines will be set up in the arboretum area. Two water pump engine will be used to distribute water effectively.

(3) Length: 1983 m (Main pipe line: 1067m, distribution lines 915m)

(4) Planning area: 25 ha

(5) Planning schedule: July 2018- Dec 2019: Construction of pipe line system

(6) Investment budget: $20000. All invested by APF Net.

1) Lump sum cost construction of pipe lines: $12000 including materials and designing

2) Water pumping engine $8000 ($4000 per engine)"

(7) Responsible party: FRI

Activity 5.4 Establishment of tree identification system

(1) The current condition: Tree identification system is a crucial part of distributing information to the visitors of the Arboretum. Not only species recognition but also the detail information of the species such as habitat range, morphological characteristics, and usefulness will be accessed through barcodes.

(2) Measures: Tree identification system though labeling and bar coding systems will be developed and set up in order to provide information effectively. The scientific name of each species will be mentioned on each label with a barcode representing the detailed information of the species. The visitors can scan barcodes easily with smart phones and can access the information of species in the website using the scanned barcode.

(3) Planning: All species in the zone will be demonstrated by labels with barcodes. At least 3 trees per species will be demonstrated.

(4) Planning schedule: July- Dec 2018: Setting up the barcoding system and uploading detailed information for each species.

(5) Investment budget: Contracting Bar-coding system service: $5000

(7) Responsible party: FRI

Activity 5.5 Construction of 3650m forest fire control line

(1) The current condition: The existence of the Arboretum is in the FRI compound where the boarders are in adjacent with the University of Forestry, University of Veterinary Science and staff's residence. Hence, fire control and monitoring is an important activity for the maintenance and protection of the Arboretum. Construction of fire breaks is an effective means of fire control as well as for monitoring.

(2) Measures: The Fire break or control lines will be constructed around the boarders of the Arboretum with 2 meter width.

(3) Length: 3650 meters

(4) Planning area: 25 ha

(5) Planning schedule: July 2018- Dec 2018: Land clearance and construction of permanent fire breaks

(6) Investment budget: 7300$ all invested by APF Net. (3650 m length* 2 m width) 7300 square meter * 1$/ square meter

(7) Responsible party: FRI

Objective 2: To demonstrate integrated watershed management practice in Paung Laung Watershed.

As Myanmar became the third worst deforestation country in the world in 2015, this part of activities to encourage and support sustainable forest management is crucial in Myanmar. Among the issues of deforestation in Myanmar, failure to sustainable watershed forest management is one of serious problems which also lead to environmental degradation. Hence, the project area is selected in Paunglaung watershed area, which is situated in the Paunglaung reserved forest, PinLaung Township, Shan State, Myanmar. Through the project, the integrated watershed forest management will be demonstrated in order to ensure the sustainability of the watershed forest and its environment. The project activities will be implementing in order to product the following outputs.

(1) Integrated watershed management plan formulated.

(2) Demonstration of integrated watershed management practices established

(3) An integrated forest management technology assembled and a technical handbook formulated.

Output 6 Integrated watershed management plan formulated

Significance

As the second main objective of the project is to demonstrate the integrated watershed forest management in Paunglaung area, participatory forest management plan of the area is crucial to be formulated based on the local social, economic and natural conditions in order to enhance the effectiveness of the management and sustainability of project implementation activities.

Activity6.1 Baseline investigation including social economic situation and threats for forest degradation

(1) The current condition: The intended project area is located in Paung laung reserved forest compartment no. 97 near Lain Li River. The residents, around 150 households, live beside the Pyinmana-Pinlaung high-way road across the reserved forest. The Palaung hydropower project was initiated in 2010 and project village, Lain Li is one of the resettlement area so sustainable watershed conservation play a crucial role not only to conserve watershed area of Palaung river but also to enhance livelihood of local community that live in that area. The major livelihood is shifting cultivation which can lead soil erosion without considering long term effect of cultivating seasonal crops along the river bank area. The average minimum and maximum shifting cultivation plots cultivated by individual household is about 1.5 to 10 ha respectively.

(2) Measures: Household survey using questionnaires will be conducted to obtain the socio-economic data such as source of income, livelihood strategies and wealth status. Group discussion and participatory approaches will be applied to assess threats for forest degradation in the targeted area.

(3) Planning area: Paung laung project site, Lein Le village

(4) Planning schedule:

1) January 2018: Baseline data survey in the project area

2) Feb 2018: Data compilation and report writing.

3) March 2018: Completion report.

(5) Investment budget: $3000 All invested by APF-Net. (5 persons* 10 days* $60/day/person)

(6) Responsible party: FRI

Activity 6.2 Development of participatory integrated watershed co-management plan

(1) The current condition: The project area will mainly focused on shifting cultivated area by applying improved fallow system using timber and fruit tree species. In order to

ensure the sustainability of the project activities, the management plan is planned to be drawn through community participation.

(2) Measures: The management plan of the watershed forest and shifting cultivation areas will be designed to formulate the management plan by using participative approach. Village meetings, focus group discussions, interviews and participatory research appraisals will be used in formulation of the management plan. The formulated management plan will be approved by the whole village before finalizing, documenting and implementing it. The following project activities will be carried out in accordance with the co-management plan both by project staff and community.

(3) Planning area: Paung Laung project site

(4) Planning schedule:

1) January- March 2018: Participatory planning:

2) April 2018: Summarize the results and report writing

3) May 2018: Completion report

(5) Investment budget: $5040 All invested by APFNet.(3persons* 28 days* $60/day/person)

(6) Responsible party: FRI

Output 7 Demonstration of integrated watershed management practices established

Significance

The planned project site is located next to the Palaung stream in Paung laung reserved forest near lain lee village. The local communities practiced shifting cultivation at the stream bank and adjacent area. The current fallow period is extremely short that is around 4 years. In order to reduce the soil erosion and degradation, bamboo strips will be planted along the stream bank and fruit trees and timber trees will be intercropped in the farm land and fallow land with the project support.

Activity 7.1 Seedlings preparation for integrated watershed management practices

(1) Measures: The preferable species will firstly be approved by the households since at the initiation of the participatory planning. Seedlings of approved species to be planted will be raised with the labor input from the volunteers of the communities. Cost for seeds and planting materials will be offered by the project.

(2) Quantities: 24768 seedlings will be raised in total during the project years.

(3) Planning area: Paung Laung Project site.

(4) Planning schedule:

1) Every January- June of 2018, 2019 and 2020: Seedlings will be raised.

(5) Investment budget: $ 80079. All invested by APFNet.

1) Tree seedlings: $74304: $3 per tree * 24768 trees .Total 24768 seedlings will be planted with 4m* 8m spacing.

2) Bamboo seedlings cost: $5775 ($1.5 *3850 clum)

(6) Responsible party: FRI, the community

Activity 7.2 Land preparation of demonstration site

(1) The current condition: The intended shifting cultivation will be farm land and fallow land. The area along the river bank will be selected to demonstrate intercropping systems using fruit trees and timber tree species.

(2) Measures: Land preparation activities such as land clearance, digging holes for seedlings, soil preparation (adding manure) will be carried out.

(3) Planning area: The shifting cultivated areas, fallow land and riverbank area.

(4) Planning schedule: Every January- June of 2018, 2019 and 2020 : Land preparation for planting.

(5) Investment budget: $24768 All invested by APF Net.

1) Manure: $1 * 24768 seedlings

2) Labor for land preparation and applying manure will be counterpart contribution from the community.

(6) Responsible party: FRI, the community

Activity 7.3 Demonstration establishment of fruit trees

(1) Measures: Planting of fruit tree species in the shifting cultivated area and fallow land. The planting design will be set up according to individual preference. About 334 trees are calculated to be planted in each hectare with the spacing of 4 m* 8m. Along the river bank, bamboo seedlings will be planted to control soil erosion and degradation from the upper side area.

(2) Planning area: The shifting cultivated area, fallow land and river banks, around 36 ha.

(3) Planting schedule: Every July- Sep of 2018, 2019 and 2020: Planting of fruit trees in the shifting cultivated area and fallow land and planting of bamboo seedlings along the bank.

(4) Total budget: $50700. $32100 invested by APF Net and $ 18600 from community .

1) Labour cost for Fruit trees:$18600 (12400trees estimated, 4m*8m, 334 trees/ha, 1.5$/tree) will be counterpart contribution from community

2) Bamboo along Paung Luang river catchment: total cost :$2700 Labor for bamboo planting $1.5 /clum* 1800 clums.

3) International consultancy cost:$9400: International Travel: $1000 ($500/person*2persons); Food and lodging: $2800 ($200*7 days* 2persons); consulting fee$5600($400*7 days* 2persons).

4) Guest house and signboard: $20000

(5) Responsible party: FRI, the community

Activity 7.4 Demonstration establishment of timber tree

(1) Measures: Planting of timber tree species in the shifting cultivated area and fallow land. The planting design will be set up according to individual preference. About 334 trees are calculated to be planted in each hectare with the spacing of 4 m* 8m. Along the river bank, bamboo seedlings will be planted to control soil erosion and degradation

from the upper side area.

(2) Planning area: the shifting cultivated area, fallow land and river bank.

(3) Planning schedule: Every July- Sep of 2018, 2019 and 2020: Planting of timber trees in the shifting cultivated area and fallow land and planting of bamboo seedlings along the bank.

(4) Total budget: $21150. $2550 invested by APFNet and $ 18600 from community .

1) labour cost for timber trees planting$18600(12400 trees estimated,2m*8m, 700 trees/ha,1.5$/tree) will be counterpart contribution from community.

2) Bamboo along Paung Luang river catchment: total cost :$2550 Labour for bamboo planting 1.5 $ per clum*1700 clums

(5) Responsible party: FRI, the community

Activity 7.5 Maintenance and monitoring of demonstration sites of integrated watershed management practice

(1) Measures: Lack of market, a constraint of up-scaling fruit trees in shifting cultivated areas and fallow land is realized during discussion with the local communities when pre-study was conducted. To address the issue, food processing machine will be provided by the project. Two communicators will be assigned to support the local communities, report the issues and update situation of the project site to the project staff. Project staff will travel to the project site every month in order to monitor the situation, provide assistance to the local communities and supervise the communicators.

(2) Planning area: Paung Laung project site.

(3) Planning schedule: Throughout the project years.

(4) Investment budget: $ 50320. All invested by APFNet.

1) Food processing machine: $10000 ($5000 *2)

2) Communicators: total cost: $9600 ($100*2person*48months)

3) Travelling expense of project staffs: $30720 ($80/day* 8persondays* 48 months).

(5) Responsible party: FRI, the community

Output 8 An integrated forest management technology assembled and a technical handbook formulated

Significance

One of the main objectives of the project is to develop and demonstrate models and technologies related to integrated watershed forest management. Though community based watershed management activities during the project implementation, a series of technologies will be summarized, compiled and documented at the end of the project. These technologies are expected to guide watershed forest management in other communities. Aggregation of technologies is, therefore, significant for the goal of project to achieve which is important for watershed areas of Myanmar.

Activity 8.1 Summarizing technologies and experience of integrated watershed management practices.

(1) Objective: After the implementing the watershed forest management demonstration project, the experiences and useful technologies gained from this project will be summarized in order to disseminate in different forms of communications. The results will also contribute in preparing the technical handbook for integrated watershed management practices.

(2) Measures: The technologies and experiences will be summarized and recorded though documented video production, research article publication and holding a summarized workshop at the national level. The experienced lessons and technologies will be discussed at the workshop and a summarized document with comments of experts and suggestions from local communities will be documented.

(3) Planning schedule:

1) Jan 2020- Dec 2020: preparation of research article

2) Jan 2021: Submitting the article to an international journal

3) Before Dec 2021: Publication of the article

4) Jan 2021- May 2021: recording video

5) June-July 2021: editing video

6) August- Oct 2021: Producing video

7) Nov- Dec 2021: Distribution of documented video

8) June 2021: National workshop

(4) Investment budget: $20800, of which19600 invested by APFNet. $ 1200 will be counterpart contribution by FRI.

1) Journal article preparation cost: $2000

2) Video Production Cost: $11300 (recording :$6000, editing:$3000: Production with CDs $5*100, travel cost: 1800 ($60* 3 persons* 10 days))

3) National workshops: 60 participants: Total cost: $7500 (meeting room $200 (counterpart), food $2700 ($45*60), travel expense $ 3000 ($50*60), workshop materials$ 600 ($10 * 60). Accommodation for local staff, NGOs and local people $1000 ($25 *40) will be counterpart funds from FRI.

(5) Responsible party: FRI

Activity 8.2 Development of technical handbooks on integrated watershed management

(1) Objective: A technical handbook on integrated watershed management is planned to be formulated in order to inform, share the experiences and lessons of the project and to assist other watershed area by guiding how watershed area can be successfully managed by integration of ecological, economic and social benefits.

(2) Measures: A technical handbook on integrated watershed management will be prepared and distributed to local communities, local government and forest department. English version will also be prepared to be shared with other GMS countries.

(3) Planning schedule:

1) Jan – July 2021: Preparation of the technical handbook

2) August- Sept 2021: Revision and getting comments from national experts and

local consultant

3) Oct 2021: Revising the handbook

4) Nov 2021: Designing the handbook and production

5) Dec 2021: Distribution of the handbook.

(4) Investment budget: $6500. All invested by APFNet.

1) Preparing and writing handbook: $4000

2) Distribution of technical handbooks: $2500 ($5* 500).

(5) Responsible party: FRI, the community

Objective 3: To enhance the capacity and knowledge of local community, local government and staff through capacity building programs, which will make sure to sustain the management activities after the project is accomplished.

The third component of the project is to enhance the capacity and awareness of the communities, staff and government through capacity building programs such as trainings and workshops. During the project, 2 times training for young researchers, 2 times trainings for local government and staff and 10 trainings for local communities will be carried out.

Output 9 Training course for project stakeholders

Significance

Carrying out different trainings for the researchers, project staff and local communities with an emphasis on relevant topic will improve the management capacity of the project activities as well as support to ensure the long term sustainability of the project.

Activity 9.1 Training for young researchers on integrated forest management technology and rehabilitation of degraded forest (15person/training)

(1) Target: Young researchers of FRI

(2) Time: trainings will be carried out during July 2018 and 2019 respectively.

(3) Training site: FRI

(4) Contents: Integrated forest watershed management and rehabilitation of degraded forest.

(5) Scale: 3 days per training, two times

(6) Budget: $ 4725 per training and $ 9450 for two trainings, of which invested by $6000 APF Net and $3450 invested by FRI, and the ratio of APFNet to FRI is 2:1.

1) Meeting room rental: $ 200 per day, paid by counterpart fund from FRI;

2) Payment for trainer, total $ 1500:5 persons, $ 300 per person(training cost $ 100/day, lodging $ 100，travel cost $ 100);

3) Food for participants, total $ 1125:$ 30 /day，3days*15 person.time，;

4) Accomodation for participants, total $ 1125:$ 25 per day, counterpart contribution by FRI;

5) Training materials, total $ 150: $ 10/person*15person times.

(7) Responsible party: FRI

Activity 9.2 Training courses for local officials and local leaders on integrated forest watershed management (10person/training)

(1) Target: local officials and local leaders

(2) Time: the trainings will be carried out during every March of 2018 and 2020 respectively.

(3) Training site: FRI

(4) Contents: Integrated forest watershed management, rehabilitation of degraded forest

(5) Scale: 3 days

(6) Budget: $ 3850 per training and $ 7700 for two trainings, of which $5000invested by APFNet and$ 2700 invested by FRI, and the ratio of APFNet to FRI is 2:1.

1）Meeting room rental: $ 200 per day, paid by counterpart fund from FRI;

2）Payment for trainers, total $ 1500: 5 persons, 300 $ per person(training cost $ 100/day, lodging $ 100，travel cost $ 100) ;

3）Food for participants, total $ 900: $30 /day，3days*10 person time;

4）Accommodation for participants, total $ 750:$ 25 per day, counterpart contribution by FRI;

5）Training materials, total $ 100: $ 10/person*10person times

(7) Responsible party: FRI

Activity 9.3 Training courses for local farmers on tree seedling raising, planting, agroforestry, organic farming, maintenance of fruit orchard and tree plantation, fruit processing and marketing.

(1) Target: Local farmers

(2) Time: trainings will be carried out during Mar. May and Nov. of 2018, 2019, 2020 and May of 2021 respectively.

(3) Training site: FRI

(4) Contents: The topics are (i) Integrated watershed forest management, (ii) Nursery techniques (iii) Tree planting and fruit orchards (iv) sustainable utilization and production of value added products from NTFPs, and (v) Food processing and marketing.

(5) Scale: 10 trainings (2 trainings per topic) during the project period. 7 days per training

(6) Budget: Investment budget: $19850 per training and $178,650 for 9 trainings, of which $113,400 invested by APFNet and $ 65,250 invested by FRI, and the ratio of APFNet to FRI is 2:1.

1) Meeting room rental:total$1000, $ 200 per day, paid by counterpart fund from FRI;

2) Payment for trainers ,total $ 2100: 7 persons, $300 $ per person(training cost $ 100/day, lodging $ 100, travel cost $ 100);

3) Food for participants ,total $ 7500: $30 /day, 5days*50 person time;

4) Accommodation for participants $ 25 per day per person: total $ 6250 (counterpart contribution by FRI)

5) Travel allowance: $50 per person* 50 person: total $ 2500

6) Training materials: total $ 500: $ 10/person*50person.

(7) Responsible party: FRI

Activity9.4 Formulation of a Training Manual

(1) Objective: A high-quality, national/ provincial training manual will be made to share the experiences and lessons of the project, the manual will assist other projects to conduct such kind of training course.

(2) Measures: A technical manual will be prepared and distributed to local communities, different level of governments and forest departments. English version will also be prepared to be shared with other GMS countries.

(3) Planning schedule:

1) Jan – July 2021: Preparation of the training manual

2) August- Sept 2021: Revision and getting comments from national experts and local consultant

3) Oct 2021: Revising the manual

4) Nov 2021: Designing

5) Dec 2021: Distribution

(4) Investment budget: $19850. Of which $12600 will be invested by APF Net and $7250 by FRI.

1) Preparing and writing handbook: $7250

2) Distribution of training manual: $12600 ($10* 1260 copies).

(5) Responsible party: FRI

Output 10 International exchange on sustainable forest management conducted

Significance

The study visits to international countries mainly intend to exchange knowledge and experiences on sustainable forest management by an integrated approach. The project staff and local farmers can learn lessons and success stories of other countries and will be able to apply the earned knowledge during the project implementation and other relevant areas.

Activity 10.1 Exchange study visit to other 2 GMS project sites to share and learn project experiences

(1) Visit time: Dec 2019

(2) Economies to be visited: Vietnam, Cambodia

(3) Visitors: main technical staff and managers (5 persons for 8 days).

(4) Content for exchange visit: carry out exchange visit in GMS countries which focus on forest ecosystem management and information exchange.

(5) Budget: $ 19,000 ,all invested by APFNet.

Visitors:$ 9000,5 persons for 8days; Food and lodging: $225/person/day，Transport: $10000,$ 1000/person and $ 1000/person for other costs (visa, insurance etc.)

(6) Responsible party: FRI

Activity 10.2 Participating in international workshop

(1) Visit time: Dec 2018

(2) Economies to be visited: European agroforestry conference (EURAF)

(3) Visitors: main technical staff and managers (2 persons for 8 days).

(4) Content for exchange visit: To learn experience of integrated sustainable forest management from other countries, to share the situation, constraints and opportunities of integrated watershed management in Myanmar.

(5) Budget: 10,600$, all invested by APFNet.

Food and lodging: $225/person/day, transport: $ 2000/person and $ 1500/person for other costs (visa, insurance etc.)

(6) Responsible party: FRI