Content

1. An Analysis of Field Level Relevance and Effectiveness of Selected Co-Management Organizations in Cox'S Bazar, Bangladesh 1

2. Devolution as One of the Options to Manage and Conserve Forest Resources Sustainably, and to Enhance Rural Economy in Bhutan 15

3. Forest Management and Policy of Cambodia 30

4. Forest Rehabilitation and Management in Fiji Islands 39

5. Forest Rehabilitation Program: a Case Study at Loa Haur Training Forest, East Kalimantan, Indonesia 45

6. Forest Rehabilitation and Management in Lao PDR 57

7. Sustainable Forest Management (SFM): the Outlook of Forestry Sector in Peninsular Malaysia 66

8. Status of Forest Resources in Nepal 78

9. Sustainable Forest Management --- Timber Forestry Training College, Lae and PNG Forest Authority 91

10. Forest Management and Forestry Development in the Philippines 111

11. An Overview of Forest Rehabilitation and Management in Sri Lanka 118

12. APFNet Training Workshop on Forest Rehabilitation and Management, Thailand 133

13. Forest Rehabilitation and Management, Viet Nam 147

An Analysis of Field Level Relevance and Effectiveness of Selected Co-management Organizations in Cox's Bazar, Bangladesh

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Abstract: Recent initiative through co-management of protected areas in Bangladesh has been progressing considerably in biodiversity conservation as well as livelihood development of landscape population. Rehabilitation of degraded forests through creating alternative livelihoods for the forest dependent communities may be considered a good means. The study incorporates investigation on the relevance and effectiveness of two co-management organizations in Cox's Bazar. These are Himchari National Park and in Inani Protected Forest Area. The study revealed a remarkable difference in implementation of co-management approach between these two initiatives, particularly on livelihood development model and function of CMOs (Co-management Organizations). Regarding livelihood program, Inani model made a comprehensive progress due to its saving initiative of forest user groups coupled with revolving fund. Whereas Himchari model could not bring significant change on the livelihood of dependent communities. On the other hand, Himchari CMC is more proactive and functional as a result of adequate sensitization and institutional support from project as well as local administration, compare to Inani CMC (Co-management Committee). The study further revealed that co-management approach for conservation and management of protected areas has shown high potentiality. It made a comprehensive progress and is gaining acceptance from a large segment of stakeholders. The achievements call for further support from Government, development partners and NGOs to address the shortcomings.

Introduction

Protected areas(PAs), span an immense variety of ecological habitats and social contexts and are highly affected by human presence. It is estimated that about half of existing PAs have people living in them(Amend and Amend, 1995). Most protected areas are under common property regimes, i.e., they are state-property or communal property.

The protected areas (PAs) in Bangladesh are under constant pressure and have already been significantly been degraded and fragmented. This situation is threatening the value of these PAs as habitat for biodiversity and for provision of vital environmental services. If this trend continues, it will soon result in a serious ecological 'catastrophe' and a declining spiral of production and productivity irreversibly detrimental to the livelihood of people living in and around the forest, historically dependant on them. Therefore, there is an urgent need to reduce

or reverse the detrimental impact on forest biodiversity and maintain resource sustainability through improved management and creating alternate livelihood opportunities for people dependent on forest resources. The interests of local societies are central to the PA. The well-being of those who live and work in the protected areas must always be a first consideration..."(Harmon,1991).These people are directly dependent on the PA's resources for their livelihood, cultural identity and well-being. Yet, communities are complex entities, within which differences of ethnic origin, class, caste, age, gender, religion, profession and economic and social status can create profound differences in interests, capacities and willingness to invest for the management of natural resources. The emphasis is to be given for benefiting present and future human generations, especially the ones living within or close to the PA.

The concern for biodiversity assets in the country has a long history and Bangladesh has a strong commitment to the cause of biodiversity conservation from the national, regional and global perspective as reflected in its endorsement and ratification of many national, regional and international conventions, treaties, protocols etc. related to biodiversity conservation. The alarming situation in forest degradation in the country and the government's commitment to national and international community, spurred government effort to designate and establish a number of protected areas with biodiversity significance under the provision of Wildlife Preservation Act, 1973.(Arannayk Foundation, 2011)

Households of Protected Areas of Cox's Bazar are vulnerable, because they are habituated by some underlying factors, such as, barriers to basic education and equitable access to common property resources essential for food security that negatively influence sustainability of their livelihoods and limit of economic and social opportunities. To reduce vulnerability, dependency on forests and access to common property rights Co-Management practices have been implementing in Himchari National Park (HNP) and Inani Protected Forest Area (IPFA). Many Households in the forest areas of Cox's Bazar spend over 70 percent of their cash income on food. About 90 percent households of these areas are living below the poverty line (IPAC, 2009a).

The area of HNP and IPFA continues Reserved Forest the area was rich in floral and faunal diversity. Most of the forest resources have now been lost through illicit felling, and conversion of land for settlement. In HNP and IPFA many lands have been encroached upon by local elites and also by settlers come from other places. IPAC is an initiative of Government of Bangladesh (GoB) and USAID to embark upon the strategic goal of scaling-up natural resources co-management as the policy and operational level by achieving recognition, acceptance and integration of this approach by the GoB into its management tactics.

IPAC started its activities in HNP in 2009 with an objective of promoting and institutionalize a co-management system for sustainable natural resources management and biodiversity conservation that results in responsible, equitable economic growth and good environmental governance. The main task that IPAC project wanted to implement in HNP is the integrated protected area co-management system and biodiversity conservation, expanded support for

alternative income generation activities, and enhance local level outreach to increase community interest in conservation and environmental stewardship.

Arannayak Foundation(AF), also known as the Bangladesh Tropical Forest Conservation Foundation, was established jointly by the Government of the Peoples Republic of Bangladesh and the United States of America as a not-for-profit organization for promoting conservation of forest and biodiversity of the country. The BFD made a proposal to the AF to support a project of co-management and conservation of the natural tropical forest blocks in Inani. In response to BFD, Arannayk Foundation is working to implement co-management system in Inani since 2009.

BFD has taken some social forestry activities to develop the degraded condition of forest and involved local people to reduce their poverty in both the PAs. These initiatives, however, have been quite inadequate when considered in the light of local need and demand.

Main objectives

To promote and institutionalize an integrated protected area co-management system for sustainable natural resources management and bio-diversity conservation.

Key Elements Related to the Study

The Himchari National Park is located at Himchari under the Cox’s Bazaar South Forest Division, about 12 km south from Cox’s Bazar town. The park lies between 21°18′ to 21°26′ north latitude and from 91°58′ to 92°06′ longitude. This National Park was formally established through a Gazette Notifications in 1980 by the Government of the Peoples Republic of Bangladesh as a conservation area for research, education and recreation under the article 23(2) of Bangladesh Wildlife Preservation (Amendment) Act 1974. The total area of Himchari national Park is 1,729 hectare. The Himchari National Park is comprised of lush tropical rain forest, grasslands and trees, and features a number of waterfalls, the biggest of which cascades down toward the sandy, sun-drenched beach. The scenario has been changed due to encroachments, illegal felling, and destruction of wildlife habitat by converse the forest land for agriculture and betel leaf cultivation. There are There are 58 species of trees, 15 species of shrubs, 4 species grasses, 19 climbers and 21 species of herbs altogether 117 plant species are available there. Besides, there are 55 species of mammals, 286 species of aves, 56 species of reptiles and 13 species of amphibians are found in this evergreen forest (IPAC 2009b).

The Inani Forest Reserve is located in part of Inani and Ukhia Ranges under the Cox's Bazar South Forest Division, about 26 km south from Cox's Bazar town and covers an area of 7700 ha hill forests. The park lies between 21º06′ to 21º17′ north latitude and from 92º03′ to 92º07′ longitudes. About 21 villages/settlements were identified in and adjacent the PA. The Inani Forest Reserve was once comprised of lush tropical rain forest, grasslands and trees. Recently it came to the verge of degradation due to heavy human intervention. But it has been changed due to encroachment, illegal felling and destruction of wildlife habitat by converse the forest

land for agriculture and betel leaf cultivation. Still now, there are many species of herbs, shrubs, trees and climbers present here.

Protected Areas (PAs) in the tropics face many threats and are often poorly managed (Wells and Shane, 2004). This is because local peoples' interests are often seen as incompatible with biodiversity conservation and PA management has often followed a "fences and fines" approach that excludes people. However conservation managers increasingly recognize that local people, local knowledge and local participation are key factors in realizing sustainable PA management (Svartad et al., 2006). In 2004, The Nishorgo Support project (NSP) initiated a co-management approach in five PAs of Bangladesh on a pilot basis. NSP aims to improve the income of forest dependent people neighboring PAs by providing AIGAs consistent with conservation. In this attachment IPAC initiated co-management Approaches in Himchari National Park and provided AIGAs to improve the income of forest dependent people. The Arannayk Foundation has developed co-management system in Inani Forest Area to facilitate capacity development of stakeholders to ensure sustainable alternative income and employment opportunity for local communities, particularly for the women and poor indigenous people whose lives depend on natural resources.

Both the organizations are implementing co-management under a uniform structure but according to their own field level strategy. Therefore, relevance and effectiveness of CMOs need to be addressed. To this end this study is undertaken. The overall objective of this study is to examine the effectiveness of CMO in two protected areas of Cox's Bazar to improve the livelihoods of local inhabitants. More precisely, the objectives of this study are:

- To assess popular perceptions and credence of the CMOs in Himchari National Park and Inani Protected Forest Reserve.
- To measure impact on enhancement of livelihood of the participating community.
- To assess issues and challenges of institutional sustainability.

The IPAC project was implemented by BFD under the financial support of USAID. The funding was inadequate to achieve the objective of reducing the dependency of forest adjacent community on forest resources.

Sustainability of protecting and co-managing forests by developing and formalizing a collaborative arrangement between stakeholders of local communities of forest will provide the overall eco-system productivity for society and reduce poverty for resource co-managers. Eco-system based livelihood programme and site specific interventions can play an important role in restoring the degraded forest.

Three questionnaires were prepared. These were used during the interviews and focus group discussion to profile the community and to learn about their livelihood, acceptance of Co-management practices among the community etc. All respondents were interviewed regardless of their status. Both male and female respondents were considered (HNP: Male-13, Female-16; IPFA: Male-26, Female-3). The questionnaire contained the following major queries:

Satisfaction with present performance of CMOs, major threats to their effective functioning, active involvement of participants in CMO's programs & decisions, status and importance of revolving fund, activities to be taken for development and conservation of forest & biodiversity, impact on enhancement of livelihood after the intervene of co-management system etc. The questionnaires were field tested and revised based on initial responses received from the targeted respondents.

The target groups were interviewed using a semi-structured. Most of the interviews were conducted in forest areas, the villages and in the offices of non-government organizations. Two focus group discussions (FGD) were conducted with members of CMOs (Co-Management Organization), PF (People Forum), CPGs (Community Patrol Groups)/CFPG (Community Forest Patrol Groups), VFCF (Village Level Forest Conservation Forum), VFDGs (Village Level Forest Dependent Groups), VCFs (Village Conservation Forum), Nishorgo Shahayak to get an overview of the performance of CMOs. Standard participatory rural appraisal (PRA) methods were used to analyze data collected from respondents concerning their perceptions.

Table1: Event wise respondent number for both the research sites

Site Name	Type of Event	Total Respondents	FD	AF (SHED)	IPAC (CODEC)	CMC Office Bearer	Forest Dependent Community People
HNP	FGD	31	2	-	2	2	25
	KII	6	2	-	1	3	-
	HHS	6	-	-	-	-	6
IPFA	FGD	27	3	3	-	1	20
	KII	4	-	2	-	2	-
	HHS	4	-	-	-	-	4

(Prepared by the author based on respondents' comments)

Household (HH) interviews were conducted with randomly selected interviewee, typically visiting one household at each stop. Basic household information and data, including information on income, education, health, occupation, gender issues, and involvement in local institutions were collected. Ranking-scoring & trend analysis were done dedicated to some perceptions and credence. The scoring was 3, 2, 1 and 0 for the ranking of high, moderate, medium and low perceptions of the respondents respectively.

Lessons Learnt and Way Forward

The popular perceptions and credence of the CMOs in the study area are explored, followed by a focus on the enhancement of livelihood of local community people directly dependent on the PA's resources for their livelihood and well-being after implementing the Co-management

system. The issues and challenges of CMOs regarding institutional sustainability were also recorded.

A. Popular Perceptions and Credence of the CMOs(as perceived by the respondents)

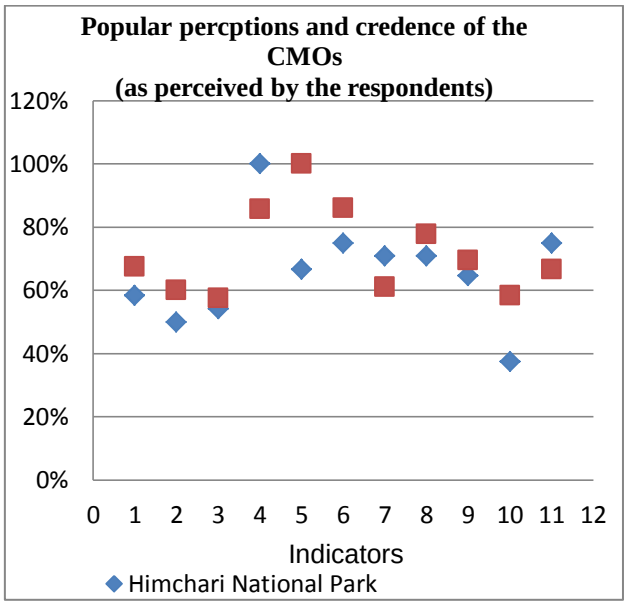

Figure-1
(Prepared by author based on respondent's comments)

It is revealed from Figure-1 that the respondents from FD/AF/IPAC express that regarding Co-management in PAs the expectations from Co-management Council are yet to satisfactory. This is because of the inadequate awareness of the representatives of government organizations as was opined discussions with the respondents. In both the PA sites, CMO's activities are not at satisfactory level due to lack of capacity of the office bearers, though the representatives and office bearers of CMOs both in HNP and IPFA express their satisfaction with the present performance of CMO. The respondents from Forest Dependent Community People opined that all the forest dependent community people (VCFs, VFCFs) are actively involved at their own level in CMO's programs and decisions in IPFA. The reducing rate of illegal felling in IPFA is satisfactory as expressed by the respondents of group-3. However, the wildlife habitat has been destroyed remarkably; it will take time to improve the wildlife habitat.

(Prepared by the author based on respondents' comments)

The indicators responded to:	
1. Achieving expectation from CMO (Committee) (Group-1) 2. Achieving expectation from CMO (Council) (Group-1) 3. CMO's activities reasonably performed (Group-1) 4. Satisfied with present performance of CMO (Group-2) 5. Actively involved in CMO's program & decisions (Group-3) 6. Reducing the rate of illegal felling (Group-3) 7. Reducing rate & volume of fuel wood collection (Group-3) 8. Reduce Bamboo collection (Group-3) 9. Reduced entry into reserved forests (Group-3) 10. Increased wildlife (Group-3) 11. Improved tree coverage (Group-3)	**Group1** : Forest Department, Arannayk Foundation and IPAC personnel; **Group2** : CMO representatives and office bearers; **Group3**: Forest Dependent Community People.

Group discussion with the villagers in five villages in HNP disclosed that more than 95% of the total populations are dependent on forest. IPAC brought 2,000 households under the umbrella co-management out of 6,381 in these villages. IPAC provided Alternative Income Generation(AIG) and Landscape Development Fund (LDF) support to only 800 families which is about 12% of total household; and inadequate with respect to demand. The illegal felling is reduced to 25% and fuel wood collection is reduced about at 40%. Encroachment is still a major problem there. The community people are not adequately aware the activities of CMO. Lack of communication is found to exist.

Group discussion with the villagers in six villages in IPFA unveiled that about 13,800 HHs are directly or indirectly dependent on the IPFA. Only 1,008 people/households are the member of village level forest dependent groups which is about 7.3% of the total households. Arannyak Foundation provided revolving fund support to 336 members (33% of the VFCF members). A major portion of the total households neither involved in co-management system nor provided with revolving fund support. They have not received any technical education which they could use for their livelihood. Illegal felling is reduced at 20% and fuel wood collection reduced about at 40% and encroachment is reduced to about 50%. The community people are not adequately aware of the activities of CMO.

According to the concerned government Gazette, 16 nos. govt. officials are the members of the Co-Management Council. The govt. representatives involved in Co-Management Council are frequently transferred. In most cases, it takes time for the new representative to acquaint with the CM system resulting almost inactive participation in the CM Council. . In both the PA sites, CMO's activities are yet to reasonably perform because of the fact that all the office bearers are not adequately competent to perform the activities of CMOs. In co-managing the PAs, there is a lack of adequate resources including funds and also trained field personnel. Donor supported projects are supporting technical skill development. This is not adequate in meeting the large demand. In local level, appropriate awareness and training regarding co-management of natural resources and biodiversity conservation needs to be increased. A technical institute could be used to promote research and monitoring on ecological and

ecosystem process, livelihood opportunities, eco-tourism and carrying capacity, habitat impact due to climate change, habitat fragmentation and wildlife viability, habitat degradation and wildlife decrease, genetic base and extinction of species, reintroduction and rehabilitation of endangered species, and ex-situ conservation (Sharma, 2011).

The respondents of group-3 opined that all the forest dependent community people (VCFs, VFCFs) are actively involved at their own level in CMO's programs and decisions. In general, it is fair to say that community-based property rights over natural resources do not guarantee equity of resource distribution. Nonetheless, CM approach allows direct involvement of vulnerable and marginalized groups in community development activities in the decision making authority as well as representation of their interest in forest management regimes. This results in the empowerment of the resource users groups (Adhikari et al.,2004).

During FGD and HH Survey different opinions from local people about reducing the rate of illegal felling, reducing rate & volume of fuel wood collection, reducing the rate of bamboo collection, reduced entry into reserved forests, increased wildlife and improved tree coverage were recorded. The majority of the respondents perceived that forest conditions have improved after launching the CM Approach. In light of this reality, it is understandable that co-management activities generate opportunities for local people to meet their basic needs without degrading protected areas.

In HNP a major portion of households are yet to be involved in CM system. IPAC provided AIG and LDF support to only about 12% of total household. In IPFA a major portion of the total households neither involved in CM system nor provided revolving fund support. Local governance issue, such as, encroachment of public lands including forests and PAs by elites is proving challenging in the absence of wide participation of local stakeholders. The successful management of PA may well depend on the involvement of the local communities. The involvement of local people in co-management system should be expanded.

Enhancement of Livelihood

The gain in income on getting the AIG and LDF support of the forest dependent people is given in Table-2.

Table2: Change in income after intervention of AIG and LDF support

Name of PA	Major Trade	Previous Income Tk./Year	Income after Intervention Tk./Year	% of increase
HNP	Handicrafts(7)	70,286	93,429	33
	Weaving(4)	42,000	78,000	86
	Others(1)	240,000	300,000	25
IPFA	Nursery Raising and Homestead Gardening(9)	58,000	143,333	147
	Small Scale Business(2)	39,600	96,600	144

(Source: Field Data, 2012)

Information from 16 respondents belonging to the forest dependent community People of HNP reveals that 4 of them did not get AIG support. Seven respondents used AIG support in handicraft preparation, 4 in weaving and 1 in grocery shop. With AIG support their average income per year increased by 33%, 86% and 25% respectively. In HNP the AIG support is too small (Tk.1800.oo per participant) and in most cases it is in kind. There is no revolving fund in HNP. All the respondents opined that to remove poverty there is no alternative of supporting from revolving fund.

It was also observed that out of 16 respondents (forest dependent community people), 14 did not enter the neighboring forest regularly and 2 respondents who did not get AIG support go to forest regularly for collecting forest produce. Each and every respondent opined that more AIG support is necessary to ensure livelihood for reducing the dependency on forest.

In case of IPFA, the data collected from 12 respondents (Forest Dependent Community People) show that 1 respondent did not get AIG support. Nine respondents used AIG support in nursery raising, homestead gardening, vegetable cultivation and 2 respondents in the business of betel nut. With AIG support their average income per year increased by 147%, and 144% respectively. In IPFA, the CMC has revolving fund which is provided by Arannayk Foundation. Out of 12 respondents (forest dependent community people), 7 respondents do not go to forest regularly, 3 respondents go to forest to perform their duty as a member of CFPG and 2 respondents go to forest once a week for fuel wood collection. The respondents from CMO representatives and office bearers emphasized the provision of the revolving fund. The revolving fund, whatsoever available, is regarded insufficient to support the community to a satisfactory level to promote AIG activities.

At VFDG level, the participants created a saving scheme where they save Tk 10 to 50 per month, the amount decided by the participants on their voluntary consensus. VFDG keeps savings in govt. scheduled bank. The participating members use to get interest free loan from this fund on need and are usually utilized in AIG activities. This initiative is playing an important role to reduce their dependency on forest as well as to reduce their poverty. It is suggested that there can be some sort of incentives in linking this kind of voluntary fund to biodiversity conservation and livelihoods programmes in PAs.

This study reveals that respondents who provided the AIGA support, were able to enhance their livelihood to a degree, and it has also gradually paved the way for reduced dependency on the neighboring forest. The income of the respondents using AIGAs support in nursery raising and homestead gardening was significant. Conservation-focused livelihood opportunities, such as eco-tourism, nursery development, growing of medicinal plants, homestead management, and non-timber based small enterprise are being encouraged to support local community in the sustenance of HNP and IPFA , and their constituent biodiversity.

The study unfolded the fact that conservation of biodiversity in protected forest areas is more challenging if local communities are heavily dependent on it for energy, nutritional, medicinal and other subsistence needs. Nevertheless, the various stakeholders in the study area

unequivocally agree that protected areas management must be community-based and consistent with overall socio-economic development plans. To this end, revolving fund should be available for AIGAs, more technical education & training be imparted, HYV seeds needed for the local people. These can be potential inputs to enhance biodiversity and address subsistence needs local communities (Masozera et. al., 2004).

Issues and Challenges of Institutional Sustainability

The perceptions level of respondents from FD/AF/IPAC about issues and challenges of the sustainability of the CMOs reveal that for both HNP and IPFA, FD and CMC are not yet complimentary to each other. There is scope for further integration. Program is implementing under the facilitation of IPAC and AF. In the absence of IPAC and AF, it is unclear whether CMC would be able to run and sustain the program on their own. Member of CPG are unable to provide volunteer service. Mixed repercussion regarding CMC's activities monitoring among the respondent is obtained. Actually the CMC activities are not monitored in a systematic and organized way at all. Table 3 shows the Percentage of respondents and their level of perceptions of FD/AF/IPAC Personnel. Only the activities taken by the IPAC and AF are consulted with FD.

Table3: Percentage of respondents and their level of perceptions (FD/AF/IPAC Personnel)

Sl. No.	Indicators	**HNP (n=6)**				**IPFA (n=10)**			
		Rank				Rank			
		High	Moderate	Medium	Low	High	Moderate	Medium	Low
1	FD's role and coordination with CMO satisfactory		84%		16%		90%		10%
2	IPAC/AF's role and coordination with CMO satisfactory		84%		16%		80%		20%
3	Member of CPG satisfied with their job			50%	50%				100%
4	CMO's activities monitored regularly		17%	16%	67%		50%		50%
5	Performance of CMO's activities(as perceived by the respondent)	16%	50%	17%	17%		60%	40%	

(Source:Field Data, 2012)

Analysis on institutional sustainability exhibits that most of the CM Committee members are adequately aware about their role and responsibilities. Many of the CM Council representatives are yet to be adequately aware about their role and responsibilities. Table 4

shows the Percentage of respondents and their level of perceptions of CMO Representatives & Office bearers. There is scope to develop community awareness and participation in conservation. The institution developed has given a basic platform for co-management. However, to make it effective all the respondent opined for financial support at the time. CMC's performance will be optimum when FD will provide certain power (devolution) and responsibilities. There are still some threats, viz. encroachment, population pressure, urbanization etc.

Table4: Percentage of respondents and their level of perceptions (CMO representatives and office bearers)

Sl. No.	Indicators	**HNP (n=7)**				**IPFA (n=7)**			
		Rank				Rank			
		High	Moderate	Medium	Low	High	Moderate	Medium	Low
1	CMC representatives are aware about their responsibilities	86%			14%	100%			
2	Stakeholders are performing their responsibilities	14%			86%	57%			43%
3	How much the CMC get support from the community		29%	71%		71%	29%		
4	Financial strength (Revolving Fund, Savings, Donation, Project Support) is necessary	100%				100%			
5	Performance of CMC is satisfactory		100%				86%		14%
6	Any threats to NR within the PA	43%			57%	100%			

Analysis of field level data reveals that formation of CMO and involvement of CPG ensured 100% moderate restriction about illegal felling/ forest offenses (Table 5). The respondents involved in Co-management approach opined that the involvement of the stakeholders are yet to satisfactory. The activities already taken for forest protection are not sufficient at all. Existing support from project is insufficient.

Table 5: Percentage of respondents and their level of perceptions (Forest Dependent Community People)

		HNP (n=16)				IPFA (n=12)			
Sl. No.	Indicators	Rank				Rank			
		High	Moderate	Medium	Low	High	Moderate	Medium	Low
	Facing obstacles to collect forest products from PA after CMO formation		100%				100%		
	Involvement in CMO's programs and decisions	44%	31%	12.5%	12.5%	67%	16%	17%	
	Activities taken for forest protection				100%			17%	83%
	Project support is sufficient to reduce pressure on forest		5%	10%	85%		8%%	15%	77%

Co-management organizations of HNP and IPFA have to manage both biodiversity conservation and local community interests and resource needs. The attitudes of local residents as well as the interactions, level of local participation, and conflicts between people and PAs have become a concern of PA effectiveness (Pimbert & Pretty 1995). However, CMOs developed has given a basic platform for PA management. Different government organizations recognized the CMC. Soon socio-cultural recognition for CMC is going to be established. The CPG members are yet to be satisfied with their job. They are financially solvent and they do not receive any remuneration for the duties performed. The CMO representative and office bearers opined that some forms of financial support, e.g., revolving fund, motivation for savings, donation, endowments, are essential for making CMOs and the associated participants more proactive. The field observations also collaborate the widely held belief in the mainstream literature (e.g. Kothari 1995, Sharma 2011) that there is hardly any alternative of effective co-management organizations in managing PAs in densely populated countries like Bangladesh. Effective CMOs are able to improve the livelihoods of the local poor dependent directly and indirectly on forest resources and enhance their capacities in resource management.

During FGDs and interviews of key informant and forest dependent community people, the major threats to the effective functioning of the CMOs have been identified as : food scarcity, lack of manpower, problem in CMC management, obstacle from elite group, encroachment, illegal activities of timber business, political threats and poor management of BFD.

Table 6: Strength and weakness of CMCs (as perceived by the respondents)

Strength	Weakness
FD and local administration recognized the CMC, Socio-cultural recognition for the CMC, representatives are democratically elected from stakeholder community, CPGs are formed and they are active in protection activities, Participatory decision making process,	Lacking in linkage between CMC representatives and the grass root stakeholders who are real dependent on forest, A major portion of forest dependent people are yet beyond supports for livelihood, Encroachment, Land use change, CMC lacks in financial ability, CMOs are still immature.

Summary

Effective co-management of PAs is of immense importance to conserve biodiversity and forest land management. The major aim of this study was to examine the relevance and effectiveness of CMO in Himchari National Park and Inani Protected Forest Area of Cox's Bazar to improve the livelihood of local inhabitants and to restore and conserve the biodiversity. In this study, I found that most of the people in and around PAs know or are broadly aware of the main objectives of co-management. Most of them share this information with others, motivating them to participate in various co-management activities. In terms of livelihood development program, interest free revolving fund supported conservation-focused activities made significant contribution to a very small segment of the landscape dependent population. The study further revealed that active involvement of forest users in co-management activities is one of the major pre-condition to make a co-management organization effective. To ensure an effective CMO, adequate livelihood development program, coordination amongst all relevant stakeholders and especially supports from other Government agencies are required and only then the CMOs can achieve their goals for conserving biodiversity.

Based on the study findings, the following recommendations are made:

1) Most of the forest in HNP and IPFA are degraded. A massive afforestation program is required to restore biodiversity, create forest resources and also create employment opportunity for local forest dependent community people.

2) Only a small percentage of households are involved in co-management system. There needs to involve a large population from PA landscape and also to extend community awareness.

3) To conserve PAs at national level, The Government can provide revolving fund from banks to respective CMOs for AIGAs of the local poor. This will accelerate the poverty reduction program of the Government included in Sustainable Development Goal, Perspective Plan and Vision 2021.

4) All Government organizations involved in development and social activities may take forest conservation related program for poverty reduction in and around PAs.

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Devolution as One of The Options to Manage and Conserve Forest Resources Sustainably, and to Enhance Rural Economy in Bhutan

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Abstract: Bhutan is one of the small countries in the world and believes strongly on Gross National Happiness (GNH) rather than Gross Domestic Products as its development philosophy. GNH principle guides the country to the sustainability of any natural resources. In-fact, it is to practice a holistic policy, strategy, framework, management plans and guidelines, and above all good governance a fundamental to achieve the progress of sustainable development in a nation. Local knowledge on forest resources is an ideal tool for sustenance and conservation of the biodiversity resources in in-situ conditions.

Participatory management of Community Forests and Non Wood Forest Product resources is a turning point for the sustainable improvement of forest state or resources in parallel to socio-economic development of the rural community. It enhances the natural regeneration capacity of the forest and underpins the biodiversity conservation of flora and fauna. It also helps to mitigate problems associated to outbreak of forest fire, watershed degradation, soil erosion, landslip and slide.

It is deduced that 100% of the community forest members participate in conservation and safeguarding activity of the forest and forest resources. Empowerment is one of the factors which push rural poor to engage in sustainable management of natural resources and generate themselves an opportunity of self employment in forest economic activity. A significant positive financial flow can be observed from the seasonal forestry activity aiding to a prominent numbers of local folks.

High value NWFP like Ophiocordyceps sinensis does contributes appreciably to the rural economy and communities, and thus meets one of the criteria of poverty alleviation which is envisaged in development plan programme of the country. Considerably the forest resources benefit and improve the financial situation of the people.

However, accord of Royal Decree and implementation of friendly environment policy have triggered the management of forest resources in context to improvement of rural livelihood of the Bhutan Himalaya.

Introduction

Bhutan is located in the eastern Himalayas which cover by thick vegetation and lies within the longitude of 88 ° 54′ and 92 ° 10′ East and latitude of 26 ° 40′ and 28 ° 15′ North. It is a tiny mountainous terrain and landlocked country which is sandwiched between China and India with insignificant flat area limiting to its South. It has total geographical land-mass area of 38,394.00 KM^2. Administratively, it is divided into 20 districts (Dzongkhags) with further division of 205 administrative blocks. The average altitude of the country varies from 150 metre asl[1] in the south and rising - up more than 7,700 metre asl in the north. The constitution of the country mandated to keep 60% of forest cover for infinity. Simultaneously, it has total forest coverage of 81.27%. More than half (51.25%) of country's landscape is designated under protected areas system. Out of the total forest cover, about 70% has tree cover (broadleaf and conifer) and about 11% is shrub cover (DoFPS, 2017).

Presently, only about 3% of its total geographical land is under the practice of agriculture. National Land Commission (NLC) 2015 stated that about 62% of the total agricultural land is dry-agricultural land, 28% wet-agricultural land and 10% is practiced as horticultural land. Due to its physical topography, the entire country population carry-out subsistence mix farming in which integration of agriculture, livestock, and the forests are the crucial components. Thus agricultural system in Bhutan is interdependent among the cited essential components without which, it is difficult to with-hold its farming systems. National Statistics Bureau (NSB) 2016 projected the country's population to 768,577. The projection is estimated based on the population and housing census of Bhutan 2005 which was conducted according to UN standards. The population census recorded 69% of the population is rural people whom directly depend on subsistence agriculture farming. It has stated in 2005 that the population growth rate was 1.30%. According to World Fact-book (2017), the Bhutan's population growth rate stands at 1.09%.

The steep terrain of the country is a bottleneck to undertake activities of a viable economic opportunity and often the rural people landed with import of huge consumable items from the neighbouring regional countries. Bhutan Poverty Analysis report (BPA) 2012 determines 12% of the populations are poor. The report has set the total poverty line at USD 28.414 per person month-1.This means 12% of the population earns income below the set poverty line.

Royal Monetary Authority (RMA) 2016 deduced the country's GDP per capita for 2015 is about USD 2,719 with real GDP growth rate of 6.50%. It can be stated that forest resources are also accounted as the country's economy. Therefore, sustaining of Bhutan's forest

[1] asl = above sea level

resources and biodiversity for the happiness of present and future generations is the long term vision of the Department of Forests and Park Services (DoFPS). Its mission spelt-out as "to conserve and manage Bhutan's forest resources & biodiversity to ensure social, economic and environmental well-being, and to maintain a minimum of 60% of the land under forest cover for all times to come". Before 5th Five Year Plan (1981 – 1986), forestry sector used to be one of the top ranking contributors to the country's GDP but at present, it is one of lowest to contribute to GDP. From 2008 – 2015, forestry sector has been contributing to country's GDP with an average growth rate of 0.075% (ibid).

In Bhutan, DoFPS, Department of Agriculture (DoA) and Department of Livestock (DoL) function under the Ministry of Agriculture and Forests (MoAF). MoAF is the largest sector that provides employment to people of the country. The Labour Force Survey Report (LFSR) 2014 illustrated that MoAF employs to 56.60% of the country's population and LFSR 2015 demonstrated 58%, an increased rate of employment by 1.4%. Within a year period MoAF has significantly making progress in offering venues to employ the people underpinning integral economy of the country. However, the country's unemployment rate has been found out to be 2.5% a reduction by 0.1% of the previous year 2014 (ibid).

During 1960s, the country has about 8% arable land and currently it shrink to about 3%. The reason behind as per Bhutan State of the Environment Report (BSER) 2016 is the increasing pressure from socio-economic developmental activities like creation of new urban settlements. Simultaneously, Tenzin (2012) accounted a rate of 0.60% rural urban migration which is the increased moving trend of people in search of better opportunity for the livelihood. BSER 2016 has also reported about 0.18% of the country has landslide areas and 0.54% as degraded.

Bhutan is one of the fastest developing countries in the world. World Bank Report 2016 stated although Bhutan a smallest country, she has the greatest growing economies ranking 13th among 118 countries of the world exceeding average global growth rate of 4.4%. Thus, the country should concern on an appropriate approaches for sustainable management and utilization of its natural resources including broadly of forest resources and other forest products. Bhutan believes on Gross National Happiness (GNH) [Origin 2] rather than Gross Domestic Products (GDP) as to implement the goals of sustainable development. Thus GNH principle guides to frame the country's overall policy, strategy and plan to put into practice nationwide. The principle is being developed based on the four pillars as: (1) Good governance, (2) Preservation and promotion of culture, (3) Sustainable socio-economic development, and (4) Environmental conservation.

Principle of GNH like sustainable socio-economic development and environmental conservation flows along with The 2030 Agenda for sustainable development. Goal 8 of the agenda emphasized on "promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all" and goal 15 to "protect, restore and

Origin[2]= In 1972, the 4th King declared Gross National Happiness to be more important than Gross National Product (GNP), and from this time onward, the country oriented its national policy and development plans towards Gross National Happiness. The statement might have ushered since 1729 legal code, which dates from the unification of Bhutan, declared that "if the Government cannot create happiness *(dekid)* for its people, there is no purpose for the Government to exist." (Ura, Alkire, & *et al*, 2012).

promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation, and halt biodiversity loss". Environmental conservation had been the focus in each Five Year Plan of the country. Government emphasizes wholesome socio-economic development vis-à-vis sustainable conservation of environment and natural resources. It is also underscored by the country's constitution in which *Environment* is adopted as Article 5 (3) and it states "*The Government shall ensure that, in order to conserve the country's natural resources and to prevent degradation of the ecosystem, a minimum of* ***sixty percent*** *of Bhutan's total land shall be maintained under forest cover for all time*".

Thus, to facilitate and promote economic development of both urban and rural population, the government has set poverty alleviation policy for the sustainable management and utilization of natural resources which includes conservation of biodiversity, forestry and allied natural resources. One of the core functions of DoFPS is to empower rural communities in managing forests for socio-economic benefits, poverty reduction and to contribute to overall sustainable forest management at national level.

Bhutan encourages the participation and engagement of local community (people) in collaboration with the relevant stakeholders to manage and utilize particularly the forest products and Non Wood Forest Product (NWFP) resources. Benefits deriving from Community Forest (CF) by the rural farmers community are, meeting timbers for rural house construction, fuel-wood for cooking, fodders for their livestock, many wild green vegetables, wild edible fruits and nuts, bamboo and bamboo shoot, cane (rattan) and cane shoot and even catch of freshwater fish. From NWFP farmers group, the rural farmers used to harvest valuable medicinal plants and fungus (like *Ophiocordyceps*), wild edible oil seeds, wild edible tuber (yam), wild edible high value mushrooms (like *Tricholoma*), bamboo culms for construction and weaving handicraft items then bamboo shoots for consumption, cane (rattan) stem for construction and weaving handicraft items and cane shoots for consumption as it is one of the Bhutanese delicacy cuisine and many others commercial value products. The NWFP farmer groups sell such commercial value products in the available markets and earns quite significant amount of money. Besides, CFs deliver the intangible ecosystem services like regulation of water catchment areas and the CF community gets benefit in terms of Payment to Environment Services (PES). Gurung 2017 reported that establishing of one CF costs about Nu.120,000 (Ca. USD[3] 1846), and so far 13 districts have generated an earnings of about Nu.30 million. Very recently Bhutan is embarking on the concept of eco-tourism trail services within the CF areas. Thus, CFs and NWFP farmer groups are the indispensible forestry components to the rural livelihood and for poverty alleviation in which, process of forest rehabilitation and management goes-on in degraded areas of the country.

The global action plan of Agenda 21 which was approved by the UN Conference on Environment and Development (1992) recognizes the function of NWFP in sustainable forest management. It stated that sustainable management of NWFP is important to regard local

[3]USD 1 ⇔ Nu.65

demand on the forest resources, to consider local knowledge of the forest resources, to involve nearby dwellers as stakeholders in managing and ensuring obligation on sustainable management and to employ local people in their own economic change by incorporating decisions on social, cultural and environmental values. It is a prudent resource use if communities are encouraged to involve in managing local resources equitably and sustainably (ibid).

Therefore, this review article presents the forest policy and legislation and case observations in which relevant stakeholders engage in sustainable management of Community Forest and NWFP Framers Groups in Bhutan for rural income, and reveal some solution to poverty alleviation.

Overview of the Forest Policy, Legislation and Strategy

Environmental conservation is the national priority in the Bhutanese policy-making. Before 1960s people used to enjoy wild forest resources without or modest intervention from the government side. When in 1961, Bhutan first developmental activities plan i.e. Five Year Plan (FYP) started, the rules and policies began evolving for the management and utilization of natural resources. From there on, natural resources became a government centralized programme.

Promulgation of Forest Act (FA), in 1969 and National Forest Policy (NFP), in 1974 were the country's first legislation and policy statements that provided legal and policy matter for protection of natural resources. These legal documents gave much emphasis to protection rather than conservation and sustainable utilization of forest resources. Later in 1995, FA 1969 has been replaced by Forest and Nature Conservation Act (FNCA) which had devolved the management of natural resources to grass-root level urging participation of local communities.

FNCA, 1995 had included the chapter of Community and Social Forestry that granted access to the use of natural resources legally by which community forestry can be practiced on State Reserved Forest Land (SRFL) and private forestry in private registered lands. However, the act did not give right to rural people for collection and sale of potential NWFP resources like *Ophiocordyceps sinensis* (Berk.) (G.H. Sung, J.M. Sung, N.L. Hywel-Jones and J.W. Spatofora (syn. *Cordyceps sinensis*) to earn as off-farm income. Instead it was included in Schedule I of FNCA, 1995 as totally protected species although it was not in the lists of Convention on Illegal Trade in Endangered Species of wild fauna and flora (CITES). According to Guo, *et.al*, 2012, the government of the People's Republic of China also included this species in the National Protection Law for Wild Plants (NPLWP) since 1999 and enlisted *Ophiocordyceps* in Appendix II of the said law. Yet, the law allowed to harvest and market as per management rule prescribed in NPLWP of 1999.

In 2002 the harvesting of *O. sinensis* was legalized only in Lunana geog[4] (western region) under Gasa dzongkhag[5] (Wangchuk, 2004). Subsequently on 17 June 2004, a noble visionary

[4] Geog = Administrative block

Royal Decree had been granted by His Majesty the 4th King (King Jigme Singye Wangchuk) to the highland communities to harvest and sale of *O. sinensis* legally in the available market. From there on, the nomadic communities of Bhutan had been enjoying the benefits from such highly valuable NWFP resources.

NFP, 1974 had been revised in 2011 and called as National Forest Policy of Bhutan (NFPB), 2011. This revised forest policy bestowed to a great extent that it allows sustainable harvesting of NWFPs following the prescriptions that drawn in management plan or guidelines.

In 2000 Forest and Nature Conservation Rules (FNCR) is being accorded and revised subsequently in 2003 and 2006. This FNCR facilitated to advance in creation of community forests. The country's policies are vibrant; so are amended and promulgated according to the needs of her citizens and for wholesome happiness of the nation-wide. FNCR 2006 has been critically reviewed and edited again and made into effective from January 2017. It is fourth edition of FNCR and it is being called as Forest and Nature Conservation Rules and Regulations (FNCRR) of Bhutan, 2017. This ensuing revised and accorded FNCRR 2017 has provided people with much amicable opportunity to participate in sustainable management of forest and forest products, NWFP, and broadly a biodiversity so that conservation of such resources benefit them equitably and economically. Wangdi, Lhendup, and Wangdi (2013) pointed out that the dynamic forest policies will create harmonious linkages among public and forestry professionals that allow involvement of multi-stakeholders in safeguarding the forest resources. The series of changes in forest policy, rules, and regulations ensure people with benefit from forests and improves livelihood then alleviating poverty by certain extent.

Legitimacy Pertaining to Development of Community Forest in Bhutan

NFP 1974 has emphasized protection rather than conservation and sustainable utilization of the forest resources. According to CFG 1996, a Royal Decree had been accorded in 1979 to recognize the concept of Social Forestry in which stated "peoples' participation is a key to conservation and utilization of forest resources". As time passed by and gained experienced on implementation of forestry activities revealed that the management of natural resources should be functioned as decentralized and people centric programme.

The Community and Private Forestry had been legitimized with the foundation of FNCA 1995. It has recognized the traditional and cultural rights of local/ community people to access and usage of forest resources. In 1996, Community Forestry Guidelines for Bhutan was developed by then Social Forestry & Extension Section (SFES) with support from FAO / UNDP Forest Resources Management and Institutional Development Project. In 1997, the first Community Forest (CF) was established making country a breakthrough by handing over a chunk of SRFL to community for its sustainable management. In 2000 Forest and Nature Conservation Rules (FNCR) is being formulated for sound implementation of the provision that are enshrined in FNCA 1995. The FNCR subsequently updated in 2003 and 2006 to

[5] Dzongkhag = Administrative district

include a chapter of Social, Community, and Private Forestry. The forestry rules included the procedure of participatory forestry approaches to establish CF and Private Forestry (PF).

In 2004 a manual was developed for CF establishment procedure. As per the need of the people and environmental conservation, 2004 manual was revised in 2012 and said as "CF Manual 2012". A roadmap to advance CF activities and setting milestone, a National CF Strategy developed in 2010. In 2016 guidelines for monitoring and evaluation of CF was developed so that CF management function appropriately according to the management plan. Through lesson learnt, government has accepted participatory forestry approach as one of the means for socioeconomic development and to alleviate rural poverty by certain measure. FNCR 2006 has been again significantly revised and made into effective from January 2017 as Forest and Nature Conservation Rules and Regulations (FNCRR) of Bhutan, 2017. It has become more applicable to the ground reality by which as much of local / community people come forward in managing SRFL area.

Because of legitimacy dynamism, the country has 682 Community Forests (CF) covering an area of 75,705 hectares managed by 28,453 households as members up-to March 2017. All approved CF in country occupy about 2.8% of the total country's forest area under the management of rural community user groups (Gurung, 2017). DoFPS targeted at-least 4% of the total country's forest area to bring under the CF regime. The CF(s) are established with a technical backstopping and guidance of Social Forestry and Extension Division (SFED), which is a functional division under DoFPS.

Procedure for Selection and Establishment of Community Forest Area in Brief

Accords of FNCRR 2017 stated that Department of Forests and Park Services (DoFPS) may designate any area of State Reserved Forest Land (SRFL), including degraded and barren areas for improvement, in vicinity of human settlement, suitable for control and management by Community Forest Management Group (CFMG), as Community Forest (CF).The designation of a CF shall comply to the stated procedures and criteria included in FNCRR. To list out few: SRFL is traditionally used and managed by the community; the area is suitable for sustainable management and utilization of forest produce; each household is allocated minimum area of 3 hectares to maximum of 5 hectares. Previously FNCR 2006 permitted only 2.5 hectares of SRFL by individual household to manage as CF.

To establish a CF, a CFMG is must to form by comprising at-least 5 resident households (FNCR 2006 consented to minimum of 10 households to form CFMG then only approve to establish CF). Thereafter, CFMG need to submit application to concerned Local Government (LG) official (LG officer of the Block Administration). LG shall review and recommend to the District Administrator (DA). After acceptance from DA, a cross sectoral committee is formed comprising CFMG, Chief Forestry Officer (CFO) of the Territorial Forest Division, District Land Record Officer (DLRO), LG Officer, and adjacent community. This committee shall verify and resolve with the consent of neighbouring communities and finally the application to establish CF shall be approved by the CFO. CFO office shall assist CFMG to

prepare CF Management Plan (CFMP) in which a clear by-law as part of CFMP is drawn which has to adopt by the CFMG. The CF Management plan is valid for a period of 10 years. After completion of the plan period, the plan shall be revised based on finding of the monitoring and evaluation report.

Legitimacy Pertaining to Development of Non Wood Forest Products (NWFP) Management Group in Bhutan

NFP 1974 and FNCR emphasized more on protection of the forest resources. However, the collection of NWFP has been considered by the forest department on case by case basis. But allowed harvesting of NWFP has not been monitored properly instead the permit holders have collected the resources like bamboos, canes (rattan), *Persea* bark indiscriminately. In due course of time, the production of NWFP resources have been declined to that extent that some of them reach at the verge of threatened status. The situation has occurred just because that there was no appropriate management plan or harvesting guidelines in place for those harvestable / commercial species. Rudimentary practice of exploiting NWFP resources has continued until 2007.

In 2006, the government and DoFPS have recognized the economic importance of NWFP for reduction of poverty in the rural areas and that has led in organizing the National Stakeholders Workshop for Development of NWFP Programme in Bhutan. Resolution of the workshop has resulted to frame a National Strategy for the Development of NWFP in 2008. This strategy provides an access to formulate Interim Framework for Management and Marketing of NWFP in 2009.

Accordingly, NWFP resources are allowed to manage and utilize through permit, based on community management system. The individual permit may be considered on a case by case basis, only if the community residing nearby NWFP resources give in writing that they don't want to manage, otherwise individual permit will not be considered. Interim Framework for Management and Marketing of NWFP (2009) granted access to harvest 41 NWFP species. The framework is very lively due to which, it is revised in 2011 and added 29 more species totaling to 60 NWFP species that are allowed to harvest by the NWFP Farmer Group adopting the guidelines prescribed in the framework for Management and Marketing of the NWFP. The newly revised FNCRR 2017 even included a section that describes the sustainable harvesting and utilization of NWFP resources with a mechanism to follow management plan or guidelines.

As of 2016, 128 NWFP farmers groups have been actively involved in managing the allotted State Reserved Forest Land (SRFL) sustainably and benefitted to 5,080 households (SFED, 2016). About 40% of the total country's rural households have taken advantages on ecological and economical aspects from such community-based sustainable management of the forest resources (Gurung, 2017, SFED, 2016, & NSB, 2015). It is commendable to a small country like Bhutan.

Procedure for Selection and Establishment of NWFP Management Group Area in Brief

DoFPS shall develop Technical Regulations for sustainable collection or harvesting of all Non Wood Forest Products from the State Reserved Forest Land and even from CF. Criteria for the selection of forest area is similar to that of setting up of CF. The management guidelines for important and valuable NWFPs shall be prepared by concerned agency of the DoFPS to implement in the field.

CFO shall create awareness on the framework for management and marketing of potential NWFP. Then establishment of NWFP Management Group (NWFMG) unlike CF, here it needs one or more households to form. Even an individual farmer can apply to harvest NWFP to CFO. Based on availability of NWFP resources, CFO shall direct accordingly. The FNCRR 2017 stated that individual farmer can collect and sale any NWFP resources without paying royalty from the private registered land otherwise (from SRFL), requires paying as per royalty schedule of the government. Each NWFMG Plan is valid for 3 years. Beyond that, it has to be revised based on the performance of the group plan.

Observation on the Performance of CF and NWFP Resources

Case 1 (a): Performance of Community Forests

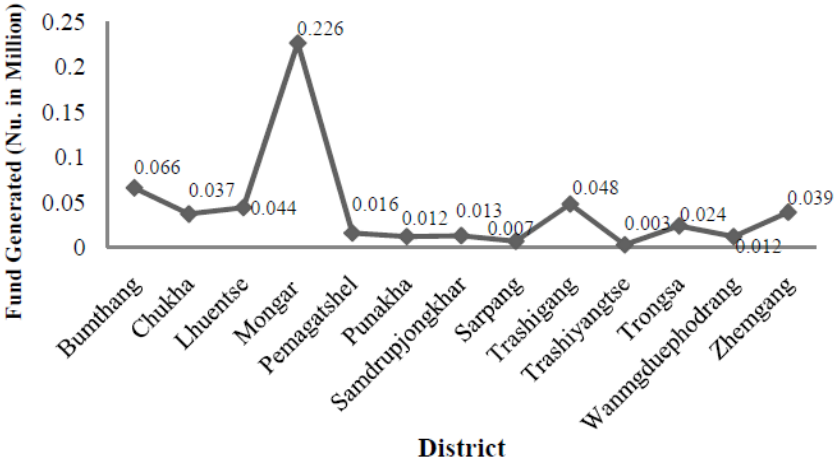

Figure 1: Fund generated by CFMG through Community Forests (Source: Temphel, & Beukeboom, 2006)

Figure 1 represented the accumulation of fund till 2005 by CF Management Group (CFMG) through establishment of Community Forest. It represents CF Fund for 13 districts of Bhutan. Mongar is the first district where country's first CF created in 1997. This district has generated the highest amount of fund of Nu.0.226 million through creations and management of CF (s) whereas the districts, like Punakha and Wangduephodrang have generated the minimum amount of Nu.0.012 million. The people of these two districts participated later in managing CF than Mongar though all the districts were fully aware of it.

Case 1 (b): Performance of Community Forests

Table 1: Participation in conservation and protection activities by CF members in percentage

Activities	Community Forests Area				Average (n=108)
	Waku Damchi (n=42)	Lumsum (n=29)	Yargay (n=20)	Mangizingkha (n=17)	
Attending CF meetings	90	90	100	88	92
Conservation of wildlife	60	52	70	76	65
Forest fire control	100	100	100	100	100
Patrolling of CF	90	86	85	100	90
Protection against illegal harvesting	100	100	100	100	100
Protection of fresh water	100	100	100	100	100
Re-plantation	100	100	100	100	100

n = number of respondents
Source: Choden, Janekarnkij, & Vijitsrikamol (2013)

Table 1 depicted that grass-root people are truly proactive in protection of forest if people are empowered to participate in protection of natural resources through community forestry option. Hundred percent of the CFMG participates in protecting CF from forest fire, illegal harvesting, protection of fresh water, and re-plantation. Even the communities are forthcoming, 65% of the CFMG takes part in wildlife conservation activities within the CF areas.

Case 2 (a): Performance of NWFP Farmers Group

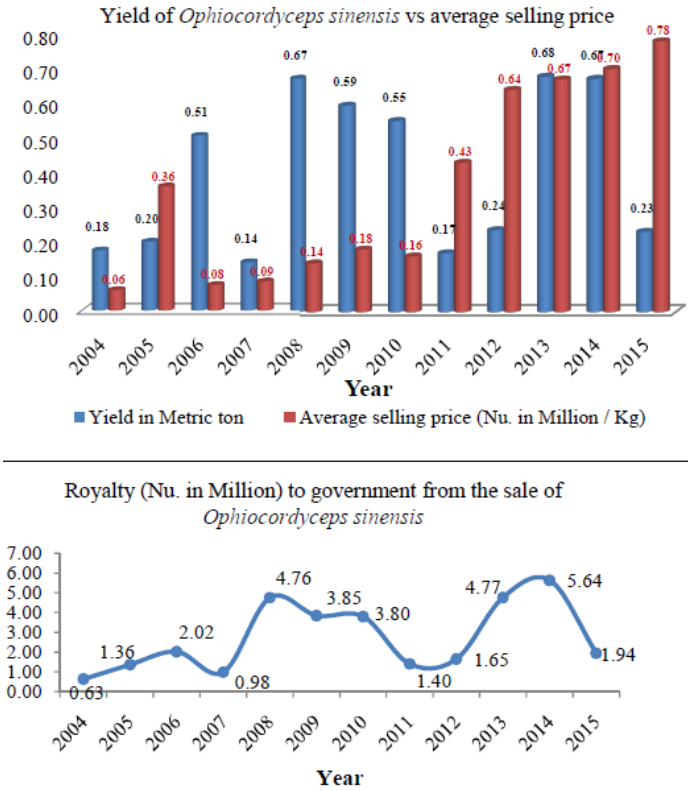

Figure 2: Sustainability of ophiocordyceps sinensis and its economy (Source: DAMC, 2015).

Ophiocordyceps sinensis is highly valued medicinal mushroom / fungus which being classified as one of the Non Wood Forest Products' species. This species is legalized to harvest and sale through the accord of Royal Decree in 2004.The bar chart in figure 2 illustrated the yield (in metric ton) of *O. sinensis* and its selling price (in Million Nu.) Kilogramme^{-1} starts from 2004 till 2015. The highest production was observed in 2013 with an amount of 0.68 metric ton and the lowest was 0.14 metric ton in 2007. The lowest yield was still high as compare to the year 2004 with a weight of 0.18 metric ton which was a baseline year for its yield and sale in the available market.

The line graph in figure 2 represents the revenue generated to government through sale of *O. sinensis* since the beginning of its legalization. Minimum revenue collected in 2004 with amount Nu.0.63 million and 2013 saw a year in which harvest and sale of the

cited species contributed highest revenue of Nu.4.77 million to the government. Yet contribution of an amount of Nu.1.94 million in 2015 was not bad as compared to the baseline year 2004.

Case 2 (b): Performance of NWFP Farmers Group

Daphne, Piper logum, & other mentioned in figure 3 are all NWFP species. Thus it represents the total income generated by NWFP Farmer Groups in one of the districts (Pemagatshel) of the country. Income generation trend had being accounted from 2008 to 2013. It does not mean that the production of the resources not sustainable but it indicates the fluctuation of market price for the NWFPs. Flux does impact a bit to the rural economy, yet farmers get increased income in compare to its baseline year of 2008.

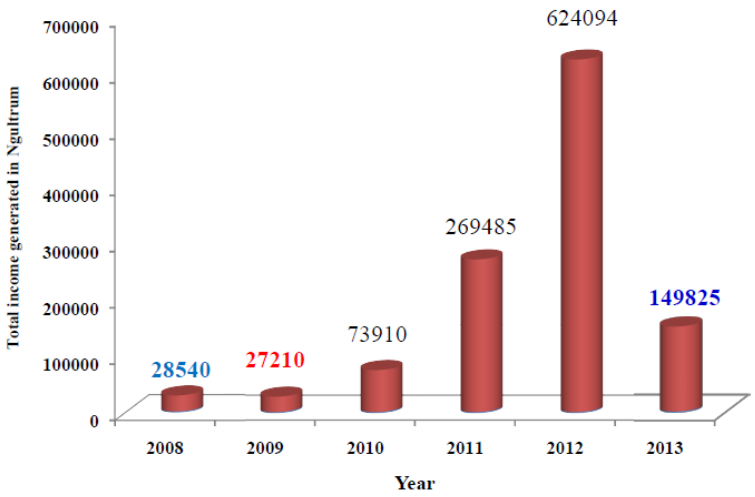

Figure 3: Income generation from sale of *Daphne, Piper longum, Piper peepuloides, Pouzolzia, Rubia cordifolia* & *Swertia chirayata* in Pemagatshel district. (*Source: DFS, 2013*)

Conclusion

Decentralization of some government function is one the viable strategies for development and sustainable management of forest and NWFP resources. Empowerment is crucial for people to participate in any process of decision making, planning and implementation with regards to developmental activities so that people enjoy the management of the resources economically and environmentally. The poor section of people with an appropriate guidance from the concerned authority would be the best possible means to manage any natural resources in a more sustainable manner. It is found that people can find self employment and generate off-farm income through sustainable and participatory management of community forests as well as functioning as NWFP Farmer Groups. Choden, Janekarnkij, & Vijitsrikamol (2013) stated that community forests in studied area (Punakha district) contributed an average of 0.3% of the total household income, and of course was comparatively low to that of neighbouring countries. However, participatory community forestry management is one of the ways in which people take part in activities to safe-guard forest from fire outbreak, against illegal harvest; protect fresh water degradation, and re-plantation in the degraded areas.

Contrary, sustainable management of community forests also take cares on the sustainable economic utilization of the NWFP resources. For instance, *Ophiocordyceps sinensis* supports rural economy immensely improving the people's livelihood. Likewise other NWFPs like *Daphne, Piper, Rubia, Swertia,* and *Pouzolzia* have a momentous potential to lessen rural poverty economically through self employment in NWFP economic activity during lean agricultural farming season.

It can be concluded that, within the purview of the sustainable forest management, forest and NWFP resources should be allowed to manage by the grass-root people as it is relatively provide economic benefits to community members of the management groups. At the same-time, such community management practices improve the health of forests. Also the participatory approach of managing community forestry has potential to conserve, revive state of biodiversity, and restore the depleted forests ecosystems. Seldon 2017 report has construed the fact that Bhutan forest observed in increased of tiger population by 39% within a span of 17 years. The National Tiger Survey (2014-2015) conducted by DoFPS has confirmed the increased. The survey report indicated that in 1998 tiger population estimated to 78 in numbers whereas in 2015 it was 103.

Lesson Learnt from the Participatory Management of Community Forest and NWFP Farmers Group

- ✓ In Bhutanese context, GNH principle is appropriate and applicable while formulating policy, strategy, and plan for the developmental activities of the country.
- ✓ Policy for any development programme has to be dynamic in order to regulate it holistically.
- ✓ Roadmap, strategy and regulation should be the driving tools for sustainable development.
- ✓ Rural centric participatory management and action plan, and guidelines should be the guiding tools for implementation of any policy.
- ✓ Collaboration among relevant multi-stakeholders is crucial in the issue of sustainable management and development programme.
- ✓ Willingness and participation of the community group is must so that an ideal situation will be created for conservation of any natural resources.
- ✓ Rural poor communities are at bay and easily motivated to take-up activities for the sustainable management of any natural resources.
- ✓ Above all good governance is must in order to achieve the sustainability of forest resources or to rehabilitate the degraded areas. Such governance can definitely help to reduce poverty of the country.

Summary

The country's political will-power is the most important phenomenon for the sustainable development so that every individual citizen is responsible to safe-guarding of the nation's natural wealth (natural resources). One thing is clear that the highest body of the country should be far-sighted and visionary so as to achieve the wholesome goal of the country. For an example, one of the articles of Bhutan's constitution is the conservation and protection of forest cover of 60% for all times to come. This article itself became the strong base for protection and conservation of forests. Similarly, the constitution's Article 9 (2) stated that the

principles of State Policy have to promote those conditions that can be conducive for the Gross National Happiness (GNH). GNH principles direct the country throughout of her socio-economic development. The ruling government has to be people centric in order to take up any developmental activities, be it for sustainable management of forest and natural resources, or any related ones. The Royal Government of Bhutan is always believed in devolution and empowering of grass-root people.

The country strongly emphasized and encouraged community people participation in sustainable management and utilization of forest resources. Alongside, development policy, strategy, framework, act, rules and regulations of the country has to be very dynamic and people friendly so that it can be amended as per the needs of the people and at the same-time focus on conservation of the environment and natural resources. Thus, Bhutan's sector specific, legitimacies are amended as and when required. For example 1974 National Forest Policy of Bhutan is revised in 2011, Forest Conservation Rules has been quite frequently revised, the latest being the one in January 2017. It is presumed that because of all those factors in place, Bhutan does not observe a serious degree of forest degradation although there are few exceptions of expansion of urban settlement areas. However, Bhutan State of Environment Report (2016) illustrated that only 0.54% of the country area is degraded and another 0.18% as landslide areas. Whilst, Bhutanese people enjoys the economic benefits of the forest resources by managing SFRL through formation of community forest, private forest, and or NWFP farmers group.

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Forest Management and Policy of Cambodia

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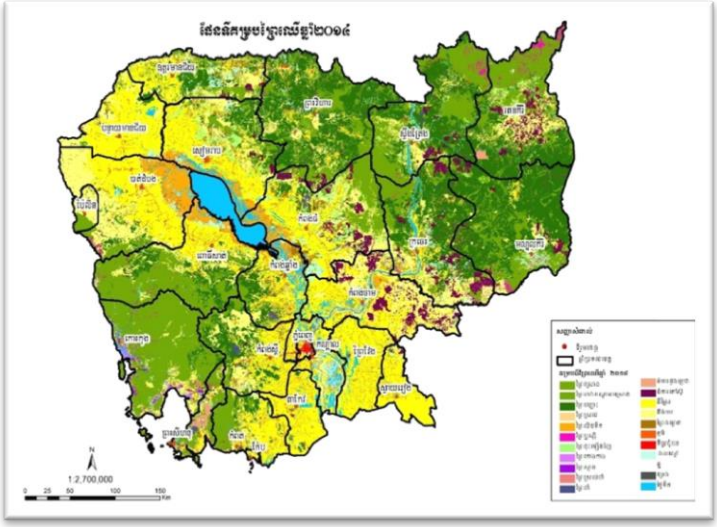
Cambodia is located in Southeast Asia, bordering Vietnam, Laos and Thailand, and has a total land area of 181,035 square kilometers. The country's population grew from around 9 million in the 1960s to around 14 million in 2006. Approximately 80 percent of the country's inhabitants live in rural areas with limited access to electricity and seasonal food shortages. Cambodia is one of the poorest countries in Southeast Asia, with around 2-3 million people currently living in cities (14-21% of the total). In addition, 37 percent of the rural population lives below the poverty line of less than 50 US cents per day and more than half live on less than US$1 a day.

Forest resources are very important for local people who are living near the forests. The people rely on collection timbers, non-timber forest products consist of bamboo, wild vegetable, mushroom, wildlife, water, including eco-service gaining from the forests.

To respond on the rapid decline of forest cover, the government has make much efforts to eliminate the forest crimes. Number of legal documents had been issued by the governments aiming sustainable forest management such as law on forestry, national forest programme, Cambodia rectangular strategic plan phase III, national strategic plan 2014-2018 etc. Strengthening of forest law enforcement, forest sector reform are the mechanism of having sustainable forest management.

Forest rehabilitation and restoration are one of the government policy priority. One tourist-one tree is created by the government to encourage the people both Cambodian and foreigner love the forests and participate in the forest restoration activities. National plantation day known as Arborday is celebrated every year on 9th July to dissemination people how important of the forest plantation.

Profile of Forest Resources and Biodiversity and its Changing Trend



The forests are one of Cambodia's most significant natural resources for environmental protection, economic development and poverty reduction. It covers a total area of 59% of the country. Eighty five percent (85%) of the population lives in rural areas, the majority of which, depend on agriculture and forest resources for their livelihoods. Local communities collect timbers and nontimber products such as fuel-woods, traditional medicines, bamboos and rattans, fruits, vegetables, and meats from the Figure 1: Map of forest cover in 2014 (source: FA)

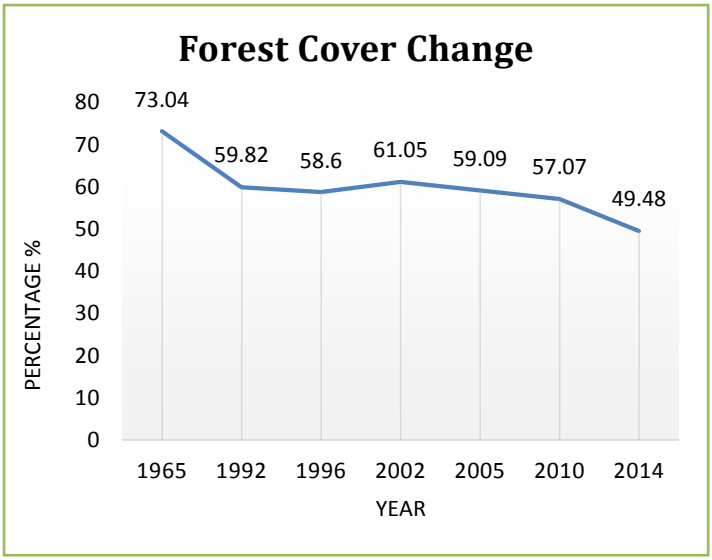
forest. Furthermore, forests are paramount in conserving soil, regulating water regime, provision of potable water and sustaining the irrigation system.

The forest cover in Cambodia is classified into 5 main types, namely: evergreen forest, semi-evergreen forest, deciduous forest, other forest (includes re-growth forest, stunted forests, mangrove forests, inundated forests, forest plantations, bamboo, rubber and oil palm plantation) and non-forest land. The forest resources are allocated into different uses, namely: production forest, protection forest, and conservation forest (source: law on forestry 2002).

The forest of Cambodia is also home to globally important species. It is estimated that Cambodia hosts 806 globally threatened species, including 26 critically endangered species, 36 endangered and 51 vulnerable species. About 423 species are largely forest or forest-dependent species – including 9 critically endangered species, 9 endangered species and 23 vulnerable species. Some of the globally threatened species found in Cambodia include eld's deer (Cervuseldiisiamensis), tigers (Pantheratigris), sun bears (Helarctosmalayanus), Asian elephants (Elephasmaximus), Asian wild dogs (Cuonalpinus), and banteng (Bosjavanicus). (source: SFM Document).

Changes on Forest Area over Last Decade, including Timber and Forest Rehabilitation

Cambodia's forests are rich in biodiversity and include forty-five habitats (FA, 2010). Unfortunately, the country's forest resources decreased from 61.05 % in 2002 to 49.48 % of the total land area in 2014 (FA, 2015). This means that the total area of 2,119,130 ha of forest land has changed due to other uses. Chao (2009) reported that the contribution of forest subsector to agricultural sector from 2003 to 2008 was between 6.9% and 8.1%. And the highest contribution of the sector was in 2004 which accounted to 8.1% while its lowest



Graphic 1. Forest Cover Changes 1965-2014 (source: FA)

contribution was in 2008 which accounted to only 6.9%. The forest sector is often confronted by the degradation and poverty in the rural areas, which need to be addressed through science and technology. Large areas of forest that are currently left unmanaged/ unattended are at high risk of forest degradation and conversion to other land uses.

National development programmes in Cambodia recognise the importance of forest resources to rural livelihoods, and peoples' access to those resources. The FA's efforts to create an enabling environment for multipurpose tree plantations and to develop plantation forestry will focus on multi-purpose tree plantations, which have a potential to supply domestic timber needs, increase incomes of local communities, and improve the environment through watershed protection and erosion control. It is important that such plantations are developed wisely and consider various species for multi-purpose planting for long-term and short-term rotation; for example, species such as Dipterocarpus alatus Hopea adorata Azadirachta indica, rubber trees, Eucalyptus spp., Acacia spp., and Sesbania grandiflora. It is important that plantations are developed in line with market needs or possible future demands. In this case, it is also important to consider species that are known and already utilized by local communities. Familiarity with a topic will lessen the possible adverse attitude local villagers may have towards the programme, and encourage these to participate on a larger scale. This may even promote private initiatives, where communities plant trees on their own on open land (source: national forest programme, 2010)

Profile of Protection Area, such as Nature Reserve or Conservation Area, Protection Forests, National Park, Forest for other Special Use Purpose etc.

Cambodia's forest estates are classified into the permanent forest reserves and private forest. The permanent forest reserve includes three types, firstly production forest is a reserve forest for sustainable timber and NTFP's productivity and regarding protection function as second priority. Secondly, protection forest is reserved for ecosystems and

natural resources protection and the third is the forest land for conversion (source: law on forestry 2002). The main system has been implemented in production forest such as community forestry under agreement, forest concessions, annual bidding coupes, rehabilitation of logged forest and forest reserve for reforestation or forest plantation development. The forest managed by silvicultural methods is hardly done and it have just researched for test, is not fully implementation, however, apply silviculture techniques presents an enormous potential enhancing quality the natural forests. Forest concessions activities have been suspended since 2001 up to now in complying with the RGC decision to require all forest concessions preparing g a strategy forest management plan for sustainable way in according to international standard. After suspended forest concession, the government decided establishing a small number of annual bidding coupes in order to supply timbers for domestic consumption. In line with the NFP vision and mission, there is a need to develop alternative production forest management systems, which contribute significantly to improving local livelihoods, the safeguarding of environmental services and watersheds, and carbon sequestration.

Profile of Forestry Industry Development, including the Way of Timber Utilization and Processing, total Forestry Production Outputs etc.

In Cambodia, timber concessions for selective logging under forest management plans were effectively suspended indefinitely due to governance and compliance issues. However, Cambodia's exports of value timber have continued, raising the question where this timber comes from if not from official forest concessions.

Some technical reports indicate that the main source of wood harvested in Cambodia since mid-2004 consists of 1) "conversion timber" from forest lands allocated to large-scale agri-industrial plantations, and 2) illegally harvested timber from adjacent lands. As a matter of fact, the Royal Government of Cambodia (RGC) itself has acknowledged that the conversion of forestland to large-scale agricultural plantations under ELCs has been the main driver of Cambodia's deforestation.

It has been reported that by the end of 2013, 2.6 million hectares of land, 14 percent of the country, had been allocated to Economic Land Concessions (ELCs) for agro-industrial plantations and other types land concessions. These land allocations have become controversial due to their environmental and social impacts: many land concessions have been allocated within the boundaries of national protected areas, and violent conflicts resulting from the inclusion of forest lands and community lands have become increasingly common. The RGC decided, therefore, to ban new Economic Land Concession (ELC) allocation, known as one of drivers of deforestation and forest degradation, and review the existing ELC having 118 companies covering 1.2 M.ha from 1996 to 2012 on 7 May 2012 (source: (www.elc.maff.gov.kh).

Current policy and practice indicates that Cambodia will continue to rely on natural forests for timber production rather than utilizing land under concessions. The socio-economic

ramifications of allocating extensive lands to agri-industrial plantations and its consequences for long-term productive land-use are also not adequately considered. To ensure balanced national and sub-national land-use planning, the relevant legal, policy, and institutional frameworks are being improved and revised, particularly if the government's National Forest Program and any proposed FLEGT and REDD+ programs are to be effective. Without this, current proposals to favor social land concessions (SLC) over ELCs simply risk the perpetuation of Cambodia's deforestation just as the transition from logging concessions to ELCs did a decade ago.

The 2006 Sub-decree on "Timber and Non-timber Forest Products Allowed for Export and Import" stipulates that logs or rough sawn timber, square or rectangular timber with width and thickness bigger than 25cm, are prohibited from export in order to enhance incentives for local timber industry for producing high quality added-value and competitive products. Meanwhile the RGC supports the import of processed or non-processed timber and non-timber forest products to supplement raw material for local industry operation and re-export the products. The majority of forest products, however, are exported in the form of semi-finished products without significant value-adding. Compared to neighboring countries, Cambodia still has considerable amounts of natural forests, which could contribute to the country's economy if the forest industry was properly developed and could also play a bigger role in rural livelihoods. Hence, in order to manage forest resources sustainably and effectively in consistence with the RGC's policy reduction policy, it is necessary to take into consideration the development of forest industry to make use and process all kinds of timber to the most economy way and high-quality products to meet the demand of markets.

Forest and Forestry Management Mechanism, these including Governmental Administrative System at Deferent Levels (Local, Regional/Provincial and National Levels), Policy and Legal Regulation of Forest Management and Forestry Development, and Definition and Types of Forestland Tenure and Ownership

Learning from deforestation in the past, the government has making much efforts to maintain the forest resources. Series of legal documents have been issued to support sustainable forest management. They are Law on Forestry 2002, National Forest Program 2010-2029, National Strategy Plan 2014-2018, Cambodia Rectangular Strategic Phase III 2013-2018, National REDD+Roadmap 2010 etc. These legal documents are having the same overall goal to be sustainable forest management with maintaining forest cover 60%.

There are two ministries having mandated on forest management, 1. The Ministry of Agriculture, Forestry and Fisheries (MAFF)

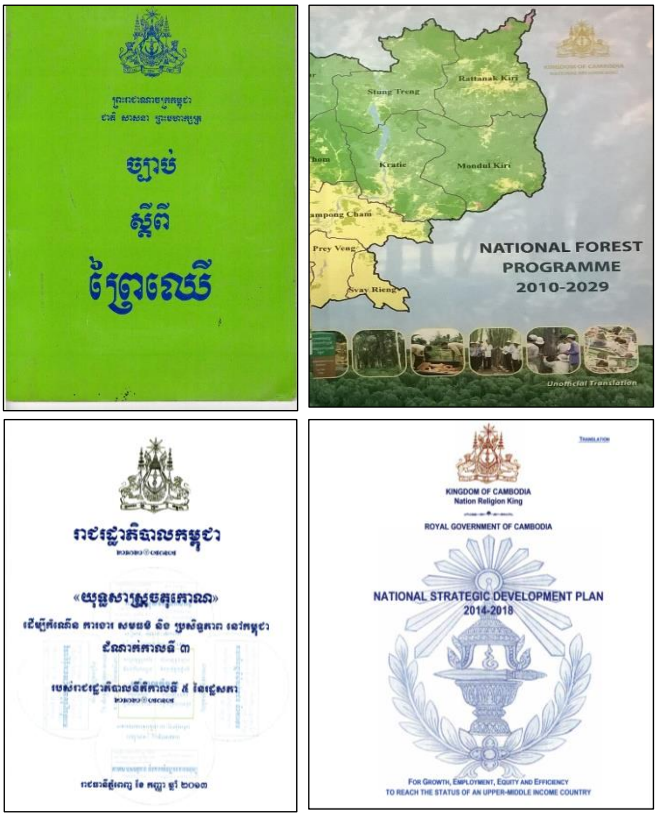


Figure 2. Legal documents on forestry

and 2. The Ministry of Environment (MoE). Forestry Administration (FA) under MAFF is production forests, research forests and private forests. FA has six departments and one research institute at the central level. It was divided 4 regions (Inspectorate) and 25 provincial levels (Cantonment) following by divisions and triages.

Recently, the structure of FA has been reformed. The Cantonments which was directly controlled by FA headquarter were integrated with the provincial department of agriculture, forestry and fisheries under the umbrella of the governor. The governor with supports from stakeholders including military, and local authorities has to responsible for forests protection and development.

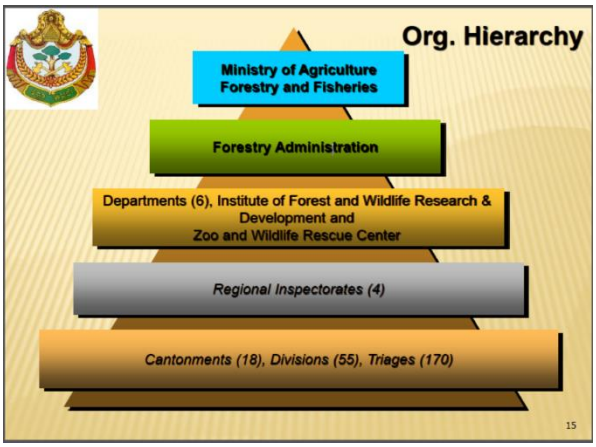


Figure 3. The organization of FA (source: FA.2010)

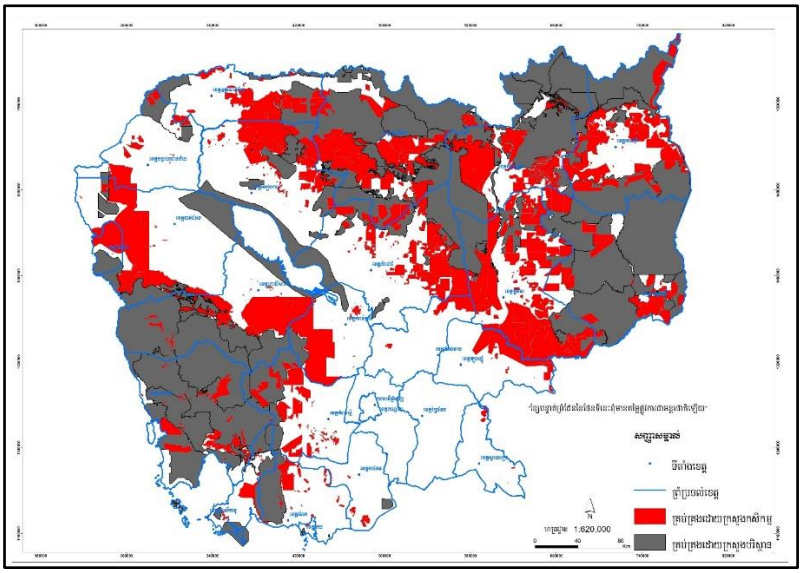


Figure 4. Area manages by MAFF (red) and MoE (gray) (source: FA)

Forestry Scientific and Research System, including Forestry Research Institutions, with Main Research Fields and Outstanding Achievements

The forestry sector currently faces challenges in terms of finding suitable systems to support the implementation of national visions, and continuously pilot and develop new SFM schemes in order to scale up good practices. Forest-related researches are often undertaken by single independent research institutes and international NGOs, with support from development partners and international research fellows. These research results are rarely utilized by the FA during the formulation of new forest policies. There is a strong national need to improve collaboration and coordination between research organizations and government authorities in developing new strategies to implement SFM, alleviate poverty, and ensure environmental protection and economic development.

In the forest management planning and monitoring process, the forest sector needs to collect relevant data, using appropriate scientific methodologies. The crucial part of the process is that the data gathered will be utilized through analysis and interpretation. Results will be articulated to managers and decision makers, both within and outside the FA, to improve forest management planning and monitoring of forest resource developments over time. Furthermore, protocols for transparency and information sharing need to be developed, and it will be necessary to come up with efficient communication strategies to inform and support policy makers, NGOs, local forest managers, and other stakeholders, as well as to publicize research information and extension materials, and to make them available to relevant stakeholders3.

Forest research has been identified as an important component in sustainable forest management in Cambodia. The National forest programme (RGC, 2010) had taken into account in capacity and research programme by enhancing forestry research capacities and strengthening applied research to support the implementation of forest policies, plans and

programmes. Research and capacity development is one of the areas identified under NFP Sub-Programme 5. The main objective of programme related to research is to develop research capacity of the FA, colleges, universities and independent non-government research organizations to provide reliable and independent information to support the development and implementation of forest policies and national goals on SFM, environmental protection and poverty reduction.

The Institute of Forest and Wildlife Research and Development (IRD) plays a fundamental role in conducting science based research to provide concrete information as well as collaboration with other organizations on forestry.The duties of Forest and Wildlife Research and Development Institute are defined in Article 12 of Sub Decree No 188 ANK/BK. In 2011, IRD has worked with some partners such as Korea Forest Service, JICA, ADB, Danida, RECOFTC, APFNet, Kyushu University.

Table 1. List of some research topic in IRD (source: forest research strategic plan, IRD 2014-2018)

No	Research project	Duration of implementation	Funding Institution
1	Improving capacity on forest restoration in Cambodia-Phase II	2012-2013	ASEAN-ROK
2	Multi-function forest restoration and management of degraded forest areas in Cambodia	2012-2014	APFNet
3	Aspect of information sharing system to promote climate change resilience reforestation and afforestation in Indochina	2013-2015	AusAID through CSIRO
4	Water cycle variation in Mekong Basin	2013-2018	FFPRI, Japan
5	Management and restoration of degraded forest for multiple use	2012-2014	APFNet
6	Community capacity building and support for REDD+ development	2013-2014	UN-REDD programme Cambodia
7	Natural regeneration of *Dalbergia cochinchinnesis*	2012-2013	AKECOP/Korea
8	Biodiversity corridor in Greater Mekong Sub-region	2011-2019	ADB
9	Capacity building for forest restoration	2012-2013	AFoCo (Korea)
10	Forest land identification for forest research and restoration	2012-2014	JICA
11	Sub-national forest programme development with forest cantonment of Kampot, Kandal, Kratie, Modulkiri, and Ratanakiri provinces	2013-2014	JICA
12	Documentation and webpage development for IRD	2013-2014	JICA
13	Wood specimen collection	2013-2014	JICA
14	Assisted natural regeneration	2011-2013	FAO
15	Promotion of indigenous tree species	2013-2014	JICA
16	Information sharing on tree species for climate change adaptation	2013-2015	AusAID

Forestry Education System, including Independent Forestry Universities/Colleges, or Forestry Related Forestry Universities/Colleges and Professional Training Agencies

There are two public universities where provide the course on forestry. The Royal University of Agriculture located at the outskirt of Phnom Penh has a faculty of forestry. Students can get bachelor degree in forestry and master degree in natural resource management. The Prek Leap National School of Agriculture has also a faculty of forestry. Besides, there are several private universities provide also the environmental and agricultural courses which are indirectly related to forestry. Students are well educated in the university in varies course related to forestry such as forest management, inventory, silviculture, restoration, economic, harvesting, nursery, wildlife, GIS etc. There are number of qualified students graduated in the field of forestry recognized by the minister of MAFF Cambodia.

Under the management of IRD, the Forest and Wildlife Training Center is providing the course related to forestry sector. However, the center is not functioning yet. It is operated once there is an organizing training course from development partner only.

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Forest Rehabilitation and Management in Fiji Islands

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Introduction: Increased use of forest resources and a shrinking forest land base, coupled with climate change issues, threaten the sustainability of forest resources in Fiji and highlight the importance of conservation and sustainable management of these resources. With the current biodiversity crisis in Fiji, the most critical issue is that of forest degradation with major challenges including population decline and population structure changes due to forest removal, conversion, fragmentation, forestry practices, climate change, invasive species, fire and atmospheric pollution.

Forest diversity in Fiji is well distributed with initiatives by the Forestry Department in in-situ and ex-situ conservation, protected and preserved forest areas and tree improvement with due consideration to the FAO recommendation of stronger actions in support of management of forest resources to achieve sustainable development and contribution to the two Millennium Development Goals, one and seven. The initiative to forest conservation has been further enhanced by support from the Australian government through a project on South Pacific Regional Initiative on Forest Genetic Resources (SPRIG) as well as the German governments (GIZ) forestry projects on sustainable forest management, both of which became an important foundation and turning point for Fiji's Forestry Department in the areas of conservation and sustainable management. The Fiji Forestry Department has management responsibilities over a number of forest reserves, plans and manages and oversees logging operations and as such has a crucial role in the conservation and sustainable forestry outcomes.

The country by far has a long way to go in adequately implementing conservation and degraded forest restoration strategies within legal frameworks and the development of national strategies for conservation, utilization of forest resources and degraded forest restoration would be an important step in defining the roles and responsibilities for relevant institutions. It is essential that we know what we have, how much of it we have and how can we keep what we have in terms of sustainable use of forest resources. The challenge would be in its application to poverty alleviation, rural development and climate change within a community forestry framework.

The significant drivers for forest degradation in Fiji are destructive logging, firewood collection and burning. Forest degradation in Fiji contributes enormously to loss of forest cover, low in biodiversity, environmental services and forest products are also largely affected.

Forest Resources in Fiji

Geographic Location

Fiji Islands is geographically located in the southern Pacific Ocean, northeast of Australia and about 1,500 kilometers directly north of New Zealand. Some 110 of the country's 332 islands are inhabited. The two largest islands, Viti Levu and Vanua Levu, account for more than 85% of the country's 18,270 square kilometers of land area.

Map of Fiji Islands

Population

The 837,271 people of the Fiji Islands are from diverse backgrounds according to the Fiji Bureau of Statistics for 2011 consensus. Some 57% (475,739) of the population belongs to the native Melanesian ethnic group, 37% (313,798) are of Indian origin and the remaining 6% (47,734) are Europeans, Chinese, and other Pacific islanders. The population trend has been very slight increases since 2003 to 2009 and then a decline after that which could be due to migration at large.

Land Use and Forest Types

The principal types of land use are: open grazing 2,700 km^2 including 950 km^2 of roadsides, compounds and sugar cane residues, 280 km^2 grazing under coconuts or forest trees, 380 km^2 of crop or fallow under coconuts, 1,950 km^2 ha of arable and tree crops other than coconuts, 1,000 km^2 of plantation Mahogany and Caribbean Pine.

Fiji's total forest cover is approximately 1,014,000 hectares in relation to the total landmass of 18,376 km2. 55.5% of the total land mass of Fiji or about 1,014,000 ha are forested, according to FAO. Of this 17.5% (177,000 ha) is classified as primary forest, the most bio diverse and carbon-dense form of forest.

Forest cover includes the following:

- Indigenous Forest: 739,340 ha
- Hardwood Plantations: 51,490 ha
- Pine: 43,200 ha

Fiji had 177,000 ha of planted forest.

Land Tenure System

About 86% of the Country's land is owned by the indigenous units, 5% is managed by the state and 9% is freehold land.

Economy

Arable land is primarily used for sugar cane, cocoa, rice and other agricultural crops cultivation. Approximately 55% of the land is covered with natural and plantation forests. Economically, agriculture dominates the domestic export of about 43% and 36% from sugar for foreign exchange. However, Tourism industry offers the most income source to the country and investment prospective.

Natural Resources - Timber

The Forestry sectors' contribution to the Gross Domestic Product (GDP) is expected to dramatically increase to $100 million within the next 5 years due to the value adding processing and production line from the Mahogany and Pine plantation forests. The foreign earnings from the export of timber and other wood based products averaged $42 million a year in the last decade. In 2004, earnings totaled $37 million. This contributes 2.3 per cent to the country's Gross Domestic Product (GDP).

The forestry sector in Fiji has a total forest cover of 1,054,419 ha, covering 58% of the total land area. This consists of:

899,229 ha of native forest,

116,488 ha of plantation forest (52,419 ha of hardwood plantations, 25,327 ha of softwood plantations and 38,742 ha of mangrove forest).

The native forest consists of:

- 5,738 ha of nature reserves,
- 16,109 ha of forest reserves, and
- 1,300 ha of recreational parks

Export earnings from timber and other wood-based products average around $42 million each year. In 2004, the recorded earnings were $42.9 million.

Total wood production in Fiji is presently approaching 500,000m^3 annually with 100,000m^3 from native forests, 100,000m^3 from mahogany plantations, and 300,000 m^3 from pine plantations.

The Department of Forests in 2009 completed the National Forest Inventory exercise. The National Forest Inventory, the formalization of the Fiji Forest Policy Statement and the National Forest Program provides the framework for the sustainable management of Fiji's forest resources. These tools represent a paradigm shift in the management focus away from timber production towards conservation and sustainable management.

Trends in forest changes

Change in Forest Cover: Between 1990 and 2010, Fiji lost an average of 3,050 ha or 0.32% per year. In total, between 1990 and 2010, Fiji gained 6.4% of its forest cover or around 61,000 ha. Fiji's forests contain - million metric tons of carbon in living forest biomass. 54.7%—or about 1,000,000 hectares—of Fiji is forested. Of this, 89.4%—or roughly 894,000 hectares—is classified as primary forest, the most bio diverse form of forest.

Change in Forest Cover: Between 1990 and 2000, Fiji gained an average of 2,100 hectares of forest per year. This amounts to an average annual reforestation rate of 0.21%. Between 2000 and 2005, the rate of forest change decreased by 100.0% to 0.00% per annum. In total, between 1990 and 2005, Fiji gained 2.2% of its forest cover, or around 21,000 hectares. Fiji lost -1,000 hectares—0—of its primary forest cover during that time. Deforestation rates of primary cover have decreased 0.1% since the close of the 1990s. Measuring the total rate of habitat conversion (defined as change in forest area plus change in woodland area minus net plantation expansion) for the 1990-2005 intervals, Fiji gained 0.0% of its forest and woodland habitat.

Biodiversity and Protected Areas: Fiji has some 164 known species of amphibians, birds, mammals and reptiles according to figures from the World Conservation Monitoring Centre. Of these, 28.7% are endemic, meaning they exist in no other country, and 15.2% are threatened. Fiji is home to at least 1,518 species of vascular plants, of which 50.1% are endemic. 9.9% of Fiji is protected under IUCN categories.

Forest Area Change between 1991 and 2010

National class (1000 ha)	1991	2010	Δ Area	No. of Years	Δ/Year
Closed Forest	704.856	562.055	-142.801	19	**-7.516**
Open Forest	152.665	414.682	262.017	19	**13.790**
Pine plantations	49.620	77.577	27.957	19	**1.471**
Hardwood plantations	39.220	62.987	23.767	19	**1.251**
Coconut plantations	34.560	18.790	-15.770	19	**-0.830**
Non-forests	830.285	675.115	-155.170	19	**-8.167**
Inland water	15.794	15.794	0.000	19	**0.000**
Total land area	**1,827**	**1,827**	0.000		0.000

Forest Area Forecasting

National class (1000 ha)	1990	2000	2005	2010	2015
Closed Forest	702.747	639.007	602.424	562.055	524.476
Open Forest	225.639	301.524	344.854	414.682	483.634
Pine plantations	52.363	77.286	92.656	77.577	84.935
Hardwood plantations	39.797	53.080	60.780	62.987	69.241
Coconut plantations	34.297	31.248	29.408	18.790	14.640
Non-forests	830.285	685.679	685.679	675.115	852.777
Inland water	21.484			15.794	19.950
Total land area	**1,827**	**1,827**	**1,827**	**1,827**	**1,827**

Forest Area Summary

FAO 2015 categories	Area (1000 hectares)				
	1990	2000	2005	2010	2015
Forest	952.900	980.444	997.264	992.896	1,017.195
Other wooded land	45.128	60.306	68.973	82.936	96.727
Other land	828.972	786.250	760.763	751.167	713.078
of which with tree cover	56.861	61.399	63.892	60.258	63.003
Inland water bodies	15.794	15.794	15.794	15.794	19.950
TOTAL	**1,827**	**1,827**	**1,827**	**1,827**	**1,827**

Data Source: Management Services Division Data-base, Fiji Forestry Department

Roles of the Department

The main role of the forestry department is to oversee the administration of the forest resources in Fiji and at the same time ensure that certain legislation and rules are followed accordingly. Even though majority of the forest are owned by communities but the effective management falls under the jurisdiction of the department.

Area of Responsibility

The department of Forest has been divided into 6 Sections in which different sections has its own roles and tasks to perform. The Forest Policy implemented by the department was used as a framework to secure the sustainability of Fiji Forest. Every section is working under this

Policy and legislation and also ensures that the corporate plan of the department is achieved accordingly.

Almost a year now taking up the post of Forestry officer in the harvesting section of the department and has been more challenging. The core responsibility of this post was to oversee the implementation of all forest operational activities and directives from the Divisional Forestry Officer to all sections team leaders. It also coordinates all core business or functions undertaken by all sectors that include the Timber Production, Forest Extension, and Timber Utilization in line with the business plan and strategic directives from the DFO. The post also requires the monitoring of the harvesting activities and coordination of the reforestation and afforestation area.

Challenges

The major challenge at the moment was the funding for reforestation and afforestation. Even though we still have enough forest cover in Fiji but the increases in commercial farming and shifting cultivation as majority of the people relies heavily to farming for their daily consumption and sources of income. Majority of the land are owned by community rather than state and privately owned.

Another challenging issue is the illegal removal of timbers by resource owners without following proper channel. Information sharing between all stakeholders is lacking. Require capacity building to resources owners on sustainability principle including the economic viability, environmentally friendly and socially acceptable. Currently, the status of the forest after Tropical Cyclone Winston struck Fiji has been in a critical position. Most of the places are recovering well but some forest has been damaged. This really affects the flora and fauna.

Expectation

At the end of the training I would expect to gain new innovative ideas. Learning new concepts on Forest Rehabilitation and Management from other countries and able to communicate and sharing ideas with fellow participants.

Based on the knowledge sharing and innovative ideas discuss during the training, the collaborative issues will be compile to enable the development of a specific and workable action plan that will be implemented back in our work place.

Forest Rehabilitation Program: A Case Study at Loa Haur Training Forest, East Kalimantan, Indonesia

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Abstract: There are at least three main problems contributing to the increased number of forest degrading activities in *Loa Haur* training forest. Logging and mining activities have increased the accessibility to the training forest. The limited personnel is another issue for the management to guard the area of 4,310 hectares. Finally, it is the economy motive that drives the local people to claim some of the forest area for their livelihoods. Hence, a breakthrough to protect the forest is needed to solve the problems.

This program aims to embrace the local people in preserving the training forest functions through land rehabilitation as well as securing the forest area. Despite its controversy, the impacts of such approach are positive when the locals are organised into forest farmer groups. For instance, the locals can be directed to plant the recommended forestry tree species; our forest extension workers could reveal more information from the locals and successfully identify actors on the ground. Consequently, the local engagement is believed to be contributing to the reportedly decreasing number of intruders into the area.

Up to this text is written, such approach shows more promising results than the old paradigm using rigid force that is prone to raise conflicts. In the near future, it is expected that the program would transform the training forest into an example of land rehabilitation management in the region of Kalimantan that not only reducing forest degradations but also documenting the processes and results of such policy implementation.

Introduction

Background of the Problems

This study case is located in East Kalimantan province of Indonesia. The province counts on natural resource exploitations for its main incomes including logging, mining, and plantation as the major sectors (Regional Climate Change Council of East Kalimantan, 2016). For decades, logging business was the main contributor to the regional income. These recent years, the sector is gradually overtaken by the other business sectors.

As the consequence of the extractions, most parts of the region suffer from land clearing activities that cause critical land that count approximately 60 % of the province' total area (Mazzetti, 2016). According to the recent data released by the Ministry of Environment and

Forestry in 2015, the number of critical zones in East Kalimantan is about 7,759,369 hectares. In details, majority of the damage occurred in forest cultivation areas (5,413,251.47 hectares). The rest, around 2,362,176.62 hectares of land degradation occurred outside of forest cultivation areas. Such condition is deemed critical to the call for ameliorative efforts to save the environment of the provincial area that entirely covers 12,726,445 hectares (Mazzetti, 2016).

Actually, the Government of Indonesia had initiated programmes to reduce deforestations and forest degradations in the region (Fatawi & Mori, 2000). They include the establishment of conservation areas such as Bukit Suharto Forest Conservation Park. Located within this forest conservation park, *Loa Haur* training forest was later established in 2002 to secure a conservation area of 4,310 hectares in total. Based on potential survey in 2009, *Loa Haur* training forest consists of young secondary forest (41.97%), old secondary forest (34.78%), and weeds and shrubs (23.25%) (Arpian, 2009). Since the establishment of its status as forest area with special purpose, the area has been utilised for field practices of education and training programs conducted for the improvement of forestry human resources. Since then, it is fully managed by Regional Environment and Forestry Education and Training Centre in Samarinda (BDLHK Samarinda).

Under the smaller management unit, the purpose of such policy is to halt the rampant illicit land uses by the local people after forest concession companies ended their operations as well as to maintain the forest conservation area. However, the forest area is reportedly still degraded by illegal activities due to some causes. The ex-logging roads constructed by timber enterprises in the past provided initial accessibility in few points to enter the forest area. Currently, mining companies operating near the area, on one hand improves the ability of BDLHK Samarinda to conduct mutual patrol to secure the area, but on the other hand, such collaboration unexpectedly increases access for other parties to encroach into the protected area.

Consequently, more people moved into the forest area and opened new farming sites. The increased human activities cause problems that worsen environmental degradation in the area. They include forest fires, illegal wood extractions, and land encroachments. The growing population also contributes to the increase of degraded land due to extensive land cultivation driven by economic motive, one of which is to fulfil their daily needs (Muhammad & Surbakti, 2017).

The Trigger to Initiate the Rehabilitation Program

Law enforcement measures are actually taken although the scales are not sufficient to solve the problem due to the limited number of personnel and lack of facilities. In fact, strict measures often cause conflicts between the locals and the on-site forest management personnel. Based on the testimony of forest extension workers, to force the people to the leave the area and shut down the access is complicated as the locals claim that they been cultivating the area before the status of the area was determined as conservation forest (Muhammad & Surbakti, 2017).

Therefore, it is important to figure out a win-win solution to manage and secure the forest area. Hence, in addition to regular patrols that prevent more encroachments, BDLHK Samarinda initiated an alternative approach, which is a land rehabilitation program that embraces the locals into the forest management activities. Such move, which is in test, aims to initially rehabilitate about 120 hectares of the degraded forest areas that have been cleared by the locals for growing agricultural crops. In the long term, the program is tailored to help transform the training forest into a model of forest conservation management through collaboration with the local communities such in developing eco-tourism in the area. Moreover, the collaboration with the local people is aligned to secure the forest area as well as improve their livelihoods (Muhammad & Surbakti, 2017).

The Initial Accomplishments

As the first step, our forest extension workers cooperated with the local governmental institutions such as village offices and sub-district offices to hold social gathering events in villages surrounding the training forest. Such events are utilised to make the locals aware on the boundaries of the conservation forest. In addition, they are also informed about the functions of forest preservation to support the environment including for water catchment and prevention of disasters such as landslides and floods. Besides informing the disastrous consequences of forest degradations, the locals are also directed to rehabilitate the degraded areas through replanting programs using forest cultivation species that also bear fruits for commercial purpose. They are also discouraged to extend the farming sites by the promotion of intensification systems using agroforestry that combines tree growing with agricultural crops (Muhammad & Surbakti, 2017).

In the short term, we managed to embrace the locals by forming forest farmer groups in each village. Through the groups, we successfully identified the name of actors that have been active in cultivating the land in the training forest and mapped the borders of land that each person squats. Such data are important for our further steps in aligning their activities into our management plan as well as for our studies in determining suitable approaches in the future. More importantly, we expect that the formation of the farmer groups could halt the coming of potential intruders from other regions as we can get more information from the locals (Muhammad & Surbakti, 2017).

Key Elements Relating to the Case Study

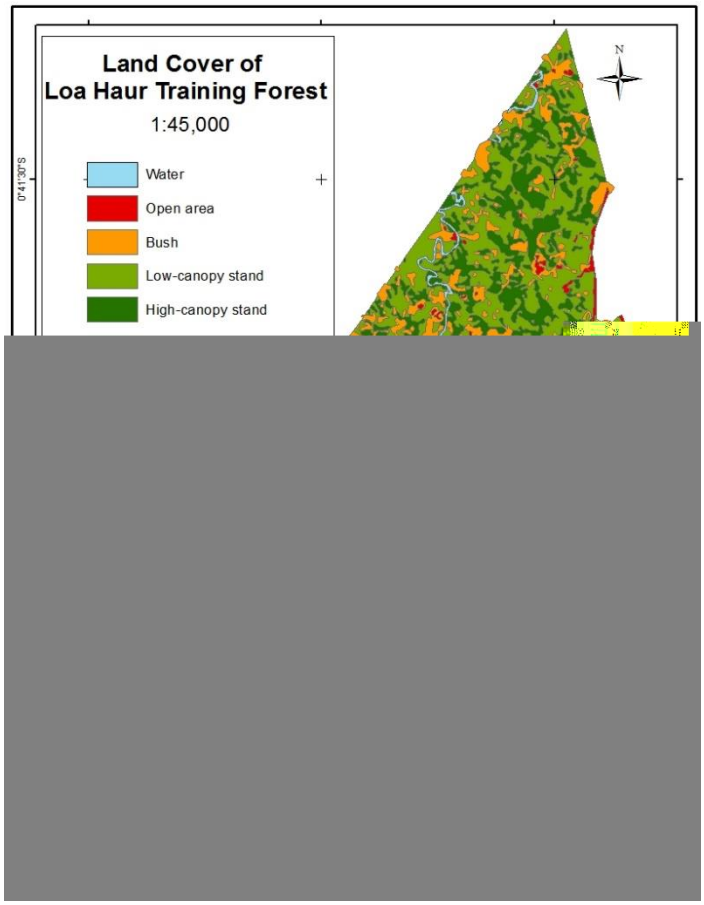
Data Collection

To get up to date data is the main challenge for the management of the training forest, especially concerning the actual land degradation in the area of 4,310 hectares. In the past, the management only relied on data sourced from the forest inventory conducted in 2009. The following table shows the data informing the percentage of different types of the area conditions.

Row Labels	Sum of Hectares	Percentage
Water	71	1.65
Low-canopy Stand	1738	40.32
High-canopy Stand	1131	26.24
Bush	1244	28.86
Open Area	126	2.93
Grand Total	4.310	100

Source: (Arpian, 2009)

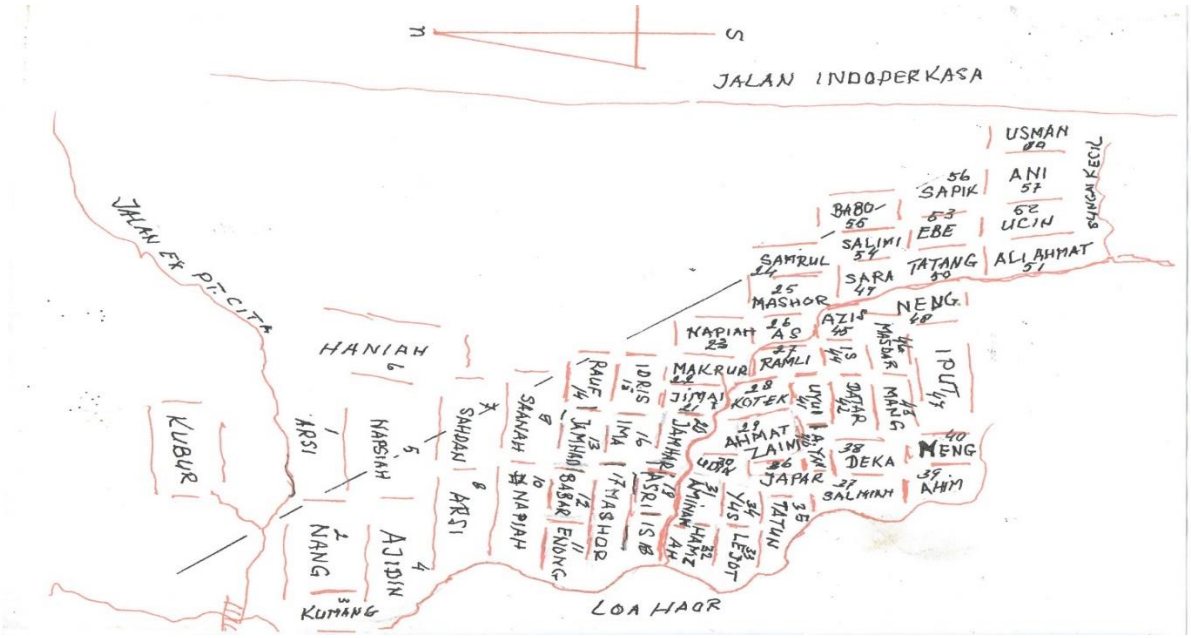
The map below illustrates the various land covers of the training forest.



Source: (Arpian, 2009)

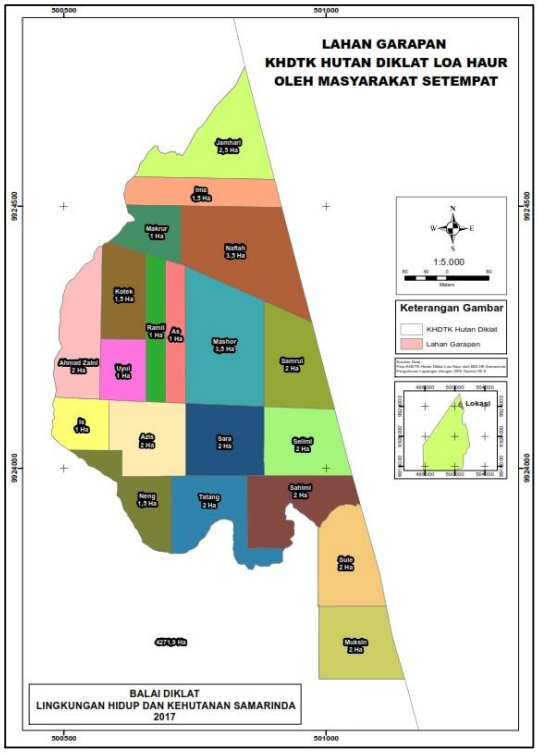
Relying on such obsolete data, however, is misleading. For example, by looking at the data above, readers may assume that no forest degradation occurs in the area as the data about the percentage of degraded forest is not clearly stated. In fact, there is no recent data to compare the coverage of the land from time to time.

The current management is now working on gathering data on forest degradation area using two approaches. The first is by assigning our forest extension workers to make a collaborative mapping on the degraded land with the forest farmer group members of villages surrounding the training forest. Based on the farmers' information, we managed to make a map picturing the pieces of degraded forest that have been cleared for agriculture as well as information about the plants they grow. The picture below shows the names of forest farmers with the locations of their plots that have been being cultivated within one of the training forest sections (Muhammad & Surbakti, 2017).



Source: (Muhammad & Surbakti, 2017)

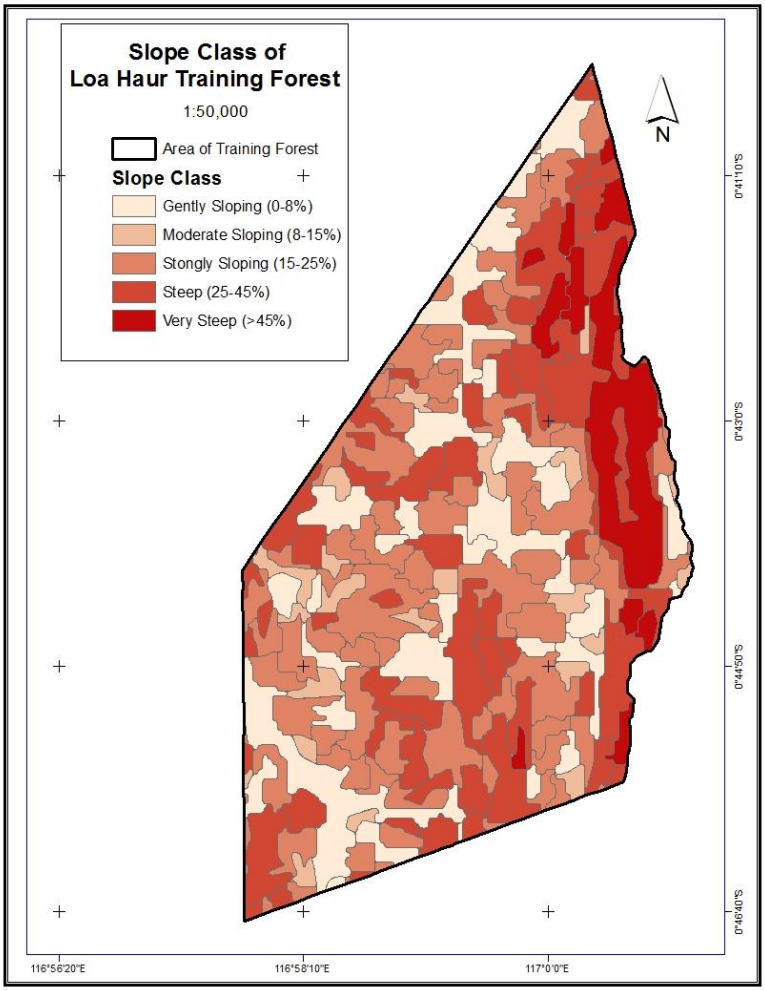
In addition of the first way, we also gathered information by cross-checking the collaborative map with the actual condition on the ground using GPS to create another enhanced map. The latter is used as our manual on developing the rehabilitation program in the future. The following picture is an example of the enhanced map as the result of cross-checking on the ground (Muhammad & Surbakti, 2017).



Source: (Muhammad & Surbakti, 2017)

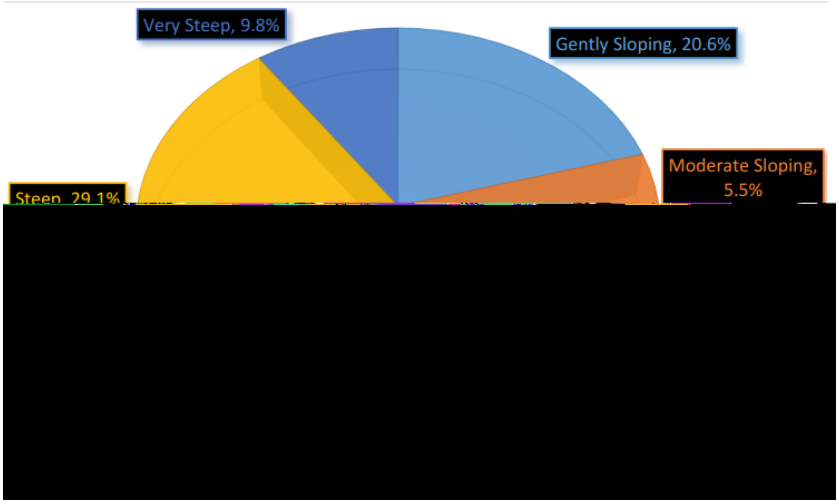
In addition, our trainer recently collected information about the elevation of the areas and created a map of topographic classes of the training forest terrains. Such map is essential for

the management to use as guidance for land rehabilitation including for what kinds of plant species should be grown to ensure the minimisation of runoffs; hence reducing land erosion and increasing water catchment in the area (Arwan, 2017). The map below depicts the slope classes of the training forest.



Source: (Arwan, 2017)

According to the data collected, the elevation levels of the training forest area are varied and distributed from gently sloping to very steep. Majority of the area is relatively steep. The details of the area's topographic conditions are shown in the pie chart below.



Source: (Arwan, 2017)

Approaches to Embrace the Locals

Another challenge is the resistance of some local people to the intervention made by the management. The people argued that they have rights for the land as their parents inhabited the area since 1960s, which was in fact long before the establishment of the area as training forest in 2002. Rather than wasting time for endless argument, our extension workers made several approaches including personal visit (so-called *Anjangsana*) to the farming sites of the defiant farmers. Persuasively, our personnel attempted to build a common goal with them: preserving the forest functions by rehabilitating degraded land that will improve their livelihoods and safety as well (Muhammad & Surbakti, 2017).

The critical aspect of such approach is the promise made to grant the people's rights to make a living in the area. Despite such tolerance is arguably controversial due to the status of the training forest as conservation area, the adjustment works to end the resistances and successfully include them in the forest rehabilitation program through forest farmer groups. In the group activities, later on, our forestry extension workers organized "on-field school programmes" that introduced and promoted agroforestry practices. One of the keys to improve the locals' participation is by listening to their aspirations concerning the rehabilitation program. One of them is by providing seedlings of popular fruits such as Durian, Lei and Rambutan to plant (Muhammad & Surbakti, 2017).

Legal Issue of the Local Community Involvement

Concerning the legal aspect, it is true that some commentators are against the idea of the project to practice agroforestry with the local people. They argue that such policy is supposedly not applied concerning the status of the training forest as a conservation area. This restriction used to make the personnel on the ground worried about the legality of the project activities.

The management, fortunately, can find the legal umbrella of the project by referring to the Ministerial Degree No.83 in 2016 on Social Forestry that enables the involvement of local communities in the management of conservation area on certain conditions. In fact, the

endorsement of the higher management level through direct supervision on the site had accelerated the formation of the forest farmer groups (Muhammad & Surbakti, 2017).

These supports are strengthened by the most recent provincial decree on critical land management. The provincial government, in fact, aims to make people concerned about their environment and natural resource conservation. The latest regulation stipulates that the improvement of local communities' prosperity and participation in land rehabilitation is one of the objectives of forest rehabilitation and critical land utilization in the province. Hence, our program objective is in accordance with the provincial administration objectives that include the training forest area into its regional development plan for the land emissions reduction program- also known as REDD+ (Reducing Emissions from Deforestation and Forest Degradation) scheme (Regional Climate Change Council of East Kalimantan, 2016).

Collaborations to Seek Extra Funding

Besides the existing supports, financial issue is still hampering the progress of the project due to limited budged allocated for the training forest. Consequently, the rehabilitation activities would be completed gradually in a relatively long time. Our forestry extension workers, for example, have to wait for some time before the funding can be received from the state budget (Muhammad & Surbakti, 2017).

To deal with the limitation, the management often collaborates with other institutions to accelerate forest rehabilitation in the area. The cooperation with Mahakam- Berau Watershed Management Office, for instance, was conducted in providing seedlings for revegetation of riparian zones within the training forest. Our extension workers often co-manage the "on-field school programmes" with other extension workers from agriculture regional service. One notable effort was done with the formulation of a proposal to seek extra funding from Alumni Grant Scheme, which is an Australia-Indonesia cooperation. Other than those mentioned above, our extension workers often do the "*Anjangsana*"- the personal approach to local communities- using their own money (Muhammad & Surbakti, 2017).

Currently, the management fully supports the project despite the condition of the little budget for the degraded land rehabilitation program. The personnel on the ground are also seeking extra funding through collaborations with other institutions and proposals to funding organizations to accelerate the process. However, sustainability of the project is still in question concerning the existing limitations and possible changes of the management in the future that might revise the long term objective of the training forest management.

Lessons Learnt

Benefits of the Forest Farmer Group

The formation of the forest farmer groups has marked one of the short term objectives of the project achievement. By doing so, the management at the present has comprehensive understanding about the underlying problem of forest degradation in the training forest since our personnel can be freely moving among the local actors to seek information about their activities. This investigative activity gave the management insights into the real motive and

economic condition of the actors on the ground. For instance, it is now understood that the local people are mostly utilizing the land for basic needs and are willing to cooperate with the management to rehabilitate the degraded areas. Hence, the old paradigm of strict law enforcement, such as removing them out of the area by force, could be counterproductive to the objectives of the project (Muhammad & Surbakti, 2017).

Such achievement is indicated by the willingness of the group members to allocate their time to attend monthly meetings arranged with the management. The people also admitted the condition of the land they have cultivated. In fact, they also accompanied our personnel in field trips in order to check the condition of the degraded land (Muhammad & Surbakti, 2017).

This harmony is the positive result of our approach to build trust with the locals since the initiation process of communication prior to the formation of the forest farmer groups. According to our forestry extension workers, there are two keys to achieve the desired condition on the ground. They include consistency and intensity of channeling the project objectives to the target groups and local government institutions (Muhammad & Surbakti, 2017).

Special Strategies by Forestry Extension Workers

Our on-site personnel emphasize that the locals need to be positioned as partners in the project; hence they deserve comprehensive information about the project from the beginning as well as its future development. Therefore, all messages conveyed by our personnel were delivered consistently to all members in the community, both institutional and individual. In addition, the frequency of meetings with the actors was increased and conducted intensely at least twice a week. Such enhanced communication were also designed to be targeted in order to ensure that all actors have clear pictures about the project. By doing so, we managed to gradually build and maintain mutual trust with the people (Muhammad & Surbakti, 2017).

To insert assumingly unpopular ideas to the group members, our personnel managed to figure out a specific strategy. For example, in directing the group members to the management's position, we prefer not to propose such ideas during group meetings. Instead, our personnel tried to discover what people think about such ideas in advance. By "testing the water" first, we could predict the possible resistance and make anticipation. Similarly, we opt to collect any ideas from the communities in the group meetings, despite the existing restrictions, instead of arguing with them during the group meetings (Muhammad & Surbakti, 2017).

Taking the example of what tree types should be planted, the locals were initially unwelcoming the idea to include native species such as *Shore* sp. and *Dryobalanops* sp., which are not fruit bearing species as they favour. In solving this issue, our forest extension workers occasionally made special meetings in advance with influential persons in the community to convince them about the policy. Those influencing people include former heads of the villages, heads of neighbourhood associations, and other dominant speakers during the group meetings. Concerning the social characteristic of the people, our personnel found that other members tend to be aligned with their stance. Therefore, such special approach for seeking agreement is the key for this initial accomplishment (Muhammad & Surbakti, 2017).

The Maintenance of the Collaborations

The agreement is critical as it enabled the next step of the project to proceed, which is an intervention to plant around 120 hectares of the farming plots occupied by the group members with forestry species. By including the forestry species in the program, the management could collaborate with Mahakam-Berau Watershed Management Office that requires the planting of those tree species. The inking of the collaboration accelerated the planting program since the partner institution not only donates the seedlings but also helps manage the revegetation program. The cooperation among these governmental institutions with the locals is another accomplishment for the short-term objective of the project (Muhammad & Surbakti, 2017).

The active participation of the group members in the planting program indicates the prospective positive results of the project. This expected response was sought by determining the technical aspects carefully such as suitable spacing that makes it possible to mix the tree seedlings with seasonal plants in each plot of the farmers. In addition, the guidance to choose shade-tolerant agriculture plants is essential to keep their livelihoods. On one hand, the members can expect some short-term incomes from agricultural crops. On the other hand, the growing saplings could minimise land erosion and enhance water catchment in the area not to mention the fruits that can be marketed in the coming years (Muhammad & Surbakti, 2017).

Besides the short-term accomplishments, the management always monitors the maintenance efforts of the program. They include providing assistance for the group members such as free seeds and trainings for achieving the long term objective. By doing so, it is expected that within less than a decade, the management could successfully partner with the group members in rehabilitating the degraded land in creative ways. Such ambition would be achieved through the reformation of all the degraded land plots into fruit gardens and the provision of eco-tourism facilities near the training forest campus in order to attract visitors as well as to market the produce of the farmer group members. As the ultimate goal, the management also sets to establish the project area as an example of land rehabilitation management in the region of Kalimantan that will be utilised in the future for training and education purposes (Muhammad & Surbakti, 2017).

The Way Forward

Carbon Accounting Project

Concerning the recent country's policy at the national level that has ratified the Land Degradation Neutrality (LDN) commitment, the objective of such land rehabilitation project should be improved to support the country's realisation of land rehabilitation acceleration before 2030. In fulfilling the indicators required in the LDN scheme, the management also needs to include carbon calculation activities as another rehabilitation indicator in addition to the productivity of the land and the increase of tree canopy coverage.

In doing so, the management recently endorsed the formulation of a new project proposal titled: "Kalimantan *Loa Haur* Training Forest: A model for climate change mitigation by promoting local community involvement and environmental education". This project is

designed by trainers and forest extension workers of BDLHK Samarinda to complement the ongoing land rehabilitation program in the training forest by preparing activities to measure the baseline of carbon stored in the degraded area. The management expects that the rehabilitation efforts would at the end increase the number of carbon stored below and above the rehabilitated ground. Therefore, the act of measuring the carbon changes is important to be documented.

Similar to the ultimate goal of the program, this complementing project also aims to provide a source of study for education and training, which is in this case is setting a learning ground for promoting REDD+ (Reducing Emissions from Deforestation and Forest Degradation) activity as a climate change mitigation activity in forestry sector of East Kalimantan. By doing so, the management is also supporting the GHGs emission reduction ambition of East Kalimantan province as the area of the training forest has been officially included as one of the province's climate change mitigation activities (Regional Climate Change Council of East Kalimantan, 2016).

Developing beyond the Trees

Concerning the deficiency of data on the training forest, the management can now expect to generate both up-to-date data and new kinds of data. In addition to the data on forest degradation, other data can be possibly documented during the process such as carbon accounting, social economy data of the forest farmer group members, or fauna inventory in the forest area which is still less recognised. Yet, the latter could be possibly regarded as an extra value to attract visitors to the area of the future eco-tourism.

To minimise the cost for those activities, the management could direct some employees now continuing their higher education on scholarship programs to do research in the training forest. Moreover, the management could also encourage other parties to participate in studies of the training forest by providing facilities for the research such as the training forest campus. Those parties include students from the regional universities or researchers both domestic and international to conduct studies in the forest area with special supervision and facilitation from the management.

Summary

This program that embraces the locals to co-manage the forest conservation area could be regarded as an effective way to reduce forest degrading activities and increase tree density in the degraded area. In fact, it is now deemed important to the creating and strengthening the local institution such as the forest farmer groups in order to possibly stop the acts of illegal land clearing as well as securing the area of the training forest. Such intervention is believed to be contributing to the reportedly decreasing number of intruders into the training forest area. Therefore, the approach of the project should be worth testing for a longer period to come in order to decrease forest degradation cases caused by such perpetrators.

Since the rate of forest degradation is increasing nationwide, we expect that the outcome of the program would realise the training forest to become a model of land rehabilitation

management that not only could compensate carbon emissions occurred in other places but also tests the implementation of policy that involves local communities in the management of forest conservation area. As a testing ground, the process should be well documented to enable replication of the approaches applied in this project to other similar projects elsewhere in the future. Likewise, the results should be also made in a balanced report elaborating the strengths and weaknesses of the project in order to make public aware of the lessons learned; hence, encouraging evaluative thinking for further improvement of such land rehabilitation policy.

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Forest Rehabilitation and Management in Lao PDR

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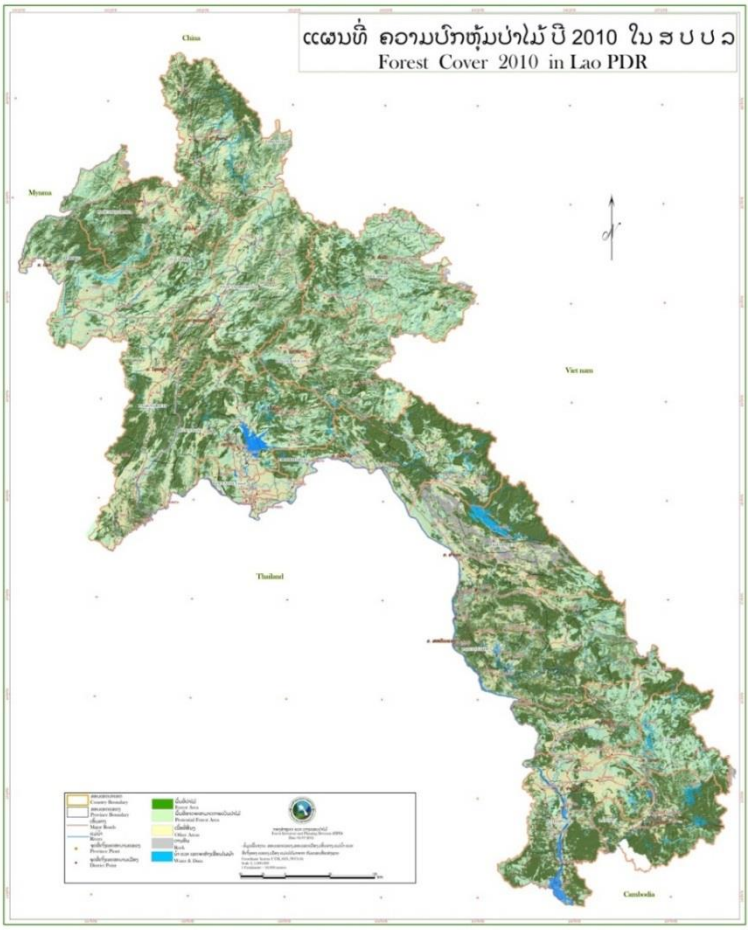
Introduction

Forest Situation



Lao PDR is the land lock country which has beauty and wealthy of Natural resources. In total area 23.68 million ha of Lao PDR, the Forest land covers approximately 17.81 million ha across the country while other land is 5.87 million ha. According to Lao forest cover assessment in 2010, there are three criteria for considering forest area. The first criterion is canopy cover density is over 20%. Second, the area is over 0.5 hectares and the height of tree is over 5 meters. Based on the Lao criteria, therefore, the forest Land (canopy cover density>20%) is 9.54 million ha, Potential forest land is 8.27 million ha and other land is 5.87 million ha. However, in term of forest restoration and rehabilitation, Lao PDR has large potential land to be regenerate into forest land in the near future.

Forest Management System

- According to Lao forest law (2007), in term of forest management, forest land has been divided into 3 types of forest land. These types of forest land include National Protection Areas which cover 7.54 million ha, National Protected Areas cover 3.84 million ha and National Production Areas cover 3.10 million ha.

Protection Forests

Protective forests are forests and forest lands classified for the purpose of the protection of watershed areas and prevention of soil erosion. They also include areas of forestland with national security significance, areas for protecting against natural disasters and areas for the protection of the environment. The target for the protective forest management system is to establish 8.2 million ha of protective forests in Lao PDR.

Protected Forests

Conservation forests are forests and forest lands classified for the purpose of protecting and conserving animal and plant species, natural habitats and various other entities of historical, cultural, tourism, environmental, educational or scientific value. As part of efforts to conserve its forest resources and biodiversity, Lao PDR established a **National Protected Area (NPA) system** designed to preserve natural resources, and protect nature and preserve the natural landscape. To date, about 4.7 million ha (22% of the land area) is classified as conservation forests including the NPAs, as well as provincial and district conservation forests. Logging, collecting forest products, excavation, mining, expansion of shifting cultivation areas, burning and activities that degrade the environment are prohibited on these areas. There are a number of relevant measures which are mentioned within the Forest Strategy 2020 which address improving the management and legal framework for conservation forests. These include developing controls and regulations for the protection of forest genetic resources and intellectual property rights, improved financing for conservation areas, improve regulations and guidelines for the promotion of eco-tourism, Increase NPA staff management capacity, controlling wildlife trade, enhancing education and public awareness on conservation and strengthening research for better decision making and management of plant and wildlife resources.

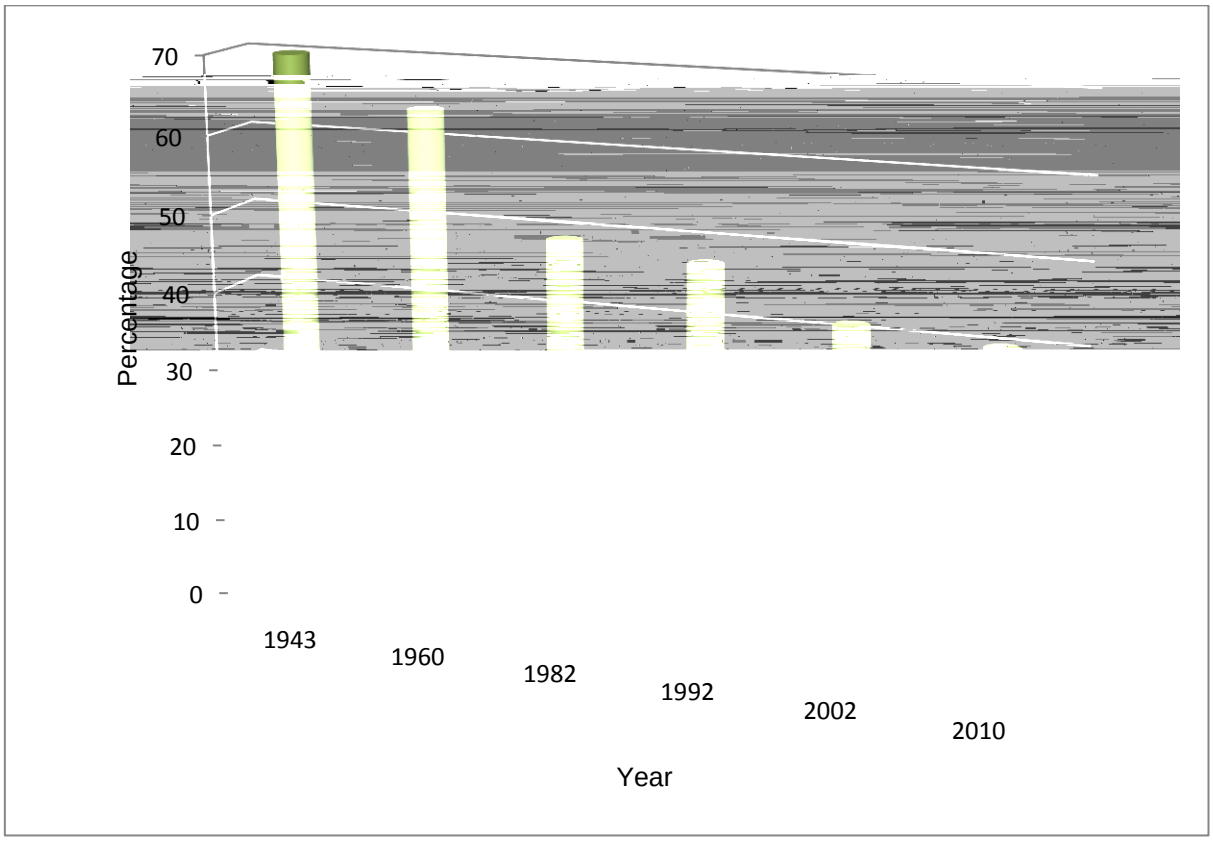
Production Forests

Production forests area forests and forestlands used regularly in providing timber and other forests products on a sustainable basis for national economic and social development requirements and for people’s livelihoods without any significant negative impact on the environment. About 3.1 million ha is classified as production forests, and 656,357 ha have sustainable forest management plans. Current efforts for promoting sustainable forest management include building capacity at all levels of government (Central, provincial, district an village), improve quality through systematic data collection on different species, forest types and ecological conditions, implement law enforcement and compliance and monitoring and controlling operations which enhance sustainable forest management. The next section provides more specific information related to general sustainable management of forests in Lao PDR

Forest Trend in Lao PDR

Forest Cover

According to the final report, forest covered 40 percent of the total land area. Between 2002 and 2010 the Ministry of Agriculture and Forestry undertook the Forest Cover and Land Use Changes Assessment 2002-2010 throughout the country. The results showed that total forest area was 17.81 million ha, out of which, current forests with a canopy density of 20% and above, amounted to 9.54 million ha (40% of land area) which illustrated the deforestation trend over that decade and Potential forest 8.27 million ha (35% of Land area) and other land was 5.87 million ha (25% of total area). In addition the study also reported that forest quality had deteriorated, however, shifting cultivation areas within the country are generally decreasing from 2.6% in 1992, to 2.2% in 2002 (DoF, 2010).



Forest Degradation Cause

Loss of forests in Laos took place due to a combination of several factors such as slash-and-burn agriculture, uncontrolled fire, frequently caused by shifting cultivators, infrastructure development such as dams, roads, urban, industry, and mining as well as clearing of land for permanent agriculture, and logging. The causes responsible for deforestation include the increase in population, the second Indochina War from 1954 to 1974 (1/4 of the country was affected by American bombardments), as well as external factors such as the high demand for wood and NTFP in the inter-national markets. The lack of clear regulations and enforcement mechanisms, the absence of land use planning and land management systems including sustainable forest management and planning also contributed to forest degradation

Improving Tree Plantation Profitability

Improving Tree Growing Technology

- Conduct applied, adaptive research on species (including seed and nursery requirements and the use of indigenous species), species/site matching, harvesting, thinning and coppicing methods, site and soil preparation, fertilization programs and post-plantation management
- Make research results available to PAFO and DAFO and then to potential growers. This would entail assisting DAFO in developing adequate capacity for the task
- Provide tree plantation owners, especially teak plantation owners in the north, with skills to select seed, plant at the correct density, thin and prune stands for quality improvement and increased sale price.

Securing Better Prices

- Carry out market research to study conditions under which plantation products are sold, how qualities are defined and checked and how prices, premiums and discounts are set.
- Develop and promote processing technology of small-diameter plantation trees

Improving Legal and Regulatory Framework

- Establish procedures respecting customary land and forest use by local people or compensating for losses upon development of commercial tree plantations
- Simplify regulations concerning all aspects of tree plantation management from planting to harvesting, transporting and exporting
- Establish procedures to convert temporary land use certificates to long term rights (land titles) without undue burden on small holders
- Prepare for large scale plantation investments both national and international partly boosted by Clean Development Mechanism (CDM) in terms of environmental safeguard and harmonization with local use

Improving Funding and Incentives

- Promote agro-forestry at household level to generate continuous income flow.
- Review existing loan schemes for tree plantation, especially those for smallholders, in terms of financial feasibility, sustainability, justification for subsidy, etc
- Explore ways and means to support smallholder tree plantations by reviewing trials in progress including the Profit Sharing System (PSS)

Marketing Development

- Provide information sharing regarding the wood prices in domestic and international markets.

Harvest/Logging Plans and Royalties

Shift from National Harvest/Logging Plan Setting to Management Plan-Based Harvesting

- Shift from the national harvest/logging plan setting and allocation to bottom-up setting of harvest levels based on management plans in accordance with Production Forest establishment.
- Publicise PFA management and operation plans so that wood processing factories can prepare long term investment plans

Improvement of Royalty Setting

- Improve royalty setting formula to reflect international market prices
- Establish an equitable benefit sharing and cost covering scheme to complement efficient royalty setting

Improvement of Royalty Collection

- Review current royalty collection systems and systems for collection of other taxes and fees payable to the central treasury, e.g. in terms of local and central responsibilities, to improve collection rates

Improvement of Log Sales System

- Resume piloting of bidding whilst strengthening institutional and staff capacity for national implementation.

Wood Processing Industry (WPI)

Simplifying Processes for Factory Operation

- Instigate dialogue between MAF, MOIH, MOF and FIMC to simplify administrative processes for establishment and operation of wood processing factories
- Increase transparency by providing criteria and responsibilities for decision making with respect to business permits, operational issues and so on.
- Rationalize existing sawmills and wood based factories so that operation are more efficient and match sustainable wood harvesting regimes

Comprehensive Approach for Reduction of Processing Capacity

- Publicise criteria for selection of factories to continue operation
- Pilot competitive log sales and undertake institutional strengthening for nation-wide introduction
- Improve law enforcement and governance regarding logging and log supply to factories, including cancellation of operation permits for factories that process unauthorized logs.

Improving Efficiency in Wood Processing

- Strictly implement regulations, rules and technical guidelines for tree marking, felling, logging, grading and log sales contracts

- Introduce tax incentives for installation of secondary or tertiary processing machinery and provision of appropriate training
- Consider development of a network on forest and wood export to promote forest management certification and optimize the market benefits available to certified forest products

Further Promotion of Export of Finished and Semi-finished Products

- Strictly implement the log export ban and restrictions on sawn timber export
- Transfer remaining wood products from the Temporary Exclusion List to the Inclusion List and reduce tariff rates to 20% under the AFTA/CEPT scheme to stimulate exports
- Temporarily and restrictively relax the ban on foreign investment in secondary wood processing using natural wood
- Introduce tax incentives for installation of timber drying kilns
- Improve skills of wood processing workers by provision of vocational training

Forest Rehabilitation and Management in Lao PDR

Main activities of Promotion Forest Plantation and Investment Division

In term of Government side work on forest rehabilitation and restoration, the responsibility is directly in Promotion Forest Plantation and Investment Division, Department of Forestry, Ministry of Agriculture and Forestry, Lao PDR. According to the year report of forest rehabilitation and management work during 1975 to 2016, it shows impressive outcome such as 111 source of seed areas were identified out of which 89 areas has been certified, Seed has been harvested 1,133,910 kg in 2015, Seedling production is 629,941,160 seedling, Tree plantation area is 428,709 ha.

Many tree species are promoted such as Teak, Aloewood, Rubber and Eucalyptus and indigenous species. Forest Reforestation and Rehabilitation has covered 2,649,877 ha.

In term of company investment in tree plantation, the total company investment is Rubber and Eucalyptus tree plantations which are 220 companies. Almost 60% are foreigner companies. Total concession Area 482,495 ha

Financing of Forest Rehabilitation and Management

The main sources of funding for forest restoration in Lao PDR are the government (currently the forest development fund and the environmental conservation fund), international donors, NGOs as well as the private sector. The Lao government is now implementing some of the major projects by using resources of the forest development fund that aim to sustain forest resources as well as to improve rural livelihood. In addition, the environmental conservation fund created in early 2006 will provide also components for environmental research (including research on forests) in the near future.

International funding sources are currently still the main financial support for forest research, development, management and restoration/rehabilitation of forests in the country. Table 8 provides information on the financial sources from international organizations practicing forest conservation activities in the country. In addition, there is still some support for forest conservation activities including research from national and international private sector companies.

Some Challenges

The Lao population and economy are rapid growing. The need of land for living and cultivation are also increase. Therefore, land conversion issue is main cause to be considered as critical issue which has to be address. Forest land has been converted to permanent agriculture land throughout country.

People especially local people's understanding and awareness related to tree plantation and forest rehabilitation and restoration is one of difficult issue to address. It requires much budget and time to raise the people's understanding about benefit of tree plantation and community forest management. However, there are many attempt of project to promote tree plantation and forest restoration as pilot project to show the benefit in reality.

Law enforcement is vital issue that has to be address along together with people's understanding and awareness related to forest restoration and rehabilitation benefit. Laws and regulations related to forest management has numerous but they has not been completely interpreted to local people. Lao government is emphasizing to this issue to support forest restoration and rehabilitation work.

To promote community forest management, it requires regulation that allows community to have right to management the forest in the village. Recently, there is no regulation related to Community land tuner for tree plantation area.

One of incentive of tree plantation is land tax exclusion. In practicing, there is unclear regulation related directly to Land tax exclusion which benefit directly to owner of the land who plant the tree and management tree.

The Way Forward

Some solutions for addressing the issues are identified as below:

1. Increase people understanding on tree planting and forest restoration and rehabilitation benefit

2. Encroachment of new decree on commercial tree plantation and environment protection

3. Enhancement Law enforcement

4. Encourage forest village management implementation

5. Finding other source of fund to support management and rehabilitation works

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Sustainable Forest Management (SFM): The Outlook of Forestry Sector in Peninsular Malaysia

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Abstract: Peninsular Malaysia is fortunate to be endowed with large tract of rich tropical rainforests. These forests are very essential and contribute significantly to the environmental protection and livelihood of the people. In this context, Forestry Department Peninsular Malaysia (FDPM) has set aside sufficient forest areas and gazetted them as Permanent Reserved Forests (PRFs) of which are managed under the Sustainable Forest Management (SFM) practices for the benefits of present and future generations. As a developing country, Malaysia undergoes rapid changes and development in the exploration and opening of forest areas for the socio-economic and well-being of the country, particularly within the Peninsular Malaysia region. This trend causes a transition in forestry sector, in special regards to its focus, priority and concerns in relation to the natural forest resource management. This paper highlights the forestry sector in Peninsular Malaysia in relation to Sustainable Forest Management (SFM) practices. It also describes the current status of forest resources, forest management, forestry industry and conservation initiatives of forestry sector in Peninsular Malaysia.

Keywords: Peninsular Malaysia, Sustainable Forest Management (SFM), Permanent Reserved Forests (PRFs), forest biodiversity, conservation

Introduction

The tropical rainforest, which has evolved over millions of years, is one of the most dynamic biological ecosystems on earth. It is dubbed as “Earth Lung” as almost 70% of oxygen in the atmosphere comes from the tropical rainforest through the process of plant photosynthesis. The tropical rainforests in Malaysia are mega-depository and storage of forest biological diversity, of which include genetic resources, offering diverse sets of ecosystems for plants, animals and micro-organisms. With such richness, Malaysia is known as one of the top twelve mega-diverse countries in the world. The flora diversity in the country is not absolutely known but nonetheless is exceptionally rich. The flowering plants in Malaysia are conservatively estimated about 15,000 species, where 26% of tree species are highly endemic. Lower plants such as ferns and fern-allies are also recorded at about 2,012 species, whereas fungi and mosses each constituted of 4,000 species and 552 species respectively. Fauna diversity in Malaysia is also relatively high. There are about 306 species of mammals, 742 species of birds, 567 species of reptiles, 242 species of amphibians, 1,619 species of marine

fish, 449 species of fresh water fish and 150,000 species of invertebrates recorded across the country. To date, Malaysia has a large tract of tropical rainforests covering about 18.27 million ha (55%) of the total land area 33.04 million ha. Approximately 14.55 million ha of natural forests are gazetted as Permanent Reserved Forests (PRFs) or Permanent Forest Estates (PFEs) that are fully subscribed to Sustainable Forest Management (SFM) practices. Meanwhile, the remaining forested areas are State Land Forests (1.86 million ha), that are the land banks designated for development purposes; and Total Protected Areas (1.86 million ha) specially allocated for conservation purposes in the form of national parks, wildlife sanctuaries and nature reserves.

Coupled by the need to conserve this natural heritage, Malaysia has ratified Conservation on Biological Diversity (CBD) in 1994 and developed the first version of National Policy on Biological Diversity (NPBD) in 1998, which was subsequently updated in 2016 to produce the second version of NPBD. Alongside its obligation under CBD, Malaysia has always been integrating biodiversity conservation as an integral part of sustainable development and social-economic advancement. This paper highlights the forestry sector in Peninsular Malaysia with regards to Sustainable Forest Management (SFM) practices. It also describes the current status of forest resources, forest management, forestry industry, conservation initiatives, issues and challenges, as well as the way forward of forestry sector with special reference to Peninsular Malaysia.

An Overview of Forest Resources in Peninsular Malaysia

Setting the Scene

Under the Malaysian Constitution, forestry comes under the jurisdiction of the respective State Governments. Each 13 States in Malaysia is empowered to enact laws on forestry and to formulate forestry policy independently. On the other hand, the executive authority of the Federal Government only extends to the provision of advice and technical assistance to the States, that covers the aspects of empowerment and trainings; research, development and innovation (RD&I); as well as the maintenance of experimental and demonstration sites. Consequently, three separate bodies have determined Malaysia's forestry policy, namely (a) Forestry Department Peninsular Malaysia (FDPM); (b) Sabah Forestry Department; and (c) Forest Department Sarawak. Nevertheless, the implementation of forest policies and programmes are coordinated and synchronized by the National Land Council (NLC). The NLC also serves as a platform for the Federal Government and State Governments to resolve common concerns and issues related to the administration, management and development of forest resources.

Blessed with vast arrays of ecosystems, the tropical rainforests of Peninsular Malaysia constitute the core of biodiversity resources in Malaysia. About 44% (5.80 million ha) of the total land area of Peninsular Malaysia (13.18 million ha) are forested area. This forest cover is inclusive of various forest habitats ranging from Mangrove Forest from 0-50 meter above sea level (2%), Peat Swamp Forest from 50 to 200 meter above sea level (5%) and Dry Inland Forest more than 200 meter above sea level (93%). The forest cover in Peninsular Malaysia is

divided into three categories, namely Permanent Reserved Forest (PRFs); State Land/Alienated Land; and National Park/Wildlife and Bird Sanctuary. The largest portion of forest cover in Peninsular Malaysia is contributed by the PRFs with a total area of 4.92 million ha (85%), followed by National Park/Wildlife and Bird Sanctuary with an area of 0.59 million ha (10%) and State Land/Alienated Land of 0.28 million ha (5%) (Figure 1).

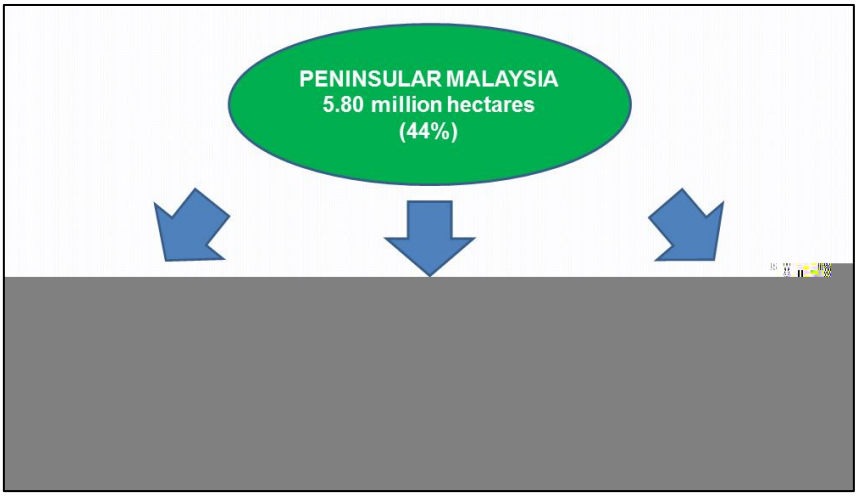

Figure 1: The total forest cover in Peninsular Malaysia

The PRFs in Peninsular Malaysia are governed and gazetted under the National Forestry Act 1984 (Amended 1993), and are managed prudently under Sustainable Forest Management (SFM) practices. Being the custodian of the PRFs, FDPM has further classified the PRFs into Production Forest and Protection Forest in accordance with Section 10(1) of National Forestry Act. As in 2015, there are approximately 3.01 million ha of PRFs designated as Production Forest under the classification of Timber Production Forest Under Sustained Yield. The Production Forest is managed sustainably to ensure supply of marketable timber and logs for both domestic and international markets are in perpetuity to generate viable socio-economic growth. Meanwhile, the Protection Forest, which encompasses of 1.91 million ha, are constituted of the following 11 functional classes:

i. Soil Protection Forest
ii. Flood Control Forest
iii. Water Catchment Forest
iv. Forest Sanctuary for Wildlife
v. Virgin Jungle Reserved Forest
vi. Amenity Forest
vii. Education Forest
viii. Research Forest
ix. Forest for Federal Purposes
x. Soil Reclamation
xi. State Park Forest

The Protection Forest within the PRFs is set aside to ensure and upkeep favourable climatic and physical conditions for well-being of life. It also simultaneously safeguards the environment and conserve forest biodiversity.

Sustainable Forest Management (SFM)

Sustainable Forest Management (SFM) has been defined by the International Tropical Timber Organization (ITTO) as followings:

> *the process of managing forests to achieve one or more clearly specified objectives of management with regard to the production of continuous flow of desired forest products and services, without undue reduction of its inherent values and future productivity and without undue desirable effects on physical and social environment.*

The SFM is also known as "the stewardship and use of forests and forest land in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfil now and in the future, relevant ecological, economic and social functions, at local, national and global levels and does not cause damage to other ecosystems". The SFM concept balances between conservation of environment, viability of economics as well as protection of social and culture, thus sustaining forest resources for the welfare of people. The three pillars of SFM are a powerful tool for defining the concept of sustainability in forestry sector. The pillars are: (a) economically viable; (b) environmentally sound; and (c) socially accepted. The economic aspect of SFM aims to maximize income while maintaining a constant or increasing stock of forest resources and creating job opportunities without compromising the integrity of forest ecosystems and the livelihood of communities. The essence of the environmental aspect under SFM focuses on maintaining resilience and robustness of biological and physical systems of forest whilst ensuring its productivity, adaptability and capability for natural renewal or processes. Within the social context, the SFM recognizes and supports people's evolving sense of well-being which includes (and not limited to) the basic needs of life but also the eccentric values (a sense of connection with nature, and provision of goods and services), not only for the current but also for the future generation. It also addresses the need to manage forest lands and resources sustainably to meet the social, economic, ecological, cultural, and spiritual needs of people. The three pillars of SFM are highly dependent and interrelated to one another. Failing in striking a good balance between the three core areas of SFM would result to unsustainability of forest resource management and affect the intactness of forest ecosystems.

Forest Management: the Trend and Development

Historical Perspective of Forest Management

The evolution of forest management in Peninsular Malaysia has started in the early 20th century, whereby a systematic and sustainable yield policy was placed of great emphasis, particularly since the establishment of Forestry Department in 1901. The forest management of the early days was economic oriented, highly driven by market demand for timber and

other profitable forest products. During the era of *Gutta percha* in 1900 – 1910, timber harvesting was carried out solely focusing on high value timbers such as *Neobalanocarpus heimii* (Chengal) and *Shorea* spp. (Balau). The preferred tree species for enrichment planting and silvicultural treatment during the said era were *Palaqium* spp. (Taban), *Gutta percha* (rubber), *Neobalanocarpus heimii* (Chengal) and *Shorea* spp. (Balau). In year 1911 – 1922, an improved felling system was implemented by emphasizing Taban tree management for rubber production (*Gutta percha*) and removing of inferior tree species that compete with the high value timber trees species. In subsequently years, Departmental Regeneration Improvement Felling (DRIF) system was introduced with the aim of promoting natural growth of heavy hardwood and light hardwood tree species only. In 1948, DRIF was then replaced with Malayan Uniform System (MUS) because of the increasing demand for raw material. Under MUS, all mature tree species measuring 45cm diameter at breast height (DBH) were harvested in one single felling. After harvesting activities, non-commercial tree species were poisoned to pave way for natural regeneration of selected saplings and seedlings of superior tree species. As a result, the forest stand was more or less even-aged and the commercial tree species were highly abundant within the forest areas. Nevertheless, MUS was deemed applicable only on lowland dipterocarp forests and not the hill dipterocarp forests. The said forest management was then replaced by Selective Management System (SMS) in 1978 to allow for a more flexible timber harvesting regime, by taking into account the need to protect the environment and tapping onto the demand of the timber market.

Malaysian Criteria and Indicators for Forest Management Certification (Natural Forest) [MC&I (Natural Forest)]

The increasing demand for timber and timber products that are produced legally and from sustainably managed sources by the international market, and the need for them to be certified by independent third party assessors through recognized timber certification schemes have pushed FDPM to initiate independent third party forest management certification in 1998. As a member of the International Tropical Timber Organization (ITTO), Malaysia is fully committed to the achievement of SFM practices. With regards to this, Malaysia has taken several measures to implement the ITTO guidelines for the sustainable management of natural tropical forests and its criteria for the measurement of sustainable tropical forest management through the implementation of Malaysian Criteria and Indicators for Forest Management Certification (Natural Forest) [MC&I (Natural Forest)]. The MC&I (Natural Forest) deliberates the criteria and indicators to assess designated forest management units (FMUs) for the purpose of certification. The elaboration of the requirements is structured around nine principles, 47 criteria, 97 indicators and 307 verifiers. The MC&I (Natural Forest) came into force on 1 July 2012 and became mandatory beginning 1 June 2013. To date, six Forest Management Units (FMUs) covering 3.81 million ha of the PRFs have been certified under MC&I (Natural Forest) by the Malaysian Timber Certification Council (MTCC). It is important to note that FDPM participates the forest certification under MC&I (Natural Forest) solely on voluntary basis. Therefore, it requires high commitment from FDPM and the State Forestry Departments in Peninsular Malaysia to safeguard, protect and maintain national

forest resources, particularly the PRFs under the Sustainable Forest Management practices to meet the market demand and also for the benefits of the present and future generations.

Forest Beyond Timbers

Malaysia, like many countries around the world, is working hard to find ways to use its forests for community benefit within the constraints imposed by ecological processes and ensuring that future options are not foreclosed. In this regards, FDPM is fully aware of the need to manage the forest effectively from single use of sustained supply of timber to multiple-use of forestry including maintaining of the environmental stability. Following this, FDPM embraces "Forest Beyond Timbers" concept as the ultimatum in managing the forest resources within the PRFs. The multiple-use forest management is considered as a preferable alternative as opposed to single-use (generally timber-dominant) management models. It is the management of land or forest for more than one purpose, such as wood production, water quality, wildlife, recreation, aesthetics, or clean air and many other relevant services(Figure 2).

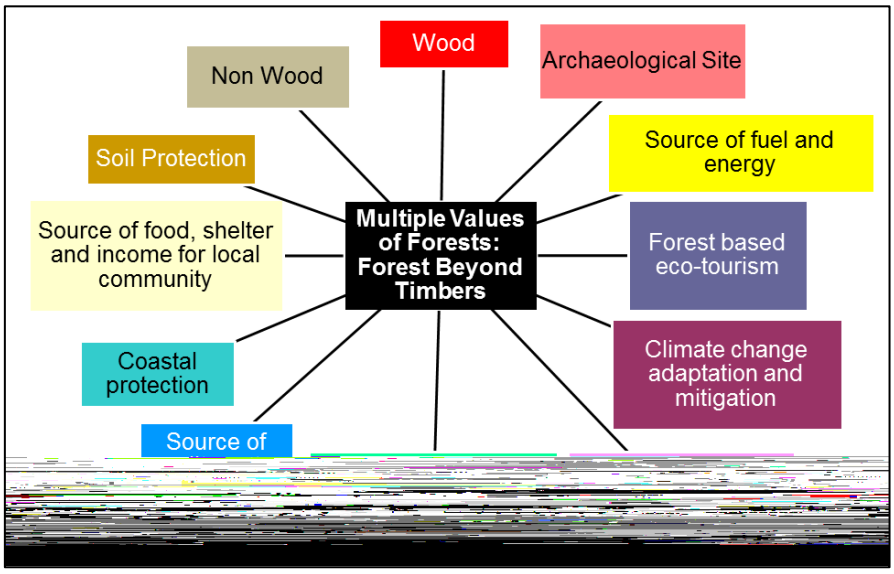

Figure 2: The multiple values of forests with regards to Forest Beyond Timbers concept

The forest sector has gone through substantial evolution over the past 30 or 40 years, from timber-driven market to production of non-timber forest products (NTFP) and sustainable forest resource through conservation approach. The sectoral trends such as timber supply source, management philosophy, management regulations and conservation approach in the forestry industry are all inextricably tied to sustainability and ethical concerns. Alongside this evolution of forestry sector, there is also growing consensus on the need for holistic solutions that integrate production and conservation efforts at a landscape scale and mechanisms like certification processes that provide transparency through supply chains to consumers on the underlying source of wood products. The evolution in the forestry sector also recognizes the need to ensure the sustainability of various forest ecosystem services for the protection of environment and well-being of the people. Nevertheless, it is noted that paradigm shift is highly perquisite not only just among the foresters, but also the stakeholders, policy makers and general public in order to scale-up the "forest beyond timbers" concept.

wood-based industry, where 79.2% of them were Malaysian (22,699 people) and 20.8% were foreign works (5,968 people). About 80.6% of the workers were male employees and the remaining percentage were female employees of whose average monthly salary was around RM 1,312.01.

Conservation of Forest Resources

Conservation Initiatives

In line with "Forest Beyond Timbers" concept, FDPM is living up to its aspiration by taking numerous initiative and strengthen approaches to conserve the forest mega-biodiversity within the PRFs. The conservation initiatives undertaken by FDPM are as follows:

Table 3: Conservation initiatives undertaken by FDPM

No	Conservation Areas	Area (ha)
1	High Conservation Value Forest (HCVF)	2,649.40
2	Genetic Resource Area (GRA)	4,806.00
3	Seed Production Area (SPA)	159.00
4	Arboretum	660.40
	TOTAL:	**8,273.80**

Apart from gazetting forest areas for conservation purposes, FDPM has also identified 32 Protected Tree Species that are to be kept aside and not to be extracted during forest harvesting activities. The identified timber species are divided into two categories, namely Under-Storey Species and Over-Storey Species, which are highly importance as food source for the fauna (Table 4).

Table 4: List of 32 timber species not to be harvested

(A) Under-Storey Species			
No	**Scientific Name**	**Local Name**	**Consumption**
1	*Aglaia sp.*	Bekak	Fruit (Primates & Birds)
2	*Archidendron bubalirum*	Kerdas	Fruit (Primates, Birds, Squirrels)
3	*Archidendron jiringa*	Jering	Fruit (Primates, Birds, Squirrels)
4	*Ardisia sp.*	Mata Pelanduk	Fruit (Primates & Birds)
5	*Artocarpus heterophyllus*	Nangka	Fruit (Primates, Birds, Squirrels)
6	*Artocarpus integer*	Cempedak	Fruit (Primates, Birds, Squirrels)
7	*Artocarpus rigidus*	Temponek	Fruit (Primates, Birds, Squirrels)
8	*Baccaurea maingayi*	Tampoi	Fruit (Primates & Birds)
9	*Baccaurea sumatrana*	Tampoi	Fruit (Primates & Birds)

10	*Barringtonia sp.*	Putat	Fruit (Birds)
11	*Boucea macrophyla*	Kundang Hutan	Fruit (Primates & Squirrels)
12	*Durio sp.*	Durian	Fruit (Primates, Birds, Squirrels)
13	*Dysoxylum sp.*	Mersindok (Langsat Hutan)	Fruit (Primates & Birds)
14	*Eugenia (Syzygium) sp.*	Kelat Jambu Laut	Fruit (Primates & Birds)
15	*Garcinia artoviridis*	Asam Gelugor	Fruit (Primates & Birds)
16	*Mangifera indica*	Mangga	Fruit (Primates, Birds, Squirrels)
17	*Nephelium lappaceum*	Rambutan Hutan	Fruit (Primates & Birds)
18	*Sandoricum koetjape*	Sentul	Fruit (Primates & Birds)
(B) Over-Storey Species			
No	**Scientific Name**	**Local Name**	**Consumption**
19	*Castanopsis spp.*	Berangan	Fruit (Primates & Squirrels)
20	*Dialium sp.*	Keranji	Fruit (Primates, Birds & Squirrels)
21	*Ficus spp.*	Ara	Fruit (Primates, Birds & Squirrels)
22	*Irvingia malayana*	Pauh	Fruit (Primates & Squirrels)
23	*Knema sp.*	Basong	Fruit (Primates & Birds)
24	*Koompasia excelsa*	Tualang	Depository of wild honey (Seed for squirrels)
25	*Lithocarpus cyclophorus*	Mempening Gajah	Fruit (Primates)
26	*Mangifera longipetiolata*	Machang	Fruit (Primates & Birds)
27	*Myristica sp.*	Basong	Fruit (Primates, Birds & Squirrels)
28	*Parkia sp.*	Petai	Bean / Fruit (Primates, Birds & Squirrels)
29	*Podocarpus sp.*	Podo	Hill / Beach conservation (Primates)
30	*Santiria laevigata*	Kedondong Gergaji Daun Licin	Fruit (Squirrels)
31	*Sterculia foetida*	Kelumpang Jari	Seeds (Birds & Squirrels)
32	*Sterculia parvifolia*	Kelumpang	Fruit (Squirrels)

Central Forest Spine (CFS)

The Central Forest Spine (CFS) includes the forest area within the groups of forest complexes of Peninsular Malaysia. The CFS as defined in the National Physical Plan (NPP) is the backbone of Peninsular Malaysia's environmentally sensitive area network, comprises of four major forest complexes, namely (a) Banjaran Titiwangsa-Banjaran Bintang-Banjaran

Nakawan; (b) Tmana Negara-Banjaran Timur; (c) South East Pahang Chini and Bera Wetlands; and (d) Endau Rompin Park-Kluang Wildlfie Reserves (Figure 3).

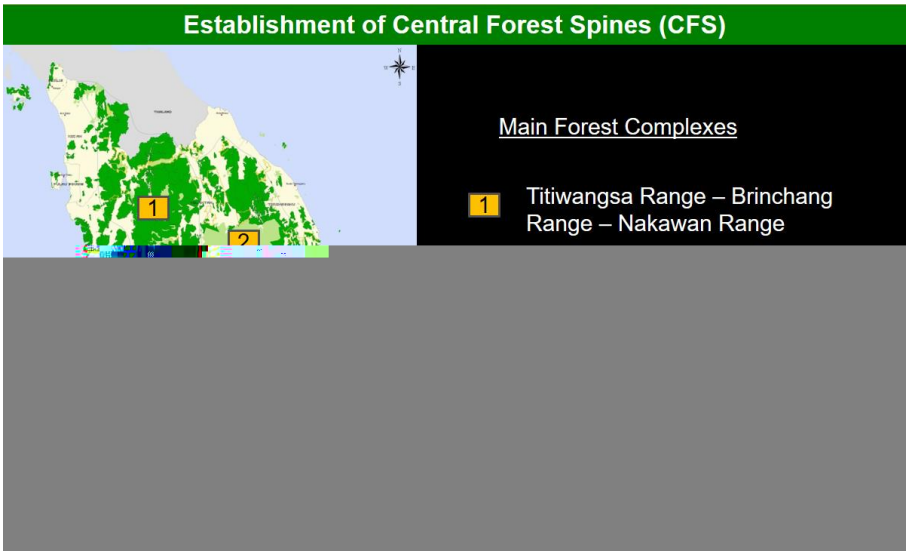

Figure 3: The main forest complexes within the Central Forest Spine of Peninsular Malaysia

The NPP identified forest fragmentation as a "major threat to the conservation and maintenance of biodiversity" and recognizes that "conserving forest lands would be integral to optimizing the use of land in the country" and that "the multifunctional role of the forest lands should be enhanced through the recognition of the CFS and programmes to create linkages and corridors to the more isolated reserves". In essence, connecting these fragmented forests is important to secure mutual co-existence and benefit for development and conservation.

Recognizing the importance in securing connectivity of the fragmented forests, the Malaysian government, through the Federal Town and Country Planning Department, has therefore embarked on a master plan study whose objective is to re-establish, maintain or restore connectivity in places where it is already lost within the CFS of Peninsular Malaysia.

Tree Planting Programmes

Apart from engaging in forest resources conservation, FDPM is one of the main anchors in most tree planting programmes implemented in Peninsular Malaysia. In 2009, the 26 Million Tree Planting Campaign was executed nationwide. This tree planting campaign is in line with the Government's efforts to ensure that at least 50 percent of the country had forest cover in accordance with Malaysia's commitment made at the Earth Summit in Rio de Janeiro, Brazil, in 1992. Carrying the theme of "Green the Earth: One Citizen, One Tree", this campaign aims to plant 26 million trees by 2014. The 26 million trees represent 26 million population of the country. Various groups ranging from Government and its related agencies, private sectors, schools, institutions of higher learning and general public are actively involved in supporting the tree planting campaigns. Apart from focusing on inland forest, FDPM also focuses on rehabilitation of mangrove forests through tree planting programme "Conservation of Coastlines Through Planting of Mangroves and Other Suitable Coastal Species". The objectives of this programme are to protect the coastal ecosystem and to enhance economic

welfare of the local communities. This social forestry project involves planting of mangroves and other suitable coastal species by general public along the coastlines of the country.

Forest Scientific Expeditions

From 1999 until 2015, FDPM had conducted 25 series of Forest Biodiversity Scientific Expeditions in different forest ecosystems within the PRFs in Peninsular Malaysia. Studies and researches were conducted during these scientific expeditions, involving various disciplines, such as the physical aspects of the forest ecosystems, biodiversity of flora and fauna, subject matter related to eco-tourism, ecology, recreation, geology, hydrology, archaeology and socio-economics. All findings are presented in seminar approximately a year after the forest expedition for further discussion. Proceeding books that comprise of a collection of scientific papers are then published and distributed for references and research purposes. The 25 series of forest scientific expeditions were held within the four main forest habitats as displayed in Figure 4.

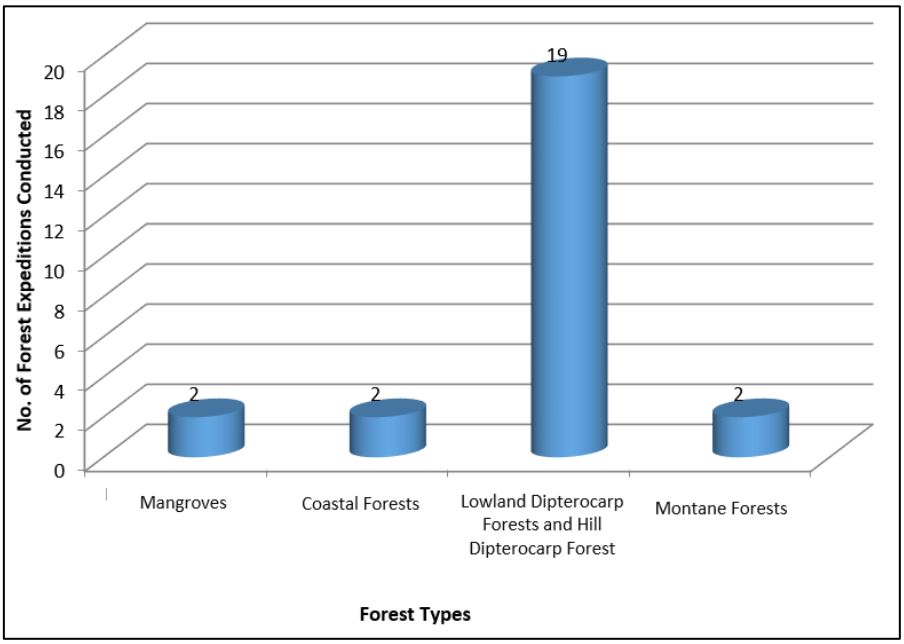

Figure 4: The number of forest scientific expeditions held within the four major forest types in Peninsular Malaysia

Communication, Education and Public Awareness (CEPA)

FDPM also goes extra miles to educate public on the importance of forests and environment in sustaining livelihood. Such efforts are delivered through forestry trainings, public talks, exhibitions and environmental education activities under Communication, Education and Public Awareness (CEPA) programme. The CEPA programmes are largely implemented in schools targeting teachers and students of both primary and secondary schools. Often the programme is conducted using creative, interactive and interpretative approach, inclusive of both indoor and outdoor activities to gain constant focus and active participation of target group. The CEPA programme aims to instil understanding on the contribution and value of

forests, disseminate information about SFM as well as exposure the roles and functions of FDPM to general public.

Conclusion

Throughout the periods of human civilization, forestry and mankind has a long history of relationship, where mankind relied on the forest for its resources, while the forest relied on mankind for its ecological dynamics. Today forest management emphasizes on the SFM practices where all aspects that affect forestry activities are to be taken into serious consideration, such as environmental, social and economic impacts, regeneration and rehabilitation, as well as the participation of all relevant parties in the forestry sector. The forestry sector keeps on progressing and evolving to cover a wider range of issues, such as mitigation of climate change and addressing the conservation of biodiversity, while at the same time balancing its role in economics. In order to accomplish this goal, there is a need for paradigm shift among the stakeholders and general public to turn “Forest Beyond Timbers” concept into a reality rather than just an aspiration. With all the new concepts and issues that surround forestry sector, the future of forestry is volatile yet remain viable and significant. Nevertheless, forestry sector no longer stands in its own domain, it requires concerted efforts and full participation of various stakeholders and general public to protect and conserve our natural heritage together. The answer to SFM practices of course is complex and the keyword is “responsibility”. This is essential, right through the chain from forest to logger, to manufacturer, to trader and to customer as well as general public. Therefore, the responsibility for sustainable management of our natural forests rests with all.

Status of Forest Resources in Nepal

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Introduction

Nepal is among the richest country in the world in floral and faunal diversity due to its unique ecological position and altitudinal variation (MFSC, 2009). The elevation of the country ranges from 67 m above sea level in the south-eastern Tarai to the highest point on earth , Mt. Everest (Sagarmatha) at 8,848 m in the north, all within the distance of 150 kilometre (km) resulting in unique climatic variability from tropical to Arctic. The population in 2009 is estimated to be 27.66 million which has been increased from 23 million in 2001 with an annual population growth of 2.25% (MFSC, 2009).

Profile of Forest Resources and Biodiversity and its Changing Trend

The geography of the country is divided into high mountains, mid hills and low land Tarai. Forest occupies a total of 5.96 million hectare which is 40.36 % of the total area of the country.Other wooded land (OWL) covers 0.65 million ha (4.38%). Forest and OWL together represents 44.7% of the country. Out of total area of the forest, 42.68% (4.93 million ha) lies outside Protected Areas (PAs) and 17.32% (1.03 million ha) inside PAs. Out of total area of forest, 37.8% lies in Middle Mountain physiographic region, 2.25% in High Mountain and High Himal, 23.04% in Churia and 6.90% in Terai region (DFRS, 2015).

According to forest cover mapping, the Terai Mixed Hardwood (TMH) forest type has the highest coverage (24.61%) followed by the Upper Mixed Hardwood (UMH) (18.23%). Similarly, the share of Shorea robusta and Pinus roxburghii forest types are 15.27% and 8.45%, respectively. Nearly 60% of the total forest area is composed of mixed types (DFRS 2015).

According to Forest Act 2049 (revised 2073), forest area is divided into community forest (CF), government managed forest, collaborative forest, leasehold forest, protection forest and religious forest. Over 18,000 community forest user groups (CFUGs) are involved to manage more than 1.9 million ha forest area as CFs. Similarly over 30 collaborative forest management committees are involved to manage forest area especially in Terai and Inner Terai. These community based forest management regimes are the most successful modality to conserve the forest as well as increasing greenary and also protection of wild fauna and flora.

Nepal lies at a transition zone comprising six floristic regions: Central Asiatic in north, Sino-Japanese in east, Southeast Asia-Malaysian in south-east, Indian in south, Sudano-Jambian in south-west and Irano-Turanian in west. The country is a part of biodiversity hotspot, among four hot spots occurring in Himalayan regions. There are six biomes occurring in Nepal while there are only eight in India. Among the 200 World Wildlife Fund (WWF) accredited Global Ecoregions, Nepal hosts nine important ecoregions among 60 ecoregions found in Himalayan region (MFSC, 2009).

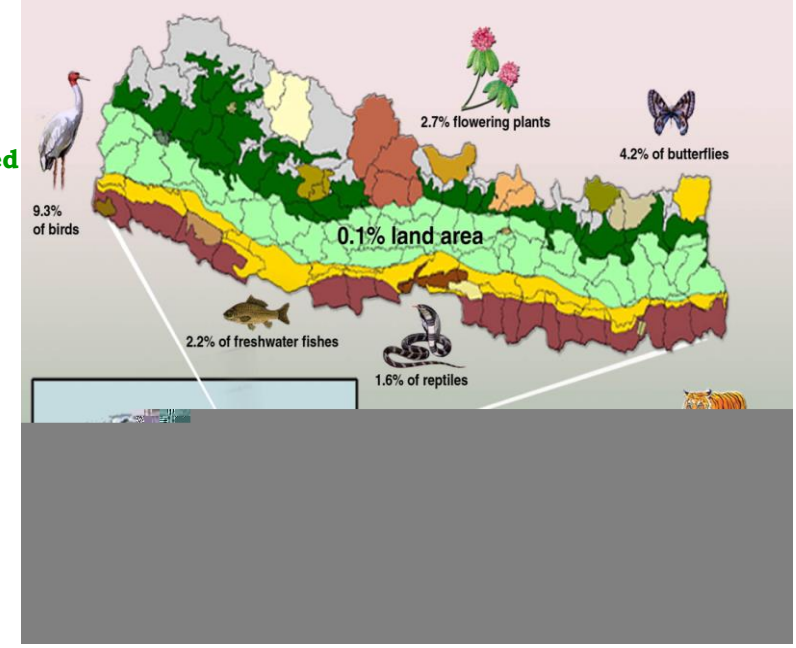
Nepal occupies about 0.1 percent of the global area but harbours over three percent of the world's known flora. A total of 284 flowering plants are endemic to Nepal. The number of known species in Nepal is: 6,073 angiosperms; 26 gymnosperms; 534 pteridophytes; 1,150 bryophytes; 365 lichens; 1,822 fungi and 1,001 algae (GoN, 2014). Phyto-geographically, Nepal is located in the Oriental Region (Polunin, 1964). According to the Conservation Science Programme WWF-US (1998), Nepal includes 12 eco-regions (TISC, 2002) A total of 118 ecosystems with 75 vegetation types and 35 forest types have been identified in Nepal on the basis of altitudinal, climatic variations and vegetation types. It has been reported that 342 plant species and 160 animal species have been reported as being endemic to Nepal concentrated at subalpine and alpine zones. The maximum angiosperms species endemic to Nepal lies between 3800 to 4200m (NBAP, 2007).

Forest, Biodiversity and Nepal's Status

Nepal Biodiversity Strategy and Action Plan (NBSAP) has identified

- **6 sectoral theme**

(i) Protected areas,
(ii) Forests outside protected areas,
(iii) Rangelands
(iv) Wetlands
(v) Agriculture
(vi) Mountains.



Biodiversity conservation has received highest consideration in Nepal. Nepal is signatory party of various international multilateral environmental agreements (MEAs) including Convention on Biological Diversity (CBD), Convention on International Trade in Endangered Species (CITES) and Ramsar Convention on conservation of Wetlands, Kyoto Protocol and so on. The conservation of biodiversity is an integral part of national policy in Nepal where several policies, legal framework and program instruments have been formulated in order to give the way for biodiversity conservation. Major strategic frameworks are; National

Biodiversity Strategy (NBS), National Biodiversity Strategy Implementation Plan (NBSIP), National Conservation Strategy (NCS) , Nepal Environmental Policy and Action Plan (NEPAP), Master Plan for Forestry Sector (MPFS) , Forest Act 1993 (REVISED 2016)and Forest Regulations 1995.

Besides the national forest management and conservation governed by Forest Act, separate National Parks and Wildlife Conservation Act, 1972 empowers to protect wild fauna and flora within the protected areas and their buffer zones (BZs) through Department of National Parks and Wildlife Conservation (DNPWC). Nepal is blessed with immense biodiversity represented by a wide diversity of flora and fauna found in the myriad of different ecosystem types the country harbors. In order to protect and conserve them, the government has declared 10 national parks, 3 wildlife reserves, 1 hunting reserve and 6 conservation areas which make up 23.39% of the total land and are established in three different ecological zones in Tarai, Mid-hills and High- mountains (DNPWC,2016).

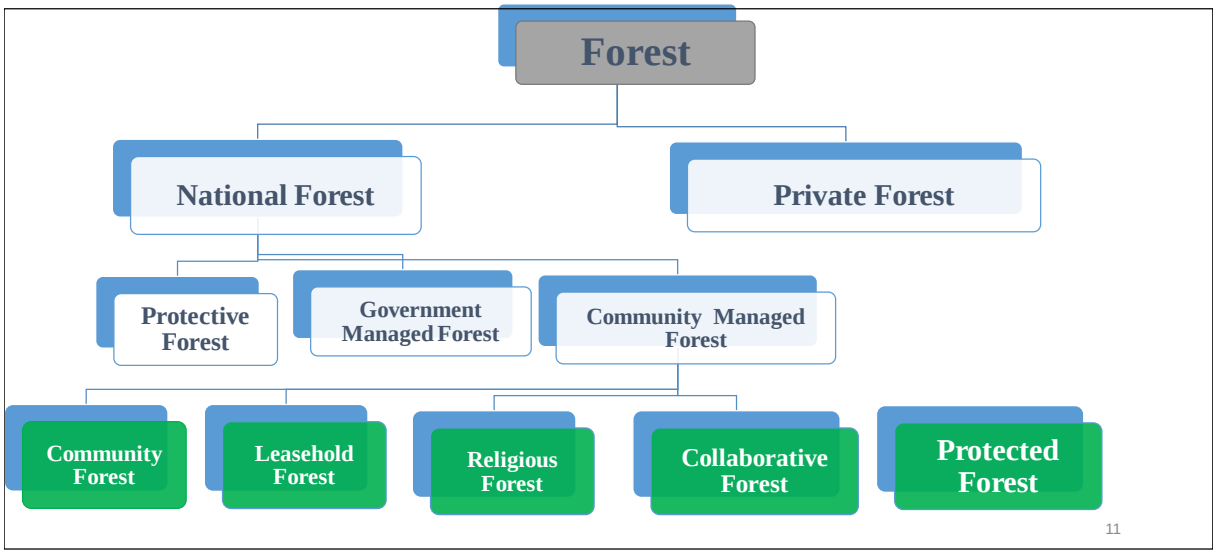
Community Forestry and Forest Governance System

The concept of community forestry in Nepal is a courageous, innovative, dynamic and future oriented approach towards participatory forest management. It has been recognized as a priority program by the Master Plan for Forestry Sector (MPFS) 1989 and Revised Forestry Sector Policy 2000 as well. Under this program, any patch of national forests can be handed over to community forest user groups (CFUGs) as community forest (CF) after endorsement of group's constitution and operational plan for the forests. The landownership remains within the government however the responsibilities especially in protection, management and utilization of forest products remain within the CFUGs. CFUGs are expected to participate in all community forestry activities such as tree planting, thinning and pruning and share forest benefits among the user households. They can place a value tag on all forest products independently without government intervention. Although the guiding principles of forest management are multiple use and sustained harvest of forest products, the biodiversity conservation has received little priority (MPFS, 1989).

The initial phase of participatory conservation approach started in the early 1980s, and the goal of community forestry then was to carry out the seedling production and distribution for afforestation and reforestation activities that had expected to increase greenery as well as to supply of forest products to local people on a sustainable basis. However in recent years, the primary objective of CF is directed towards poverty alleviation, good governance, livelihood and sustainable development, conservation of biodiversity, forest certification and gender balance. Furthermore the 9th and 10th five- year plans of Government of Nepal (GoN) aimed at increasing women's participation in decision making process, poverty alleviation and achieving the Millennium Development Goals (see MDG – direct: 1,2,3,7,8 and indirect: 4,5,6 for detail information) through community forestry development program. For this broader vision, community forestry development program is considered as a participatory and sustainable forest management paradigm which also seeks the inclusion of women, ethnic groups and disadvantaged groups in the decision making and governance process.

Preparation of group constitution and forest operational plan through the support of forest technician is mandatory before handing over the forest area to CFUGs. The operational plan includes the baseline information such as land area, details of forest inventory (species, crown cover, regeneration status, non timber forest products etc), protection methods, cultural operations (thinning, pruning and harvesting), forest products utilization and community fund mobilization. The governmental institution, particularly District Forest Office (DFO) is responsible to provide the technical support for preparation of forest operational plan, to approve the plan and hand over the forest to local communities as well to perform the activity monitoring.

Different Forest Management Regimes Nepal (Forest Act 1993)



Except the CFs, there are some other forest governance modalities legally adopted aiming effective and sustainable forest resources conservation and management outside the protected areas and their buffer zones in Nepal. Collaborative forest management, leasehold forest management and religious forest management are some popular modalities of forest resource management practiced so far. Still major areas of large forest blocks are managed by DoF itself especially in the Tarai region, however the national policy debates are now increasingly considering the issues of Tarai forest governance (NFA, 2008). Religious and leasehold forests covered a little area. Government also has not particularly emphasized them due to complex administrative process as well as some unclear legal provisions. Therefore the government has been focused higher priority to local community to be managed as community forests. Collaborative forest management (CFM) modality has been practiced focusing on block forests and distant-users especially in Tarai districts. This modality is also based on the participatory conservation and sustainable utilization paradigm and governed by separate directives formulated by Ministry of Forests and Soil Conservation (MFSC).

Government of Nepal has also emphasized to the landscape level resources management approach through local communities' participation. Active participation of local communities at grassroot level has been internalized to ensure sustainable resource utilization and

biodiversity conservation. Tarai Arc Landscape (TAL), Chitwan Annapurna Landscape (CHAL), Kailash Sacred Landscape (KSL),Western Hill Landscape and Kanchanjungha Landscape program are major leading landscape level conservation programs implemented through participatory conservation modality.

Changes on Forest Area over Last Decade

According to Forest Resource Assessment 2010, nearly two-thirds of the total forest area in the country was affected by grazing. Tree cutting, bush cutting, lathra cutting, lopping and forest fire were also common. Other anthropogenic disturbances, such as bark removal from the base of a tree, snaring, foot trails, forest roads, etc. were observed in about one-quarter of the surveyed forest areas. Among all the physiographic regions, Churia was observed to have the highest occurrence of forest disturbance, particularly grazing, forest fire, landslide and cutting of vegetation. Tree cutting and lopping were the highest in forests of Terai region. Litter collection was higher in forests of the Middle Mountains region.

Forest encroachment: Forest encroachment is one of the major challenges of DoF in the recent decade. Political instability of the country has assisted forest encroachment by the people and institutions. So far 94,871 ha forest land has been encroached throughout the country. Evacuation of the encroached area and restoration of forest land is major challenge. Similarly conservation and wise use of Churia region, situated in 36 districts comprising 12.78% of total land of the country, has been put a high priority by GoN. The decision made by the government on 16 June 2014 is another milestone to address the conservation issue of Churia and Tarai-Madhesh. With a high level political commitment, the newly formed Churia Tarai-Madhesh Conservation Committee is expected to get adequate speed and achieve the target.

The challenges being faced by the department to address the changing management modalities and addressing cross cutting issues such as climate change, REDD plus and payment for environmental services (PES), human wildlife conflicts, ecotourismetc. need more support on infrastructure, competent forestry professionals, equipment, technology, logistic support as well as provision of appropriate legal instruments and enabling environment.

Profile of Protection Areas

The protected areas of Nepal cover mainly forested land and are located at various altitudes in the Terai, in the foothills of the Himalayas and in the mountains, thus encompassing a multitude of landscapes and preserving a vast biodiversity in the Palearctic and Indomalayan ecozones. Nepal covers 147,181 km2 (56,827 sq mi) in the central part of the Himalayas. Altitudes range from 67 m (220 ft) in the south-eastern Terai to 8,848 m (29,029 ft) at Sagarmatha within a short horizontal span. This extreme altitudinal gradient has resulted in 11 bio-climatic zones ranging from lower tropical below 500 m (1,600 ft) to nival above 5,000 m (16,000 ft) in the High Himalayas, encompassing nine terrestrial ecoregions with 36 vegetation types. Botanists recorded 1,120 species of non-flowering plants and 5,160 species

of flowering plants. Nepal ranks 10th in terms of richest flowering plant diversity in Asia. Zoologists recorded 181 mammal species, 844 bird species, 100 reptile species, 43 amphibian species, 185 freshwater fish species, and 635 butterfly species. In recognition of the magnitude of biodiversity the Government of Nepal has established a network of 20 protected areas since 1973, consisting of ten national parks, three wildlife reserves, six conservation areas and one hunting reserve. In 2017, the Shuklaphanta Wildlife Reserve was upgraded to a national park.Additionally, nine Ramsar sites were declared between 1988 and 2008. Following are the different categories of protected areas.

National Parks

Chitwan National Park – 932 km2 (360 sq mi)

Sagarmatha National Park – 1,148 km2 (443 sq mi)

Langtang National Park – 1,710 km2 (660 sq mi)

Rara National Park – 106 km2 (41 sq mi)

Khaptad National Park – 225 km2 (87 sq mi)

Shey Phoksundo National Park – 3,555 km2 (1,373 sq mi)

Bardiya National Park – 968 km2 (374 sq mi)

Makalu Barun National Park – 1,500 km2 (580 sq mi)

Shivapuri Nagarjun National Park – 159 km2 (61 sq mi)

Banke National Park – 550 km2 (210 sq mi)

Shuklaphanta National Park – 305 km2 (118 sq mi)

Wildlife Reserves

Koshi Tappu Wildlife Reserve – 175 km2 (68 sq mi)

Parsa Wildlife Reserve – 637 km2 (246 sq mi)

Conservation Areas

Annapurna Conservation Area – 7,629 km2 (2,946 sq mi)

Kanchenjunga Conservation Area – 2,035 km2 (786 sq mi)

Manaslu Conservation Area – 1,663 km2 (642 sq mi)

Blackbuck Conservation Area – 15.95 km2 (6.16 sq mi)

Api Nampa Conservation Area – 1,903 km2 (735 sq mi)

Gaurishankar Conservation Area – 2,179 km2 (841 sq mi)

Hunting Reserve

Dhorpatan Hunting Reserve – 1,325 km2 (512 sq mi)

Ramsar Sites

The following Ramsar sites were declared between 1988 and 2016.

Bishazari Tal – 3,200 ha (12 sq mi)

Ghodaghodi Tal – 2,563 ha (9.90 sq mi)

Gokyo Lake Complex – 7,770 ha (30.0 sq mi)

Gosaikunda – 13.8 ha (34 acres)

Jagdishpur Reservoir – 225 ha (0.87 sq mi)

Kosi Tappu Wildlife Reserve – 17,500 ha (68 sq mi)

Mai Pokhari – 90 ha (220 acres)

Phoksundo Lake – 494 ha (1.91 sq mi)

Rara Lake – 1,583 ha (6.11 sq mi)

Lake Cluster of Pokhara Valley[8] – 178.5 km2 (68.9 sq mi)

Profile of Forestry Industry Development, Including the Way of Timber Utilization and Processing, Total Forestry Production Outputs etc.

Participation and investment of the commercial actors in the forest-based industries is found mainly in processing, manufacturing and trade with limited participation in production of forest products and services.Major commercial producers in Timber, NTFPs, Bioenergy, Ecotourism and Forest Carbon subsectors are government agencies, forest producer groups, and private companies and individuals Mainly contractors and local collectors harvest timber, NTFPs and fuel wood. Likewise, the processing and manufacturing of timber products is carried out by saw millers, veneer producers, plywood producers, and furniture and handicraft makers that are mainly based in towns and cities. In case of NTFPs, the main actors for these functions are distillers, local processors (e.g., wild fibre, handmade paper), resin and kattha

processors, herbal products manufacturers, and handicrafts makers. In bioenergy, char producers and briquette makers are involved. For the trade of all products except ecosystem services, district level and national level

Traders, wholesalers, retailers, importers and exporters are the major actors. In case of forest carbon, these include packagers, product verifiers, distributors and buyers while in eco-tourism various combinations of local businesses, such as travel and tour operators, hotel and other accommodation providers, and restaurants and food providers are involved (ANSAB 2014).

At present, approximately 41,000 forest enterprises are running with (small and medium level industries) and around NRs 32 billion investment. About 60% (19 billion) is in timber related (+10000 industries) and 2/3 rd investment is production and 1/3 rd is in processing sector . Regarding Ecotourism and ecosystem services (+ 1700 industries) investment is increasing (+ 6.5 billion) whereas NTFPs/MAPs – (+2100 industries) Highly potential and prioritized sector however investment (NRs 6 billion) and most are exported in raw form. Bioenergy: less priority (less than a billion) and 30-40 industries/firms only. Government investment in forestry sector: 1.8- 2% which is comparatively too low (Pokharel and Branny 2014) .

Recent timber demand is around 60 million cubic feet which is largely supplied from private land. Community forest is also major source to supply timber and fuelwood to local community forest groups. Shorea robusta is the main and highly demanded species. Plantation of Sissoo (Dalbergia sissoo) also plays the vital role to restore degraded fores in Terai and Pinus specie in hilly region. Nepal is importing around 400 thousand cubic feet log/timber from Malayasia, Myanmar, Indonesia per year.

Forest and Forestry Management Mechanism, these Including Governmental Administrative System at Deferent Levels

The Ministry of Forests and Soil Conservation (MFSC), as the central agency at the highest level, is mainly responsible for overall administration and Acts/Regulation/policy formation. It develops the HRD policy for all level forestry officials, coordinates among 8 Divisions within MFSC, 3 Parastat organizations and 5 separate Departments which are responsible for implementing forestry development and training in field level. Department of Forests (DoF) is the largest department. The general introduction of DoF is illustrated below.

Dof: from Past to the Present

In Nepal, the First National Forestry Plan (NFP) was prepared in the year 1976 (2033 BS) to achieve the goals and objective of the forestry sector. Based on the objective set by the NFP (1976), the organizational set up of the Ministry and Department were also restructured. Altogether 9 Forest Circles and 40 Forest Divisions were established. In addition, to start up participatory forest development activities in all the districts, 75 District Forest Sections were also established one in each district. Similarly, to assist the Chief Conservator of the Forests at DoF, three separate offices viz. Forest Survey and Research Office, National Parks and Wildlife Conservation Office, and Plantation Office were established at the center.

To decentralize forest administration and development activities as envisioned by the NFP, from the FY 2040/041 (1984), the structure of the District level offices were reorganized by naming them as District Forest Offices and placing District Forest Controller in each district. It was completed until the end of FY 2042/043 (1985). Then Five Regional Forest Directorates, 40 Forest Divisions and 75 DFOs were established.

The organization of the Department was again changed in the year BS 2045 (1988), by establishing Five Regional Forest Directorates, 75 District Forest offices, 222 Ilaka Forest Offices and 888 Forest Ekaai (units).

Based on the principles and recommendations of Administrative Reform Commission, to address the need of making forest organization more effective, efficient, context specific and people-oriented, the existing organizational structure of the DoF was again changed in 1993. It was made effective since the start of FY 2050/051 (1994). It consisted three Divisions (Community and Private Forestry; Planning and Training; and National Forestry) directly under the Director General of the DoF. The decision placed five regional Directorates under the MFSC for performing planning and monitoring roles. There were 74 DFOs, 92 Ilaka Forest Offices (IFO) and 696 Range Posts (RP). The districts were divided into five categories based on the location, forest area, the sensitivity of forest protection, and the opportunity and possibility of forest management and utilization. In Tarai and Inner Tarai districts, for the protection of the forests and patrolling, the units of Armed Forest Guards (AFG) were also set up and in 19 bordering districts to India and China, 19 Rangers one in each district were also placed in the Customs. For the training of Armed Forest Guards, an Armed Forest Security Training Centre was also set up in Tikauli, Chitwan under the jurisdiction of DoF.

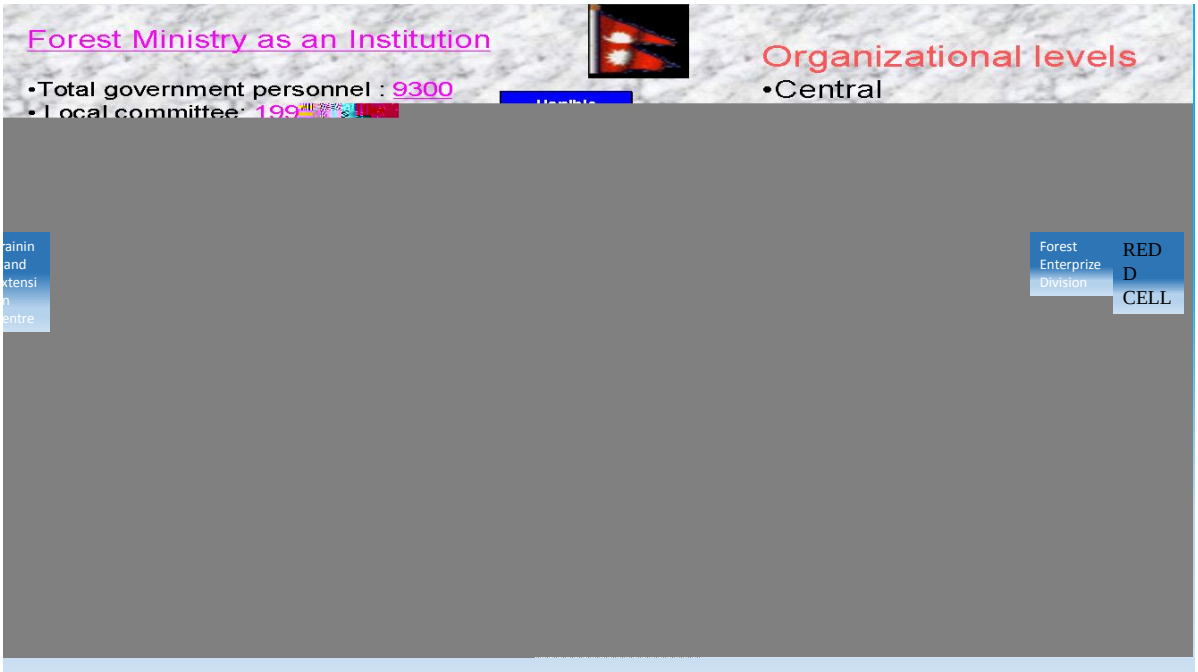
The last organizational structure that was established in the year 1994 continued about two decades. It was focused to create efficient and effective forest management and administration.

After the introduction of Multiparty democracy in 1990 and the change in political system, Forest Act and its regulation were enacted in 1993 and 1995 respectively. These put high priority on participatory forest management. Based on the notion of Forest Act (1993), Forest Regulation (1995), Master Plan for the Forestry Sector (MPFS) 1989, the Revised Forest Policy (2000) and several directive and circulars from DoF, the responsibilities of the district forest offices have been changed and increased by manifold in recent two decades. Similarly, after the implementation of community based forest management (community forestry, leasehold forestry, religious forestry, protection forestry and collaborative forest management) the responsibilities, work nature and work load of forestry staffs have also been changed from direct patrolling and protection focus activities to participatory, technical and facilitative roles. With the rise of population, urbanization, new settlements, development and livelihoods opportunities and unemployment in Tarai and Inner Tarai districts, the large chunk of forests in these areas are under a serious pressure of illegal felling, theft and encroachment. The current capacity and the workforce under the Tarai districts have not been effectively successful in protecting and managing the Tarai forests.

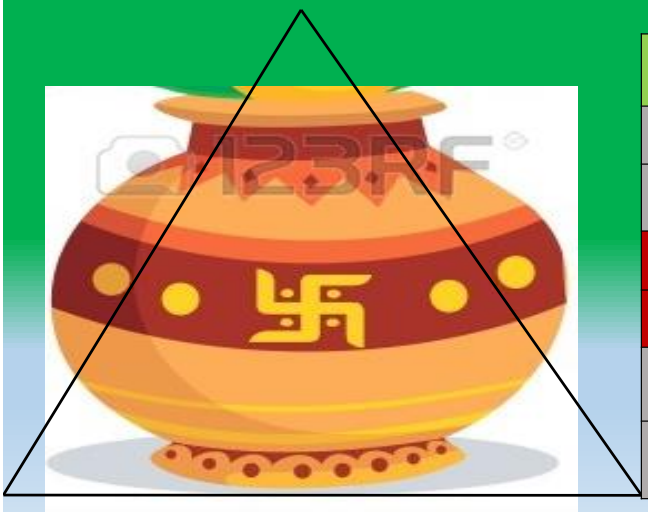
The recently completed Organization and Management (O and M) Survey of the DoF, although it was taken as an interim provision to accommodate the high number promoted officials, has assessed the institutional structure and capacity of the department in effective forest protection, management and regular programme implementation. As directed from the Ministry of General Administration (MoGA), despite of the strong necessity of the change and increase in the field level units in the districts, it did not recommend for the addition of new institutional structures and positions. But it has specifically addressed that the physical capacity and resources of the field level units are in the need of immediate improvement, maintenance and creating new structure and resources.

In such a context, the department needs a reform in its organization and has to set up and boost its capacity according to the demand of time and the changed scenario of forest management in the country.

The organizational structure of Ministry of Forests and Soil Conservation is mentioned as below.



Status of Human Resources in Department of Forests



Grade	Number	Percentage
Joint Secretary	12	0.16 Ü
Under Secretary	120	1.6 Ü
Forest Officer	955	13 Ü
Ranger	688	9 Ü
Junior Foresters	979	13 Ü
Forest Guard/ Armed Forest Guard	4518	62 Ü

Forestry sector policy instruments

Several policy instruments (laws and bylaws, strategies, directives) etc a are formulated in the forestry and biodiversity conservation. Some policies are listed as below.

- Revised Forest Policy 2015 and Forestry Sector Strategy 2016-025
- Draft ABS bill
- Revision of NBSIP
- Agriculture development strategy
- Agro biodiversity policy
- Sectoral law and rules:
- Forests
- Protected area
- Agriculture
- Environment
- Local governance
- Federal/Province level Acts/Rules (are being prepared)
- Policies, directives , Frameworks employee management in province level
- Reconstruction and Recovery of Earthquake loss
- Scientific Forest Management Guideline 2014

Forestry Scientific and Research System, Including Forestry Research Institutions, with Main Research Fields and Outstanding Achievement

Department of Forest Research and Survey (DFRS) is one of the five departments under the Ministry of Forests and Soil Conservation, Government of Nepal. DFRS is mandated to conduct forestry research and survey to produce knowledge and information for sustainable

management and utilization of forest resources of Nepal. The department works in close collaboration with various national stakeholders and international agencies.

The department has three divisions: Forest Research Division, Forest Survey Division, and Remote Sensing and Planning Division.

Forest Research Division is responsible for developing and demonstrating appropriate technologies related to natural and manmade forest management, determining forest growth to maximize forest productivity, and identifying suitable tree species for different site conditions. Research is also conducted in the fields of agroforestry, tree improvement, forest utilization, socio-economic studies, etc.

Forest Survey Division generates valuable statistics and information necessary to plan overall forestry development at national, regional and district levels.

Remote Sensing and Planning Division is responsible for acquiring remote sensing data to generate useful products for conducting forest inventory and mapping. It is also involved in preparing programme and budget of the department and monitoring of activities.

Forestry Education System, including Independent Forestry Universities /Colleges, or Forestry Related Forestry Universities/Colleges and Professional Training Agencies

The Institute of Forestry (IOF) is the first and only institute in Nepal fully committed to education and training in Forestry and Natural Resource Management. It was established as Nepal Forestry Institute in 1947 under the Nepal Government, Department of Forests at Singh Durbar in Kathmandu. It was moved to Supping (Bhim Phedi) in 1957 and then to Hetauda in 1965 in better physical facilities constructed by the Indian Co-operation Mission (ICM). The Institute merged into Tribhuvan University in July 1972 under the name “Institute of Forestry” and developed the infrastructure for Dean’s Office and Pokhara Campus in Pokhara, Kaski, with technical and financial assistance from the World Bank, International Development Agency (IDA) and the United States Agency for International Development (USAID).

The Institute offered only a two-year Certificate Level course in Forestry at Hetauda until 1981. Thereafter, in order to meet the demand for trained natural resource managers in Nepal, it launched two academic programs at newly established Pokhara Campus in 1981: a two-year Technical Certificate in Forestry (TCF), which is now phased out, and a threeyear Bachelor of Science in Forestry (B.Sc. F.), which evolved into a four-year program in 1995. The IOF started offering Master of Science and Ph.D. programs in Forestry in 2004. Currently, it offers Master of Science in Forestry, Master of Science in Natural Resource Management and Rural Development, and Master of Science in Watershed Management. The Doctoral program of the IOF is research based and is open for all those interested in any field related to Forestry.

The IOF offers courses pertinent to various disciplines of NRM and modifies its curricula as time necessitates. The current curriculum entails basic science and forestry courses with emphasis on Forest Management, Community Forestry, Agroforestry, Eco-tourism, Park and Recreation Management, Environmental Science, Wildlife, Protected Area Management, Soil

Conservation & Watershed Management, etc. Teaching and Research at the IOF preserve and enrich creative traditions through well designed educational programs.

Beside IOF, Agriculture and Forestry University offers forestry education at Bachelor and Masters level. Kathmandu Forestry College (private sector) also offers the forestry education.

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Sustainable Forest Management --- Timber Forestry Training College, Lae and PNG Forest Authority

Mr. Charles Pakure

Acting Manager-Projects, Papua New Guinea Forest Authority

Introduction: The National Constitution provides for Papua New Guinea's natural resources and environment to be conserved and used for the collective benefit of us all and be replenished for the benefit of future generations. Our forests play a significant role in the economic, social and environmental well-being of our communities and the government is committed to the pursuit of sustainable forest management for the benefit of current and future generations.

The International Tropical Timber Organization (ITTO) and the International Union for Conservation of Nature (IUCN) have defined sustainable forest management as: The process of managing forest to achieve one or more clearly specified objectives of management with regard to the production of a continuous flow of desired forest products and services without undue reduction of its inherent values and future productivity and without undesirable effects on the physical and social environments.

PNG's approach to sustainable forest management is laid down in a legal and policy framework, which includes the National Forest Policy 1991 (amended) the Forestry Act 1991, the Forestry Regulation 1998, the National Forest Development Guidelines, the National Forest Plan and the Environment Act 2000.

The National Forest Policy recognizes the multipurpose nature of the forest resource including environmental conservation, recreation, provision of subsistence and cultural requirements and the supply of timber and other forest products.

The objectives of the Forestry Policy 1991(amended) are to:

- manage, develop and protect the nation's forest resources and environment in such a way as to conserve and renew them as an asset for the succeeding generations; and
- maximize Papua New Guinean participation in the wise use and development of the forest resources as a renewable asset; and
- utilize the nation's forest resources to achieve economic growth, employment creation and industrial and increased 'downstream' processing of the forest resources; and
- encourage scientific study and research into forest resources so as to contribute towards a sound ecological balance, consistent with the national developmental objectives.

The Forestry Act and its Regulations provide that forest roading and logging and all other forestry activities of whatever nature must be undertaken according to the Logging Code of Practice and the Planning, Monitoring and Control Procedures (PMCP) for Natural Forests Selective Logging Operations.

Background

Global agenda on Sustainable Forest Management (SFM), widely expressed at national and international meetings and forums is about principles, management techniques and regulations developed by many nations promoting sustainable forest management towards economic viability, social beneficiaries and environmental development and at the same time improving rural livelihood.

The forestry sector in Papua New Guinea is one of the three major income generation sources in the country, beside minerals and agriculture. It provides skill employment to Papua New Guineans and contributes to rural infrastructure development. Therefore, logging practices should be controlled to avoid adverse effect and impact on the social, economic and environmental benefits of the livelihood of communities living in the forest. The forest degradation and deforestation is a global issue and currently has great impact to many countries in the Pacific region. It is therefore vitally important that PNG Forest Authority staff must be well versed with management tools and sound Sustainable Forest Management techniques to ensure Forest Act and its regulations as under pinned in Planning Monitoring Control Procedures and PNG Logging Code of Practice are satisfactorily implemented.

The National Forest Policy recognizes the multipurpose nature of the forest resource including environmental conservation, recreation, provision of subsistence and cultural requirements and the supply of timber and other forest products. The promoting sustainable forest management practice is vital to improve livelihood of communities living in the forest. This can be achieved by implementing the Two (2) major elements of the forest regulations that have a major impact in the execution of Sustainable Forest Management techniques adopted in PNG. The major elements have been the Planning Monitoring Control Procedures with PNG Logging Code of Practice.

Furthermore the National Government budget priority is more focus to infrastructure development, the budget allocation for the Government departments and statutory bodies including PNGFA becomes a great concern every year in terms of providing adequate service delivery to Papua New Guineans. Field Officers need therefore be vigilant in facilitating the collection of levies so that funds derived from logging are received by the approved recipients, including PNGFA and channeled to other development purposes on a timely manner. The field Officers need to know the requirements of their roles and responsibilities and the expectation placed on them by the management in all aspects of monitoring, evaluation, and reporting of Timber permit operations.

The Course

This training is designed to disseminate vital information on Sustainable Forest Management to PNG Forest Authority Field Services Directorate staff. The purpose is to up lift field Officers performances in discharging day to day roles and responsibilities in monitoring Timber permit operations in selective logging in natural forest. The course had four (4) Modules called; Monitoring, Evaluation and Reporting and Finance Accounting systems and procedures which also includes the Roles and Responsibilities of the monitoring Officers. These modules were developed jointly by Timber Forestry Training College (TFTC) and PNG Forest Authority (PNGFA). They were delivered by nine (9) experienced Forestry Officers from PNGFA Headquarter and the senior Log Harvesting Instructor from the Training College on 5 days training program. The relevant resources (materials) and manuals from PNGFA Headquarter Port Moresby were used as handouts and guide Trainers in the delivery of training plans. Participants were encouraged to share field experiences in group discussions and presentations during the training sessions.

Training Input

The aim of the course is to strengthen the knowledge skills of Field Services Monitoring Officers; effectively implement government regulations in managing the county's forest resources on a sustainable basis, hence achieving maximum social, economic and environmental benefits.

Modules

The Timber Forestry Training College and PNG Forest Authority under the supervision of senior Log Harvesting Instructor – Mr John Barry Ken developed the course curriculum. The Curriculum has 4 modules comprises of: monitoring, evaluation, reporting and collection of charges for PNGFA under Timber permit conditions. Under the training plan, the 4 modules had proposed the total teaching days from 5 to 10 days. The number of hours varies from 4 hours to 16 hours depending on the volume of information contain by each module and the subject topic. These training sessions then divided into lecture discussion follow by group discussions/ activities/ presentations, assessment and evaluation.

However for this particular course, the duration reduced from 10 days to 5 days because of funding situations. The funds given by the Aid Donor were insufficient to meet the cost of boarding lodging and tuition for 37 participants at Timber Forestry Training College. The recipient (TFTC) decided to reduce the 10 days training plan to 5 days when insufficient funds were available to cater for full boarding lodging and tuition at the college.

Modules	**Duration**	**Subject/ Topic**	**Method of Training (Lecture discuss & group activity & presentation)**
Monitoring	2 days (16 hours)	PMCP/ LCOP/ LISP/ LEP/ WAMP	3 Tiers Planning, 5 year, Annual & Set up plans & Application of 24 Key standards, Log identification scaling & reporting procedures, Log Export and Waste Assessment and management procedures
Evaluation	1 day (8 hours)	PMCP/ LCOP/ LISP/ LEP/ WAMP	Evaluation compliance of TP, LCOP, LISP, LEP & WAM standards in set up closing
Reporting	1 day (8 hours)	PMCP/ LCOP/ LISP/ LEP/ WAMP	Reporting compliance of TP, LCOP, LISP, LEP & WAM standards and improvement requires by Permit Holder
RIL – Basic by TFF			Basic principles of reduce Impact logging under SFM practices
Finance Account & Roles & Responsibilities	1 day (8hours)	PMCP/ LCOP/ LISP/ LEP/ WAMP	Evaluating, processing, collecting levies under Finance procedures Significant roles & responsibilities of monitoring Officers

Training Out Put

Following successful completion of the training, participants would be competent in

1) Monitoring compliance of Timber Permit terms and conditions
2) Monitoring compliance of Planning Monitoring control Procedures
3) Monitoring compliance of PNG Logging Code of Practice
4) Monitoring compliance of Procedures for Log Identification, Scaling and Reporting
5) Monitoring compliance of Procedures for Exporting Logs
6) Evaluating and auditing projects of review for extension.
7) Applying PNGFA finance accounting systems and procedures in debiting, collections and banking levies on a timely manner.
8) Discharging significant roles and responsibilities in SFM and sustainable levy collection under Timber permit operations.

Subject Topics

The course training in depth covered the following subject topics under monitoring evaluation and reporting of Timber permit operations.

- Thirty – four (34) Steps in acquisition and allocation of forest resources under Timber permit.
- Issuance and cancellation of Licences
- Auditing and Reviewing of Timber permit/ Licences
- Three (3) Tiers planning (5 year, Annual and Set-up Plans) under Planning Monitoring and Control procedures.
- PNG Logging Code of Practice (24 Key Standards)
- Log Identification, scaling and Reporting Requirements
- Log Export Procedures

- Collection of PNGFA Revenues and Levies (Spread Sheet)
- PNGFA Financial procedures and Accounting system
- Roles and Responsibilities, Job Descriptions, EPPA & Agreement, Disciplines and Incentives

Target Group

The training course is designed for Provincial Forest Officers, Inspection Supervisors, Project Supervisors and Monitoring Officers involved in monitoring of Timber permit operations in the selective natural forest logging operations. The participants should have the following pre requisite knowledge skills before attending the training course. The pre requisite knowledge skills are in: Forest Act, Forest Policy & Regulations, National Forest Plans & Guidelines, PNG Logging Code of Practice & Planning Monitoring & Control Procedures, Log Identification, scaling and reporting Requirements, Log Export procedures, Waste assessment Procedures, Use of Spread sheet (Excel Spread Sheet), PNGFA & Government Finance procedures and Accounting system. The participant should also know and be familiar with their job descriptions inorder to discharge their roles and responsibilities to the management expectations.

Course Training Program

The five (5) days training program was divided into classroom lectures, group discussions, activities and presentations. Each group was allowed 5minutes to present group work at the end of each session. The participants were encouraged to shared field experiences with others in classroom sessions, group discussions and presentations. The subject topics covered in the training sessions on each day are as follows.

Monday	Thirty four (34) Steps acquisition and allocation of forest resources
	Issuance and Cancellation of Licences/ Auditing/ Reviewing of projects
	Three (3) Tiers Planning (5 year, Annual Set up Plans)
Tuesday	PNG Logging Code of Practice (24 Key Standards)
	Log Identification Scaling and Reporting
Wednesday	Timber Permit & Project Agreement/ Compliance report/ Log Export Procedures/ Spread sheet producing data information/ Collection export levies
Thursday	PNGFA Finance & Accounting system/ Spread sheet producing data information/ Collection PNGFA revenue & levies under Timber Permit
Friday	Administrative/ Roles & Responsibilities/ Job descriptions/ EPPA/ Disciplines/ Incentives
	Test (Evaluation) participant skills
	Presentation of Certificates
Saturday	Departures

Note: Also refer to the Attachment.

Training Workshop Outcome

Generally the participant should be competent to reinforce the systems and procedures of effective monitoring, evaluation and reporting of selective logging in natural forest through PNG Logging Code of Practices and Planning Monitoring and Control Procedures towards sustainable management of forest and also conduct assessment and collection of charges for PNGFA under Timber Permit conditions. The PNGFA manuals should be used as guidelines in implementing the forest policy and its regulations towards sustainable forest management in selective natural forest logging operation. The participants should now be able to:

- Apply the Thirty – four (34) Steps in acquisition and allocation of forest resources under Timber permit.
- Apply the correct procedures and process of Issuance and cancellation of Licences.
- Apply Forest Act 1991 and its regulations auditing and reviewing Timber permit/ Licences.
- Apply PMC procedures in assessment, evaluation, and endorsement of three (3) Tiers Planning (5 year, Annual and Set-up Plans) in selective logging in natural forest operations.
- Apply PNG Logging Code of Practice (24 Key Standards) in planning, monitoring, evaluation, reporting and closing a Set up operation.
- Apply Log Identification, scaling and Reporting Requirements in generating log harvest summary and collection of PNGFA revenues and levies under Timber Permit conditions.
- Apply Log Export Procedures in authorisation ship loading and collection export levies before releasing shipment of cargo with custom Officers.
- Apply Computer Excel Spread Sheet Programme generating log harvest summary for debiting and collection of PNGFA charges (revenues and levies).
- Apply PNGFA Financial procedures and Accounting system in issuing debit note, collection PNGFA revenues and levies and banking monies into PNGFA Bank Account.
- Apply significant job descriptions enforcing SFM in effective systems and procedures of monitoring, evaluation and reporting of selective logging in natural forest operation and collection charges under Timber Permit conditions on a timely manner.

Trainers

The training course engaged nine (9) experienced senior foresters from PNG Forest Authority Headquarter and the senior Log Harvesting Instructor from Timber Forestry Training College delivered the course training program. These Trainers served their organizations – PNGFA/ TFTC over Ten (10) years and had vast experience on Sustainable Forest Management (SFM) in monitoring, evaluation and reporting of selective logging in natural forest operations through the application of Logging Code of Practice and Planning Monitoring Control Procedures. They also have vast experience in the systems and procedures applied by PNGFA

in assessment and collection of revenues and levies under Timber Permit conditions. Trainers were engaged in the dissemination of the training program were:

1.	Ms Magdalene Maihua	Director Forest Allocation Project
2.	Mr Roy David	Team Leader - Revenue
3.	Mr Lyall Umbo	Acting Principle Field Monitoring Officer
4.	Mr Charles Pakure	Acting Manager Projects
5.	Mr Andrew Aopo	Principle Management Officer
6.	Ms Brenda Kispe	Acting TRP Officer – Southern region
7.	Mr Sarto Inaido	Senior Talent Management Officer
8.	Mr Geno Kini	Senior Technical Training Officer
9.	Mr John Barry Ken	Senior Harvesting Instructor TFTC

Method of Training

The adult training program method was used in delivering the course information. Trainers use forty five (45) minutes classroom lecture discussions follow by group discussion, activities and presentations. The main key points were emphasised to ensure the application of systems, process and procedures in monitoring, evaluation and reporting were understood by participants. The Power-point slides were showed to reinforce all compliances of monitoring, evaluation and reporting requirements must be achieved in monitoring forest operations.

The participants were divided into groups and performed activities and presentations. Each group was allowed 10 minutes to present what have being learned from each session. The group discussion and presentations were exciting because each group was challenge to present collective views and ideas on the applications of systems and procedures learned through lecture discussion. All sessions were back up by handouts and in particular with the PNGFA field operational manuals in monitoring evaluation and reporting of selective natural forest logging operations. Participants shared experiences and make other comments where they think appropriate and beneficial to others participants.

Evaluation Test

After covering all the subject topics, participants were given 1½ hours test on the final day. The 25 test questions added up to 100 marks were driving from the areas of volume calculations, naming species and code, writing specific key standards, forest regulations, financial procedures and process, Timber permit obligations, multiple choices and true false answers in log export and collection of revenues and levies. The participants were challenged by the test to see if they have the know – how to monitor, evaluate and report timber permit operations through effective management system using PNGFA operational manuals. All questions were driven from 10 subject topics covered in the course including Forest Act, Forest Policy & Regulations, National Forest Plans & Guidelines, PNG Logging Code of

Practice & Planning Monitoring & Control Procedures, Log Identification, scaling and reporting Requirements, Log Export procedures, Waste assessment Procedures, Use of Spread sheet (Excel Spread Sheet), PNGFA & Government Finance procedures and Accounting system. The questions were structured to give short answer, multiple choices, true/ false, volume calculation, species identification, 24 key standards, 3 Tier Planning (PMCP), Forest regulations, Timber permit conditions, generating log summary and revenues using Excel spread sheet and roles and responsibilities.

Evaluation Scores

The 70% of the participants scored 70% and above while 30% scored just between 50% - 69%. The test result indicated that those Officers involved in field operations had minimal difficulties enforcing the regulations, systems and guidelines in monitoring of selective logging in natural forest. However those Officers who do not actually participate in field operations had difficulties giving correct answers. They either have no knowledge or never involved in enforcing the rules and regulations.

One major area which everyone needs further mentoring, coaching and training is Excel Spread sheet to generate data processing and sharing the information to collect charges for PNG Forest Authority. This computer programme is new to everyone therefore all field Foresters has to go for the training to use the programme to process data information.

There are also Foresters needs to go for species identification and log volume calculation courses at Timber Forestry Training College. About 30% of the group were not able to translate specie name into scientific names and Trade names into 3 letter specie code. Refer Attachment.

Evaluation Result

The course ended with high note as Thirty seven (37) participants graduated with Attainment Certificate. They are accredited as competent field Officers under the Project – RAFT 3 Activity to enforce effective systems of monitoring, evaluation and reporting of selective logging in natural forest operation under Timber Permit. They have the know - how to enforce monitoring, evaluation and reporting on the 34 steps in acquisition and allocation of forest resource, national logging code of practice with Planning Monitoring Control procedures, log identification scaling and reporting requirement, Log exporting procedures, waste management under sustainable management practices and implement systems and procedures in Finance Account to collect revenues and levies for PNGFA. The onus is now onto them to assess and collect all outstanding revenues and levies for PNGFA starting from now onwards. They are challenged to apply good forest practice to sustain forest resources for now and future generation, deliver monetary benefits and achieve expectations by the management. They are the custodians and with careful planning, monitoring and control procedures, the forest values, cultural heritage and environmental benefits can be achieved through sound Forest Management practices.

Certificates

The 37 Field Officers (participants) successfully completed the 5 days training program and awarded with Attainment Certificates. The Facilitators were also awarded with Attainment Certificate on the recognition of developing the training curriculum and teaching the course program from 22nd - 26th May 2017 at Timber Forestry Training College Lae.

The other reason for awarding Attainment Certificate to Trainers was as part of delivering the training on promoting Sustainable Forest Management (SFM) through implementing effective system of forest Planning Monitoring and Control Procedures (PMCP) with National Logging Code of practice (LCOP) including collection levy charges under Timber Permit conditions. These Trainers have been assessed as competent enough to plan and conduct Sustainable Forest Management training program in the forest industry.

Way Forward/ Recommendations

After conducting the training workshop, strong recommendations made by the training group are:

1. Review log identification, scaling, reporting manuals to accommodate current technology (computer world) and practice in the work place environment. All Logging companies using computers generating/ processing data information (log harvest summary) in comparison to PNGFA still using manual recordings checking and verifying assessment and collection of revenues and levies under Timber Permit conditions.
2. Introduce computer Excel spread sheet to generate log harvest summary in each active projects. Use this programme to verify the data produce by Timber Permit holder before issuing debit note to collect PNGFA charges on a timely manner.
3. Revised job descriptions to cater for significant roles and responsibilities discharge by field Officers in forest operations. The current job descriptions do not really reflect the type of duties (roles & responsibilities) carry out by the monitoring Officers and needs to be revised to significantly change of attitude and boost their morale.
4. Introduce the “Structure” proposed by the Team to consistently collect outstanding levies under Timber Permit operations. The structure should consist of Chief Coordinator base in Headquarter and PS, PFO and AO in the Provinces and regions. This team replaces the Task Force who were proposed by the Authority to collect outstanding levies. This team should carry on with the task and concentrate on collecting outstanding revenues and levies for PNGFA under Timber permit conditions now onwards.
5. All Project Supervisors and Monitoring Officers go through one week Computer Excel spread sheet training program in Port Moresby to undertake the responsibilities of generating processing log harvest summary and to verify and confirm the same information (log summary) produce by Timber Permit holders for payment of PNGFA revenues and levies.
6. Supply Project Supervisors with Computer Laptops to undertake verifying data information (log harvest summary) produced by Timber Permit holder for collection of

revenue and levies. The collection of PNGFA revenues and levies must be on a timely manner to avoid accumulation of outstanding levies under the Timber Permit conditions.

7. After the second training workshop, organize the field evaluation workshop at one central location and evaluate the effectiveness of this two (2) training programme. Discuss any issues/ problems that need to be addressed and solved in implementing effective systems and procedures of monitoring, evaluation and reporting of logging operations and sustainable collection of PNGFA revenues and levies on a timely manner.
8. Brenda Kispe travels with Finance Officer to Provinces to assist set up Computer Excel Spread Sheet programme for generating log harvest information by Field Officers.
9. Sarto Inaido travel with a Field Services Officer to project site to observe and complete job description for PFO, PS and MOs before end of this year.

Attachments

Appendix 1: Course Notes & PPT

Appendix 2: Modules (Curriculum)

Appendix 3: Training program

Appendix 4: Participant Listing

Appendix 5: Participant Attendance

Appendix 6: Budget – Expenditure

Appendix 7: Expenditure Summary

Appendix 8: Evaluation Test

Appendix 9: Example on scores on Evaluation Test

Appendix 1:

Concept Note

Papua New Guinea's forest management system

The National Constitution provides for Papua New Guinea's natural resources and environment to be conserved and used for the collective benefit of us all and be replenished for the benefit of future generations. Our forests play a significant role in the economic, social and environmental well-being of our communities and the government is committed to the pursuit of sustainable forest management for the benefit of current and future generations.

The International Tropical Timber Organisation (ITTO) and the International Union for Conservation of Nature (IUCN) have defined sustainable forest management as: The process of managing forest to achieve one or more clearly specified objectives of management with regard to the production of a continuous flow of desired forest products and services without undue reduction of its inherent values and future productivity and without undesirable effects on the physical and social environments.

PNG's approach to sustainable forest management is laid down in a legal and policy framework, which includes the National Forest Policy 1991, the Forestry Act 1991, the Forestry Regulation 1998, the National Forest Development Guidelines, the National Forest Plan and the Environment Act 2000.

The National Forest Policy recognises the multipurpose nature of the forest resource including environmental conservation, recreation, provision of subsistence and cultural requirements and the supply of timber and other forest products.

The objectives of the Forestry Policy 1991 are to:

- manage, develop and protect the nation's forest resources and environment in such a way as to conserve and renew them as an asset for the succeeding generations; and
- maximise Papua New Guinean participation in the wise use and development of the forest resources as a renewable asset; and
- utilise the nation's forest resources to achieve economic growth, employment creation and industrial and increased 'downstream' processing of the forest resources; and
- encourage scientific study and research into forest resources so as to contribute towards a sound ecological balance, consistent with the national developmental objectives.

The Forestry Act and its Regulations provide that forest roading and logging and all other forestry activities of whatever nature must be undertaken according to the Logging Code of Practice and the Planning, Monitoring and Control Procedures (PMCP) for Natural Forests Selective Logging Operations.

Appendix 2:

Module 1: Monitoring

1.1. Subject: Sustainable Forest Management

1.2. Module Duration: 2 days (16 Hours)

1.3. Module Purpose

The aim of the module is to strengthen the skills and abilities of Field Services Directorate Monitoring Officers of PNGFA in order to effectively and efficiently implement government regulations in managing the county's forest resources sustainably, hence achieving maximum social and economic benefits.

1.4. Pre – Requisites

Participants must have prior knowledge and work experiences of:

- Forest Act, Policy, Regulations and national forest guidelines
- Environment Act and plans
- Planning and Monitoring Control Procedures (PMCP)
- PNG Logging Code of Practice (PNGFA)

- Selective logging in natural forest operations. (Sustainable forest management),
- Basic chainsaw operation harvesting trees
- Basic log identification, scaling and reporting.
- Basic Procedures for log export administration
- Collection of royalty and levies under Timber permit

1.5. Relationship to Competency Standrads

This module is designed to provide participant's concise overview of Sustainable Forest Management (SFM), and it significance in fulfilling the required competencies of the following tasks:

- 34 Steps in Acquisition and allocation of Timber permit
- Planning Monitoring Control Procedures (PMCP)
- Papua New Guinea Logging Code of Practice (PNGLCOP)
- Procedures for the Identification, Scaling and Reporting (including Royalty Self-Assessment) on Logs Harvested from Natural Forest Logging Operations.
- Procedures for Log Exports administration
- Wood Waste Assessment procedures
- Procedures for Timber Permit and Timber Authority Operations
- Assessments and collection of timber royalty and levies under timber permit

1.6. Learning Outcome

a) Allocation process under Timber permit
   - Understand the 34 steps in acquisition and allocation of forest resource under Timber permit
   - Understand the process, issuance and cancellation of Timber permit/ Licence.
   - Understand the basics of Issuance and cancellation of Timber permit/ Licence.
   - Understand the process of audit and extension of Project under FMA dealings.

b) Compliance with Timber Permit
   - Annual Allowable Cut requirement
   - Collection of royalties, levies and charges
   - Infrastructure requirement

c) Compliance with PNGLCOP
   - Understand planning and evaluation of Annual Logging Plan
   - Understand the planning and evaluation of Set-up Plans
   - Understand the evaluation and approval of Set-up plans (requirements)
   - Understand the monitoring of Set-up Operations (requirements)
   - Understand the procedures in Set-up Clearance (requirements)
   - Understand Log Ponds requirements
   - Understand Logging Base Camps requirements
   - Understand forest Safety standards

➢ **Compliance with Procedures for Identification, Scaling and Reporting**
   - Understand the principles of selective logging under Sustainable Forest Management

- Understand the procedures of marking merchantable trees in the set-up plans.
- Understand the procedures of Identification and scaling of logs,
- Understand the measurement of diameter, length and defects of log.
- Understand the procedures in calculation of self-assessment timber royalty and levy collection.
- Understand the log wastage at minimum rate of 0%

➢ **Compliance with Procedures for Exporting Logs**

- Understand the procedures of authorisation ship loading.
- Understand the supervision of scaling discrepancy + - 10% of cargo applied for shipment
- Understand the clearance of shipment after completion the payment of levy payment commitment
- Understand the collection of levy payment before the releasement of shipment with Custom Officers

➢ **Compliance with Environmental requirements**

- Understand the protection and conservation of natural forest production including ecological balance (soils, water resources and biodiversity and flora & fauna).
- Understand the prevention of waste management in logging camps, log pond, shore lines including coral reefs
- Understand the prevention of waste, debris, into protected forest areas etc (only in approved disposal areas).
- Understand the protection of areas (buffer zones) from logging
- Understand the application of CEPA Act in logging operation

1.7. Learning Outcome Details

Learning Outcome 1:

Compliance with Timber Permit to meet projected monetary and development targets

Assessment Criteria

(a) Determine annual allowable cut for each provinces in PNG for a five year period from 2013 to 2017. NFP, FWP Schedule 2;

Option 1: Calculate annual allowable cut

- Determine total net harvestable volume in timber concession area
- Divide that by 34 or 35 years cutting cycle
- Answer will be annual cutting cycle in cubic meters (m^3)

Option 2: Refer to Annual Allowable Cut in National Forest Working Plan

(b) Calculate revenue generation from Forest Working Plan Schedule 4 (FMA)

- Royalty collections
- Log export tax
- Follow up development levy

- Agriculture development levy
- Forest management levy
- PNGFA levy

(c) Check and verify infrastructure requirement of FWP Schedule 5 (FMA). This will be in two folds;

- Additional non- monetary development benefits to includes;
  1) Discounted prices on sawn timber
  2) Agriculture development options
  3) Schools and other houses
  4) Spiritual centres
  5) Law and order
  6) Water supply system tanks
  7) Local business development opportunities.
  8) Telecommunication facilities
- Construction, upgrading and maintenance of roads, bridges and crossings;
  1) National/ Provincial Roads
  2) Feeder roads to the Villages or community(ies)
  3) Schedules and standards of construction of bridges and crossings

Learning Outcome 2:

Compliance with PNGLCOP for the enhancement of sustainable forest management

Assessment Criteria

(a) Check and determine required component information contained in an Annual Logging Plan (ALP) basing on the Five Year Forest Working Plan (5YFWP).

Check list on application components for approval of an Annual Logging Plan which include;

- A covering letter
- Five copies of a bound volume
- A schedule showing planned order of operation
- A schedule detailing roads and water crossings
- A schedule detailing equipment
- A schedule detailing all landowner benefits which are to be delivered during the year
- A schedule on the implementation of the previous year's ALP

(b) Endorsement of ALP;

- PMCP. Attachment 6 – Pro Forma Letter of endorsement by Project supervisor

(c) Check and determine the required information (component) contained in a set-up plan basing on the Annual Logging Plan. Only selected logging set- ups will be dealt with here.

Check list on components of a logging set-up to include;

- A covering letter to PNGFA project Supervisor

- A topographic map (recommended scale map)
- Topographic features and water crosses
- Set up boundaries
- Clan boundaries
- Planned forest roads and water crossings
- Planned skid tracks and water crossings
- Planned log landing
- One copy of a schedule showing results of the 10%
- One copy of schedule showing the result of 100%
- One copy of schedule listing all water crossings and types
- One copy of schedule showing future roads
- A document from the landowners confirming their cultural sites (PMCP)

Attachment 11; landowner cultural site identification form

- One copy of a schedule showing results of the 10% inventory
- One copy of the schedule showing the results of 100% tree marking
- One copy of the schedule listing all the water crossings and their types
- One copy of the schedule showing and future permanent roads
- A document from the landowners confirming their cultural sites PMCP.

(d) Compliance with monitoring of field logging operations requirement;

- Approved Set-up Plan are marked out in the filed
- Application of key standards
- Key standard No: 1
- Key standard No:2
- Key standard No: 3
- Key standard No: 4
- Key standard No: 5
- Key standard No: 6
- Key standard No. 7
- Key standard No. 8
- Key standard No. 9
- Key standard No 10
- Key standard No. 11
- Key standard No. 12
- Key standard No. 13
- Key standard No. 14
- Key standard No. 15
- Key standard No. 16
- Key standard No. 17
- Key standard No. 18
- Check where appropriate that;

1. Forest road and logging crew are familiar with the meanings of the colour tags or paint used to identify natural features and pre-harvesting activities

2. Forest roads, water crossings, skid tracks and log landings are being located as marked in the filed

3. Roads and water crossings are constructed are constructed in accordance with the required standards

4. Areas to be selected from logging are being observed by field operators

5. Areas excluded from logging are being observed by field Officers

(e) Compliance with Set-up Clearance requirement. Apply key standards;

- Key standard No.19 – Decommissioning forest roads
- Key standard No.20 – Remove logging debris from streams
- Key standard No. 21 – Construct water bars on skid tracks and decommissioned roads
- Key standard No.22 - Rip log landings
- Key standard No.23 - Remove rubbish from log landings and roads
- Issue set-up clearance certificate which deactivates the set up. PMCP. Attachment 15. Schedule 1.

(f) Compliance with management on the number of Approved Set-up Plans. Requirements of set-ups as control tool

- Withhold the next set-up plan approval until the previous set up has been completed to the project Supervisor's satisfaction and formally cleared.
- Approve up to three set-up plans
- Approve two extra set-up for wet weather
- Multiple logging crew
- Addition pre-approved set up plans
- Permanent road-line set-up plans

(g) Compliance with Log Ponds requirement. Check components of a log pond to have the following;

- A covering letter
- Three copies of a site plan
- Three copies of a schedule
- A document from the landowners (PMCP.) Attachment 17.

(h) Compliance with Logging Base Camps requirement

- A covering letter
- Three copies of a site plan
- Three copies of a schedule
- A document from the landowners (PMCP). Attachment 1

Learning Outcome 3:

Compliance with procedures for the identification, Scaling and Reporting, including self-assessment on logs harvested to maintain quality.

Assessment Criteria

(a) Only merchantable logs within the specific measurement as per permit are harvested

- Log identification and scaling method
  1. Determine location for log identification and scaling
  2. Determine log trimming
  3. Determine log identification (PNGFA/ SGS Log Tag)
  4. Determine Species identification
- Defect measurements and allowance
  1. Determine Core defects
  2. Determine length defects
  3. Determine type of defects
- Information recorded by licensed scaler
  1. Filling in log scaling record sheet
  2. Log scaling record sheet collection
  3. Calculation of log volume and defect allowance
- Species identification
  1. Species code

(b) Control of log scaling record sheets by Provincial Forest Officer

(What is/ are the process and the procedure or activity?)

(c) Summary of equipment needed

1. Length Tapes
2. Diameter Tapes
3. Supply of PNGFA log tags
4. Staple gun
5. Adequate supply of PNGFA Log scaling record sheet
6. Paint

(d) Scaling checks by PNGFA project Supervisors

(e) Log stacking on the skids

(f) Declaring log harvested and royalty self-assessment

(g) Report to PNGFA Head Office – Revenue Section

Learning Outcome 4:

Compliance with Log Export Procedures to maximize value

Assessment Criteria

(a) Release shipment after completing payment of all levy commitment

- Pre-shipment Inspections
  1. Species identification (100% correct).

     Appendix 7: Statement Of Logs To Be Exported,

     Appendix 10: Notice of Discrepancy at Pre-shipment/Loading,

     Appendix 7: Statement of Logs to be exported
  2. Log volume check (10% must be within ±3.0%

(b) Report shipment not in compliance with levy payment commitment

- Final ship clearance
  1. ±10% volume check by PNGFA Boarding Officer at the Declared Customs Port. Appendix 13: SGS Log Inspection Report, Appendix 5: Information sheet: Log Export.
- Exceptional circumstances
  1. More heavy logs than anticipated captain have all rights to order lower loading limit, for safety reasons.
  2. Larger ships are expected to take additional logs, should there be additional logs immediately available at the site and of species that the Marketing Branch of PNGFA Head Office is able to endorse at the price that is still valid.
- Inconsistency
  1. PNGFA Boarding Officer seeks and grant permission from Marketing Branch of PNGFA Head Office for the variations
  2. Final shipment clearance given in usual manner
- Circumstances of reviewing previously endorsed prices
  1. Volume of species different from log export license
  2. Particular species with more volume than expected, ie; PNGFA endorsing a price of particular specie and later finding out it has increased volume than what endorsed.
- Renew of new price endorsement and export license.
  1. Appendix 6 : Information amendment sheet – Log exports
  2. Appendix 1 : Application for price endorsement for the sale and export

Learning Outcome 5:

Conduct field inspections for a set-up clearance

Assessment Criteria

(a) There are two kinds of set-ups clearance here;

- For permanent road line set-ups

1. All merchantable trees harvested and removed
2. No excessive forest clearance within permanent roading corridor width of 40 meters in width
3. Debris and or soil pushed into the forest edge

- For selecting logging set-ups.
  1. All tagged trees harvested from forest and removed from log landing
  2. No unavoidable wastes
  3. All temporary water crossings removed
  4. Log landings cleared off all logs
  5. Roads not to be used in future properly decommissioned
  6. All rubbish properly collected and disposed
  7. All logging debris removed from streams

(b) Non-compliance of permit requirements are identified and highlighted to the company and corrective actions put in place promptly.

- Set-up clearance procedure

I. Field inspection (.PMCP. Attachment 12. pp7-8)

- Advice on work required if not satisfied
- Further work required
- Inspect corrective measures
- Satisfied then check all waste penalty payments are received if applicable
- No then advice work required
- Further work required
- If all payments completed of payment
- Then issue applicant with 'Certificate of Satisfactory Completion of Work

(c) All inspections must be covered with a report highlighting inconsistencies against requirements and corrective actions taken.

- Set-up clearance procedure (PMCP - attachment 12. P.8)
- Set – up clearance procedure (PMCP – attachment 12. P.9)

2.7. Assessment Strategy

Particular attention will be given on group discussions and presentations with emphasis on issues faced at the work place with respect to sustainable forest management and forest logging operations.

Participants should demonstrate analytical and problem solving skills in discussions and presentations reflecting on real work situations experiences.

2.8. Mode of Delivery

Deliver by classroom exposition with the availability of relevant resource materials including training notes and manuals, which are relevant to the module. Field site visit can also be undertaken.

2.9. Suggested Learning Resources

- Forestman & associates et all (1997). Papua New Guinea Forest Authority. Logging Code Of Practice & Planning and Control Procedures Training Course. (1997). Port Moresby. National Capital District. Papua New Guinea.
- Independent State of Papua New Guinea. (1991). Forestry Act – 1991. Papua New Guinea Forest Authority. Port Moresby. National Capital District. Papua New Guinea.
- Papua New Guinea Forest Authority & Department of Environment and Conservation.(1996). Papua New Guinea Logging Code Of Practice. Waigani. National Capital District. Papua New Guinea.
- Papua New Guinea Forest Authority. (1995). Planning, Monitoring and Control Procedures for Natural Forest Logging Operations under Timber Permit. Port Moresby. National Capital District. Papua New Guinea.
- Papua New Guinea Forest Authority. ( ). Form 1.7.1. Job Description. PNG Forest Authority. Port Moresby. National Capital District. Papua New Guinea.
- Papua New Guinea. (1991). National Forest Policy. Ministry of Forests. Hohola. Port Moresby. National Capital District. Papua New Guinea.
- Field inspection (PMCP), attachment 12d
- Set-up plan approval evaluation procedure. Part 2 : Pre-approved field inspection PMCP), attachment 12 e

(d) Ad-hoc report

- Set-up plan evaluation procedure part 1: reviewed (PMCP), attachment 12 b
- Set up plan evaluation procedure (PMCP), attachment 12 c
  1. Completeness of application
  2. Application satisfying requirements
- Set-up plan approval evaluation procedure : part 2 ; pre-approved field inspection (PMCP), attachment 12d
- Set-up plan approval evaluation procedure. Part 2 : Pre-approved field inspection PMCP), attachment 12 e

Forest Management and Forestry Development in the Philippines

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Profile of Philippine Forest Resources and Biodiversity

The Philippines total land area is about 30 million hectares. These land masses are classified as forest and alienable and disposable lands. The lands classified as forestlands cover around 15.81 million hectares or 52.7 percent, while the alienable and disposable lands encompass 14.19 million hectares or 47.3 percent.

Historically, the Philippines' forest cover was recorded to be at around 21 million hectares back in year 1900s. At that time, the country was still under the Spanish regime where forest policy focused mainly on keeping the Spanish navy supplied with timber. During this period, the population was still small and pressure on forest resources was limited. When the Americans took over the management of our country, more timber were used in the construction of railways and buildings. Also, it was during the American regime when commercial logging and mining started which continued for several decades until the second world war.

Deforestation continued after the war. During this time, the country needed to utilize more of the natural resources to recuperate from the damage and destruction from the war. Forest policy put more emphasis on the production of timber. With the advent of modern mechanized technology in timber production, large areas of forests were heavily exploited, driven by operations of multi-national logging companies, high demand for logs abroad, and the need to increase government revenue. The forest harvests peaked in the 1960s with an average annual rate of deforestation of 100,000 hectares. As a result, forest cover declined to just 10.2 million hectares. By 1990, the country's forests shrunk to only five million hectares, with a mere 800,000 hectares of "virgin" forests remaining.

The result of the forestland cover mapping activity in 2010 showed that the total forest cover of the Philippines was 6,839,718 hectares or 23 percent of the country's total land area of 30 million hectares. Of the total forest covered area, 1,934,032 hectares were closed forest or 28.28 percent; 4,595,154 hectares or 67.18 percent were open forest; and 310,531 hectares or 4.5 percent were mangrove forest. The study was conducted by the Forest Management Bureau and the National Mapping and Resources Information Authority (NAMRIA) using satellite remote sensing data, and using the global standard classification of forests. A similar study was conducted in 2003 and in terms of overall forest cover, the country's forest cover

had decreased by 328,682 hectares from 7,168,400 hectares in 2003 to 6,839,718 hectares in 2010. This represents an annual forest loss of 46,954 hectares.

A DENR and GIZ study published in 2013, Analysis of key drivers of deforestation and forest degradation in the Philippines, interviewed respondents from various sectors (DENR, local government units, peoples' organizations, the Philippine Council for Sustainable Development, traders) in four sites to determine their perceptions as to the direct and indirect drivers of deforestation and forest degradation in the Philippines. The results identified 13 direct drivers under four main categories: Forest Products Extraction, Agricultural Expansion, Infrastructure Expansion and Biophysical Factors.

The thirteen direct drivers are timber harvesting/timber poaching, fuelwood gathering and charcoal making, non-wood forest products extraction, shifting cultivation, conversion of forest land into settlement/resettlement areas and oil-palm and rubber plantations, highland vegetable farming, transport (road construction), mining, markets (wood-processing plants), hydropower dam construction, tourist resort development and biophysical factors (natural causes such as typhoons, earthquakes, landslides, floods, drought, forest fires and climate change).

Among the indirect drivers, weak institutional capacities, weak law enforcement, corruption/collusion and political interference are the likely factors as far as the governance aspect is concerned. Regarding socio-demographics, the most likely factor is increasing numbers of informal settlers in forests and their irresponsible attitudes towards forests. For the economic and market aspect, the main reasons cited are the high demand for wood and limited livelihood options.

Protection Area

The Philippines is one of 17 megadiverse countries in the world that collectively host 60-70 percent of the earth's biodiversity. Conversely, it is also among the 25 global biodiversity hotspots. Managing and protecting biological resources in the country are extremely challenging due to various pressures and threats brought about by unsustainable human activities and in recent years, by the changing climate.

To address this alarming situation, the Philippine government, pursuant to the mandate under Republic Act 7586 or the National Integrated Protected Areas System (NIPAS) Act of 1992, set aside portions of the country's land and water with unique physical and biological significance for establishment as protected areas. These areas are managed to enhance the country's biodiversity and protect them from destructive human activities.

The Philippines has been active in biodiversity conservation. One of the major strategies is the proclamation of biodiversity areas into protected areas by the President through an Executive Order, prior to legislation by Congress into law. As of December 2016, there were 170 proclaimed terrestrial protected area covering about 4.06 million hectares and many are still to be identified for proclamation. In addition, 70 areas were proclaimed as marine protected area covering about 1.38 million hectares.

Of the 240 protected areas included as initial component of NIPAS, only 113 areas are proclaimed protected areas through Presidential Proclamation. The Biodiversity Management Bureau shall be the lead office of the DENR for the systems-wide planning, coordination, policy development, monitoring and evaluation and technical assistance on protected area programs and projects.

Protected areas (PAs) fall under the classification of National Parks under the 1987 Philippine Constitution. Each protected area is managed by a Protected Area Management Board, a multi-sectoral body responsible, among others, for approving policies, plans, programs and projects in the area. A Protected Area Superintendent (PASu), designated by the Department of the Environment and Natural Resources (DENR), takes charge of the day to day operations on site. In few protected areas, local government units take lead in its management.

The management of protected areas in the country faces many challenges. There is a need to integrate protected areas into the wider landscape and development plans and budget cycles of the government both the national and local government units. Also, the government should encourage broader stakeholder support for the protected areas and scale up capacity development and effective management of the protected areas where all decisions made are based on science.

Forestry Industry Development

In terms of forest utilization, specifically with regard to licenses, leases and permits, as of December 2012, there were 4,307 tenure instruments with an aggregate area of 2.9 million hectares. Among the tenure instruments, the Community-Based Forest Management Agreement (CBFMA) had the largest coverage, with a total of 1,888 issuances and an aggregated area of 1.6 million hectares or 55.22 percent of the total tenured area. A total of 1,888 peoples' organizations (POs) were involved in these projects, with 192,090 members. In 2012, only three Timber License Agreements (TLAs) remained with an aggregate area of 177,085 hectares located in Samar (Region 8) and Zamboanga del Norte and Sur (Region 9). However, these licenses have not been operational since 2012. There were 140 Integrated Forest Management Agreements (IFMAs) with a total area of around 1.0 million hectares and 63 Tree Farm Lease Agreements (TFLAs) with a combined area of 6 177 hectares.

In February 2011, the forestry industry in the country experienced a major setback, when the President of the Philippines signed into law, Executive Order No. 23, a moratorium in the harvesting of timber within the natural forests. Through this order, the DENR is prohibited from issuing logging contracts/agreements in all natural and residual forests, such as IFMAs, SIFMAs, CBFMAs and other contracts/agreements with logging components in natural and residual forests. The DENR is likewise prohibited from issuing/renewing tree cutting permits in natural and residual forests nationwide, except for clearing of road right of way by the Department of Public Works and Highway, site preparation for tree plantations, silvicultural treatment and similar activities, provided that all logs derived from the said cutting permits shall be turned over to the DENR for proper disposal.

Tree cutting associated with cultural practices pursuant to the Indigenous Peoples Right Act (IPRA Law) may be allowed only subject to strict compliance with existing guidelines of the DENR. The DENR was also tasked to close and prohibit operations of all sawmills, veneer plants and other wood-processing plants that are unable to present proof of sustainable sources of legally-cut logs for a period of at least five years; and to develop the NGP through the Department of Agriculture-DENR-Department of Agrarian Reform (DA-DENR-DAR) Convergence Initiative.

E.O. 23 also paved the way for the creation of the Anti-Illegal Logging Task Force that enforces the moratorium and leads the anti-illegal logging campaign over the entire country. The Task Force is composed of the DENR Secretary as Chair, and the Secretaries of the Department of Interior and Local Government, Department of National Defense, the Chief of the Philippine National Police and the Chief of the Armed Forces of the Philippines as members.

With the implementation of the moratorium on logging in natural and residual forests, the wood-based industries resorted to wood importation and plantation species. As of 2014, there were only 22 active regular sawmills in the entire country with daily rated capacity of 999 cubic meters; 65 mini-sawmills with daily rated capacity of 903 cubic meters. Also, there are 67 veneer and 37 plywood plants with daily rated capacities of 3,021 and 2,514 cubic meters, respectively.

Before the implementation of E.O. 23, there were 197 illegal-logging hotspot areas (municipalities) nationwide. Together with the intensified forest protection and law enforcement initiatives of the government, the illegal logging hotspot areas have declined to 23 representing a reduction of 88 percent. The remaining illegal-logging hotspot areas are mostly located in the southern part of the Philippines.

With the implementation of E.O. 23, all the 19 logging concessions operating in the natural and residual forests of the country were ordered closed by the DENR; a total of 1 411 illegal logging cases were filed in court with 191 persons convicted (2010-2014 data). In terms of trend in the total volume of apprehension and confiscation of forest products annually, the volume was significantly decreased by 60 percent in 2013 and 63.7 percent in 2014, compared to 2012 data. The significant reduction is attributed to intensified forest protection and the law enforcement initiative of the government.

Forest and Forestry Management Mechanisms

In 1995, the government signed into law Executive Order No. 263 adopting the Community-Based Forest Management (CBFM) as the national strategy towards the sustainable management of the forests in the country. In the past two decades, efforts have been made to bring back the forests and control the rampant illegal activities within the forestlands. Along with this, several approaches and programs have been put in place to do this. The household-based reforestation programs, upland development program, reforestation through social mobilization, among others with the assistance of grants, aids, loans and menial investment from the government.

There are other forest management schemes aside from CBFMP, IFMA, TFLA and TLA still implemented by the government, i.e., Socialized Integrated Forest Management Projects (SIFMP), Forest Land Grazing Management Project (FLGMP), Forest Land Use Agreement (FLAg) and Forest Land Use Agreement for Tourism (FLAgT). These programs and projects aimed at rehabilitating and developing open forest lands and increasing supply of wood and other forest products. The tenurial intruments issued in each program has a duration of 25 years and renewable for another 25 years.

In terms of area coverage, the SIFMP covers about 32,217 hectares which are awarded to 1,529 groups and individuals. This program aimed at developing open and denuded forest lands through the participation of private tree planters. The SIFMA holders shall be granted the privilege to benefit from their tree crops for wood production, non-timber species and other cash crops that may be interplanted.

In the year 2011, two (2) of the major issuance focused on the protection of the existing forests and the country's largest reforestation program embodied in Executive Orders No. 23 and 26, respectively. Executive Order No. 23 is the moratorium of logging in natural and residual forests. While Executive Order No. 26 or what is popularly known as the National Greening Program (NGP) aims to grow 1.5 billion trees in 1.5 million hectares nationwide within a period of six years, from 2011 to 2016. The planting, protection and forest rehabilitation activities being undertaken under the NGP is expected to improve forest cover in the country if initial accomplishments are sustained.

For year 2016 alone, NGP was able to report a total of 619,970 jobs were generated, 282,091 ha planted with 410,906,574 seedlings or an equivalent of 114% accomplishment in terms of area and 99% in terms of seedlings planted under the Program. As of December 28, 2016, a total of 1,660,231 ha have been covered from 2011 until 2016 from an actual target of 1,447,683 ha or an equivalent of 115% accomplishment. On the other hand, seedlings planted amounted to a total of 1,365,105,165 from 2011 until 2016. Jobs generated for the entire six years of implementation amounted to 3,798,255.

Aside from being just a reforestation program, NGP aims to address poverty, food security, environmental stability, biodiversity conservation and climate change mitigation and adaptation.

Considering that this is the first major investment of the government in the rehabilitation of our forests and forestlands there are several challenges and major hurdles in its implementation. This includes the issue on accountability, transparency, reportability, among others which have been continuously up to this date being improved. The Forest Management Bureau (FMB) played a major role in justifying the budget proposal on NGP and conduct monitoring to address policy-related issues and concerns on implementation, including of the maintenance of the NGP website for transparency. The Bureau developed the good governance measures and implementation of safeguards (submission of GIS map and geotagged photos, coding of planting sites and issuance of tree plantation certification duly signed by Regional Directors (RD), Assistant Regional Directors (ARDs), Provincial

Environment Natural Resources Officers, Community Environment Natural Resources Officers, etc.). In addition, the FMB has been vital in the issuance of policies and guidelines for the NGP.

The final year of implementation of the National Greening Program saw a reduction in budget from Php 10.191 Billion to Php 8.161 Billion based on the General Appropriations Act of 2016. This however did not dampen the energy to pursue the attainment of the remaining targets of the Program. The budget cut was the main agenda of the Regional Strategic Planning Workshop for the Luzon, Visayas and Mindanao clusters held in January 2016 with discussions that focused on strategies and measures to achieve the targets. The activity also identified issues, concerns and recommendations as well as next steps beyond 2016.

Forestry Scientific and Research System

During the reorganization of the DENR in 1987, there was an office that was created, the Ecosystems Research and Development Bureau (ERDB), to assist the DENR and interested parties who need technical or researched-based information pertaining to the forest, grasslands and degraded areas, upland farms, coastal zone and freshwater areas, and urban ecosystem. It is the DENR's research and development (R&D) arm which aimed at generating technologies and provide technical assistance in research development of technologies relevant to the sustainable use of the country's ecosystems and natural resources.

In 2015, the bureau was rationalized and its regional offices were collapsed into five (5) clusters, i.e.,1) Watershed and Water Resources Research Center (WWRRC); 2) Land Management, Agroforestry and Upland Farming Technology Research Center (LMAUFTRC); 3) Biodiversity, Coastal Wetlands and Ecotourism Research Center (BCWERC); 4) Mining and Degraded Areas Rehabilitation Research Center (MDARRC); 5) Forest and Timber Resources Research Center (FTRRC) and 6) Urban, Toxic Substance and Hazardous Waste Research Center (UTSHWRC)

Watershed and Water Resources and Research Center (WWRRC) aimed at providing relevant water and watershed resources technology and information through research towards sustainability and enhanced productivity of the natural resources and protection of the environment for the improvement of lives of Filipino people. This center merges research service of four DENR Regional Offices in Northern Philippines (Region 1, 2, 3 and the Cordillera Administrative Region).

Land Management, Agroforestry and Upland Farming Technology Research Center (LMAUFTRC) focuses on the conduct of action research and to implement technology commercialization along the lines of land management, agroforestry systems and upland farming practices. It merges three research services of the DENR in the southern part of Luzon including the island of Palawan.

Mining and Degraded Areas Rehabilitation Research Center (MDARRC) core function is to plan, formulate and implement research, development and extension programs, projects and

activities including generation and transfer of technologies related to rehabilitation and management of mining and degraded areas.

UTSHWRC is based at the National Capital Region (NCR) and caters research, development and extension works related to management of urban ecosystem, management of toxic substances and hazardous waste and generation of best practices for the abatement of pollution in the metropolis.

Forestry Education System

The forestry profession is considered one of the oldest professions in the Philippines. It dates back to an era when the Spanish government organized in the Philippines a forestry service known as the "Inspeccion General de Montes" under the Direccion General de Administracion Civil" with personnel from the forest service in Spain.

However, forestry education in the Philippines dates only from 1910. The first forestry school was at the University of the Philippines Los Banos. Its first objective was the training of Rangers for the Philippine Bureau of Forestry. A four-year course, Bachelor of Science in Forestry (BSF) was later on offered.

In the 1960s, the Society of Filipino Forester, which was organized in 1948, made strong representation in Congress for the passage of the Forestry Modernization Bill. On June 19, 1971, their efforts paid off when the President of Philippines signed into law Republic Act No.6239 or "The Forestry Profession Law". A Board of Foresters was created and required all college forestry graduates to take a licensure examination to become a registered forester in the Philippines.

As to date, there are 54 schools, universities and colleges nationwide offering the forestry course, i.e., Bachelor of Science in Forestry. However, in several schools, a variant forestry course is being offered, i.e., Bachelor of Science in Agroforestry. Most of the schools are government owned and administered.

A number of institutions like the Development Academy of the Philippines are developing educational programs for DENR implementers in protected areas in the implementation of biodiversity conservation and management, ecotourism planning and management, and related courses.

An overview of Forest rehabilitation and management in Sri Lanka

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Abstract: Sri Lanka is a tropical island in the Indian ocean, with a geographical area of 65,610 km^2. The climate shows variations across the country mainly due to differences in rainfall and elevation. Generally three broad climatic regions are recognized in the country: the wet zone, dry zone and intermediate zone. The land is used for wide range of agricultural and non agricultural uses. The total forest cover in the country is 29.7 percent of the total land area. The sparsely used crop lands, homesteads and paddy occupy the highest land area in the agriculture sector. It occupies about 36 percent while plantation crops mainly tea, rubber and coconut covers 11 percent of the total land area.

Sri Lanka is currently facing the challenge of deforestation and forest degradation due to several reasons such as large scale agricultural and settlement projects, shifting cultivation, excessive harvesting of timber in the past, encroachments, inappropriate land use trends, illicit felling, illicit gem mining, forest fires, overharvesting of non-wood forest products, invasive species and cattle damage etc.

With the limited knowledge some efforts have been taken by the forest department of Sri Lanka to restore and rehabilitate the degraded forest areas. Department of Wildlife Conservation, Plantation Companies, Private sector organizations, Non Government organizations, Rural communities are the major stakeholders who give their corporation in this restoration and rehabilitation programme.

Forest department started this programme in 2014 and around 9600 hectares of degraded forests are now under the ongoing restoration activities. Removal of invasive species, protection of land from fires, Protection of the land from cattle and other human interventions, establishment of seeds and scattered tree planting are the main interventions carried out in the field. Forest department face a range of challenges and constraints in carrying out the field activities and identified some issues to be addressed in future operations. Lack of knowledge and experience in restoration activities, slow growth of naturally established seedlings, low survival rate of planted native seedlings, inadaptability of selected native species to the severe site conditions, difficulties of obtaining community support and lack of funds are some of them.

Improvement of silivicultural practices, obtaining more community participation, conducting researches, conducting awareness and training programmes, adoption of proper land and

species selection procedures, introduction of new techniques etc. can be recognized as some of the areas to be considered in the future.

Introduction

Key Features

Sri Lanka is located in the Indian Ocean about 80 km south east to the Indian subcontinent, lying between 50 55' and 90 51' North latitudes and between 790 42' and 810 53' east longitudes. It comprises a mainland of area 65,610 km2 including 2,900 km2 of inland water bodies and several small islands. The south-central part of the country is mountainous, while the rest of the country is mostly flat undulating land. The country has a coast line of about 1,585km, comprising sandy beaches and sand dunes, dotted with many lagoons, estuaries, mangroves and deltas. There are altogether 103 rivers spread around the country.

The topographical features of the country strongly affect the spatial patterns of winds, seasonal rainfall, temperature, relative humidity. The mean annual rainfall varies from under 900 mm in the driest parts to over 5000 mm in the wettest parts of the country. Depending on the total annual rainfall, the island has been divided into 3 climatic zones namely Wet zone, Intermediate zone and the Dry zone. The mean annual temperature of the island 27 0C with the values varying between 35 0C in the lowlands and about 15 0C in the central highlands.

Sri Lanka is a lower middle –income country with a total population of 20.7 million and the rate of growth is 1.0 %. The population density of the country is 310 heads per square kilometer. The wet zone districts show very high densities while dry zone districts show lower densities. Following 30 years of civil war that ended in 2009, Sri Lanka's economy grew at an average 6.7 percent during 2010-2014. In 2014, the service sector accounted for 63 percent of Gross Domestic Product (GDP), followed by manufacturing (29 percent) and agriculture (8 percent). Per capita GDP reached US$ 3,811 in 2014. The national poverty head count ratio has been declined from 15.3 percent in 2006/07 to 6.7 percent in 2012/13. Much of the poverty reduction was driven by the reduction in rural poverty.

Degradation of Lands

Land Degradation in Rubber Plantations

Total rubber cultivated area in the country is around 198,500 ha. Rubber needs high soil moisture and it is traditionally grown in high rainfall areas which are below elevation of 300m on lands up to average slope of 15 – 20%. Closed canopy of the crop, leguminous cover crops grown and mechanical soil conservation measures adopted reduce the soil erosion of this crop to minimal levels that are comparable to erosion in natural forests. However, when old rubber stands are cleared for replanting, soil is exposed to rainfall and severe erosion can take place. Similar situations are experienced in young plantations until cover crop is established and tree canopy is formed. However, degradation of lands under rubber is considered to be very low.

Land Degradation in Coconut Plantations

Coconut plantations are generally located in lands with very mild slopes. Further, the soil is covered with grass or weeds most of the time. The soils are degraded with respect to their fertility state despite the low erosion status in the coconut lands. This situation warrants introduction of better nutrient management program to maintain the soil fertility of the coconut lands.

Land Degradation in Tea Plantation

Experimental results have shown that soil degradation in tea lands was high in low and mid elevations compared to that of high elevations. Reduction in soil depth (due to erosion) &organic carbon content and increase in percent gravel content in soils in the low elevations tea fields were significantly high compared to that of high elevation tea lands. Soil erosion and fertility decline are the main degradation processes.

Land Degradation in Livestock Sector

Livestock sector plays a very important role related to the economy of the country. Most of the poverty alleviation programs operated in the rural areas include a livestock component. Cattle, buffalo, poultry, swine and goat are the main livestock farming in the country. The total cattle and buffalo population of the country in 2015 is 1.4 million while sheeps and goats accounts for 0.3 million. Cattle, buffalo and goat rearing use lands extensively compared to poultry and swine farming. In most cases specially in the dry and intermediate zones the cattle and buffaloes are allowed for free grazing in the open forest areas leading to over grazing which leads to land degradation.

Degradation of Forest Lands

Forest occupies 29.7% of the total land area of the country according to 2010 estimates and distribution of the forest cover in Sri Lanka in main climatic regions shows in Figure 1. Despite the protection efforts by the FD and DWC illegal activities such as gem mining, felling of trees and sand mining from streams are reported to take place in forest lands. Forest fires are also very common incidents in the country. Illicit felling of trees is done by local people living around forest boundaries for firewood or for their daily timber needs. The plantation workers living around the forests in mid and up country area remove undergrowth bushes and small plants for firewood.

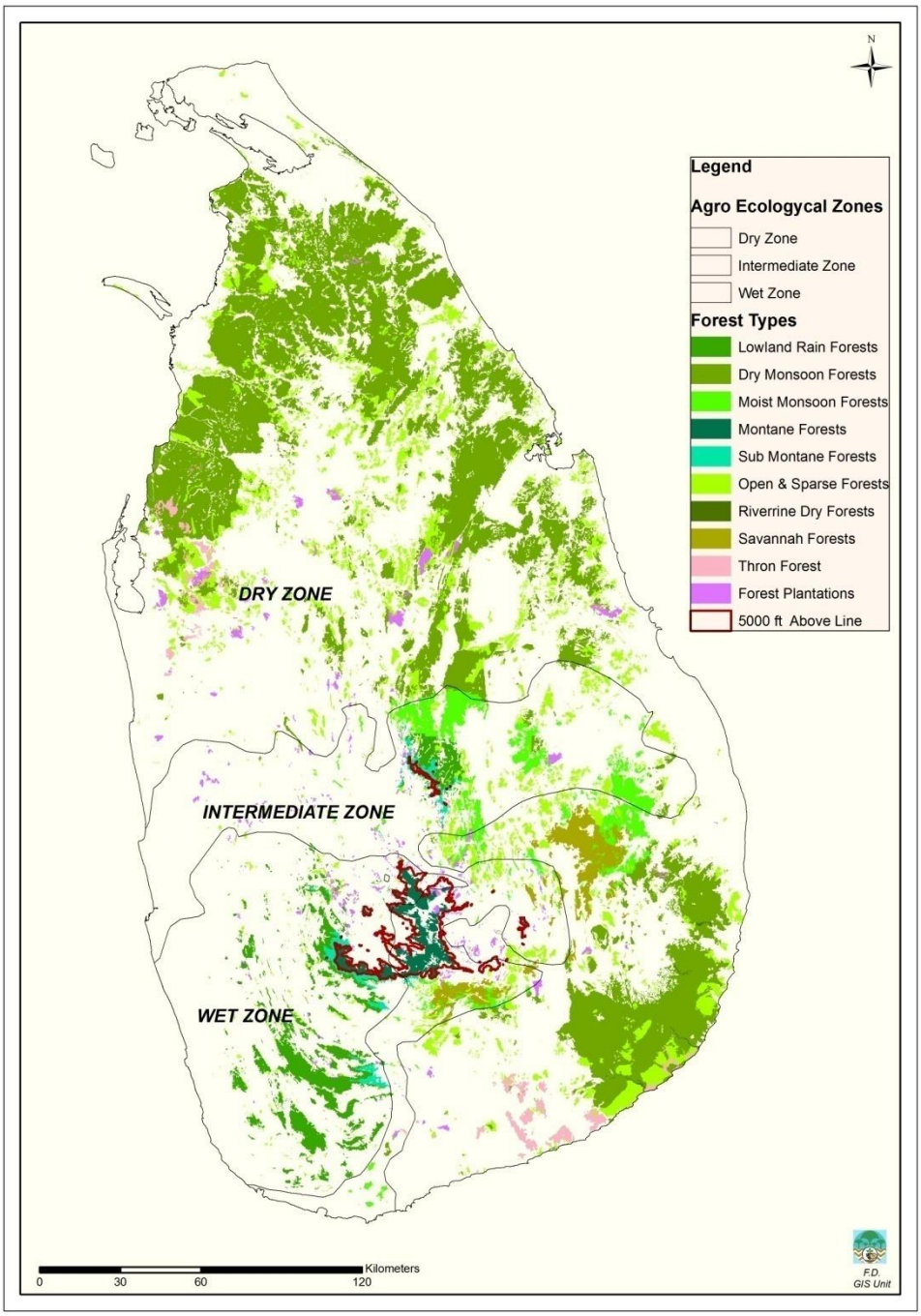

Fig.1: Forest cover map of Sri Lanka (2010)

Occasionally, there are organized gangs who illegally remove trees for timber. These activities and occurrences result in degradation of the forests.

The forest degradation takes place in the form of reduction of canopy cover and reduced plant density. The consequences as evidence from the field are reduction in water infiltration in to the soil, reduction of biodiversity, increased soil erosion, soil fertility decline, increased scarcity of wood, including fuel wood, reduced dry weather flows, siltation of irrigation and hydropower reservoirs and reduced carbon sequestration in the forests.

The dominant irrigations systems for paddy cultivation in the mid and up country area are the anicut (weir) systems which depend on seepage and runoff water from these forests. Since recent times it is observed that large tracts of paddy lands under these irrigation systems in many areas have been abandoned due to insufficient discharge from the forests. The reduction of forest area and degradation of them have been cited as a reason for this reduction. The people living in the area complain that unlike before at present water flow in the streams dry up soon following rains. The problem is aggravated by the effects of climate change. The degradations aspects of these forests have not been properly studied hence sufficient information on degree, extents and impacts of the degradation is not available. Map of degraded forest lands is shown in Figure 2.

State of Land Degradation

The land comprises of many ecosystems. These ecosystems have specific functions which are very vital for the sustenance of the land productivity. These ecosystem functions are affected by natural processes or human activities causing degradation of lands. It has been identified 12 processes of soil degradation in the country which are associated with land degradation (Nayakekorala in 1998). Those are soil erosion, fertility decline, dystrification, eutophication, salinization, sealing and crusting of soil, compaction, water logging, soil subsidence, aridification, pollution and conversion of agricultural lands/loss of agricultural lands. In addition to the above processes, excessive ground water extraction and water pollution have been identified as important degradation processes. Soil erosion and fertility decline are the most widely spread land degradation process among them.

Some of the land degradation processes mentioned above may take place under natural conditions while they are accelerated by human activities. there are no comprehensive studies conducted to ascertain the root causes of land degradation in the country. However, a few studies conducted so far reveal the reasons for behavior of people to cause land degradation to some extent. Ignorance of land users on cause and effects, unfavorable land tenancy conditions, low farm income (poverty), pressure for lands, unfavorable political environment, week institutional framework, weak law enforcement efforts and incompatible economic policies have been reported as root causes of land degradation in many instances.

About 120,000 hectares of degraded forest areas have been identified all over the island which can be restored in the future (Figure 3).

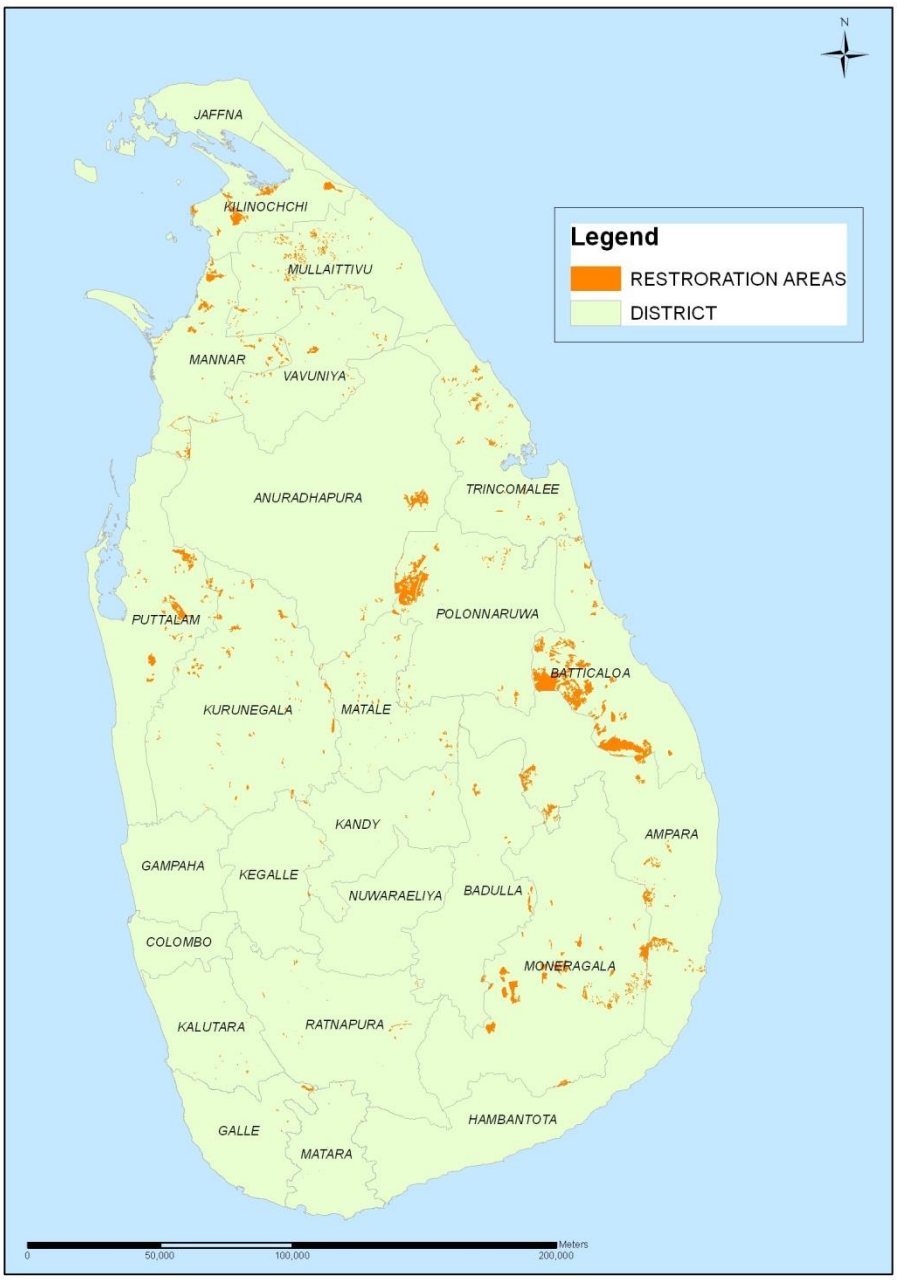

Figure 3. Degraded forest areas

History of Forest Restoration Efforts

A Forest rehabilitation and restoration progrmme was commenced in 2014 by Forest Department of Sri Lanka to enhance the forest area and to improve the quality of the forests. Forest Department expects to increase the forest cover from existing 29.7 percent by rehabilitating and restoring of degraded 60,000 ha of forest lands to achieve the national target of 32% forest cover by 2030. Under the forest restoration and rehabilitation programme around 9600 of degraded forest lands are being restored and rehabilitated from 2014 to 2016.

This programme is implemented island wide covering dry zone and wet zone and intermediate zone.

Key Elements Related to Forest Restoration

Policy, Legal and Institutional Issues

National forest policy of Sri Lanka has three policy objectives. The first objective is to conserve forests for posterity, with particular regards to biodiversity, soils, water and historical, cultural, religious and aesthetic values. According to the policy, degraded forests lands will be rehabilitated as forests for conservation and multiple use production where it is economically and technically feasible, mainly for the benefit of local people. In addition, Government of Sri Lanka has set a target to increase the forest cover up to 32% of the total land area of the country.

Sri Lanka National Agricultural Policy aims to increase the agricultural productivity through the application of sustainable management practices. The same policy promotes maximum use of degraded, barren and infertile lands as well as lands under shifting cultivation to ensure higher productivity and idle lands to be used to crop/forest cultivation and animal husbandry. Since shifting cultivation is a cause of deforestation, this policy can have negative effect on forests. However, use of idling lands for forest cultivation has a positive effect on forestry.

There is a demand for lands for development, settlements and village expansion. Demand for degraded forests from development sector is high since degraded forests do not consist of large trees and good vegetation. Further, developers do not recognize a regenerating forest but instead see an economic opportunity in the form of apparently unused and unoccupied wasteland. This is a severe threat for forest rehabilitation.

Institutional Aspects

Forest Department is the main government agency responsible for Forest Restoration while Department of Wildlife conservation responsible for improvements of wildlife habitats. Estate Plantation Sector (Tea, Rubber and Coconut) do reforestation activities on their unproductive lands under crop diversification programmes. All these organizations have technical capacity and human resource for reforestation. However, knowledge in forest restoration and rehabilitation is limited.

Involvement of Key Stake Holders

Key stakeholders are Forest Department, Department of Wildlife Conservation and Estate Plantation Companies. The other stakeholders are rural communities who are living adjoining to degraded forest areas and shifting cultivators. They have negative influence over the restoration programmes. Private sector organizations are also important stakeholders of this programme since they expect to restore degraded forest lands to compensate the damages to the environment. Environmental NGOs are the other supporting stake holders. The restoration programme involve all these stakeholders in the implementation of the programme. Local communities are consulted in selecting the land and they involve in implementing the

programme. Some of the restoration programmes are implemented with the participation of private sector organizations.

Technology Deployed For Rehabilitation In Different Situations

There are different ways to improve degraded lands. They are Ecological Restoration, Rehabilitation and Reclamation. Lamb and Gilmour (2003) define above terms as follows.

Reclamation: Recovery of productivity at a degraded site using mostly exotic tree species. Species monocultures are often used. Original biodiversity is not recovered but protective function and many of the original ecological services may be re-established.

Rehabilitation: Re-establishing the productivity and some, but not necessarily all, of the plant and animal species originally present. For ecological or economic reasons the new forest may include species not originally present. In time, the original forest's protective function and ecological services may be re-established.

Ecological Restoration: Re-establishing the structure, productivity and species diversity of the forest originally present. In time, ecological processes and functions will match those of the original forest.

Lamb and Gilmour (2003) described the difference between approaches as illustrated in Figure 4.

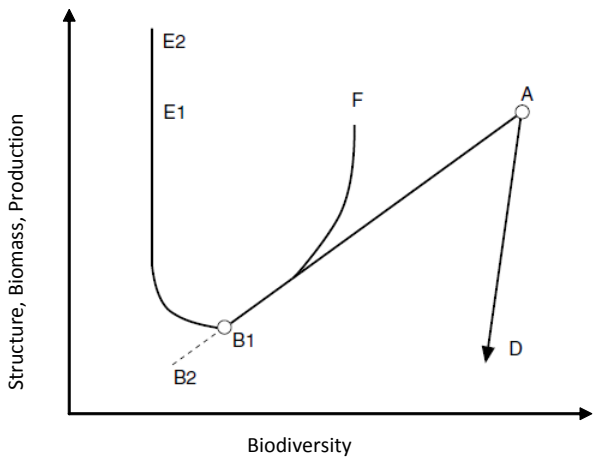

Figure 4 . Ecological restoration, rehabilitation and reclamation

In the absence of human intervention the degraded forest may gradually recover and species richness and biomass will improve slowly towards its original condition (B1 to A in Figure 4). The rate at which this occurs depends on the speed with which species are able to colonize the site; it might be accelerated by human intervention (i.e. restoration). Alternatively, recurrent disturbances (e.g. wildfires or grazing) may further degrade the system and more species may be lost, pushing the system towards point From B1 to B2. Reclamation is represented by point E, where a tree plantation or crop monoculture has been established. This may have recovered the original biomass (E1) or perhaps even exceeded it (E2) because of site preparation and fertilizer use. Rehabilitation is represented by point F. In this case structure and biomass and

some, but not all, of the original species richness have been recovered. Each of these three alternatives (A, F or E) might, theoretically, be applied to any of the several forms of degraded lands (Lamb and Gilmour,2003)

The objective of the forest restoration is to improve the productivity and species composition of the degraded forest in to its original status. Interventions to be carried out depend on the severity of degradation. These guidelines provide two approaches for restoration of degraded forest lands.

1) Restoration of highly degraded forests

Bare lands or grasslands without any other vegetation such as shrubs or trees, will be identified as highly degraded forests. No natural regeneration can be expected on these lands.

The land should be surveyed and mapped before starting interventions. At least 600 seedlings of local species should be planted and the size of the planting whole should be 1ftx1ftx1ft. If there are naturally regenerated seedlings on the land, these seedlings should be cared and their growth should be promoted. There should be a plan to protect the land from forest fire. All planted and naturally regenerated seedlings should be managed at least for three years.

2) Restoration of moderately degraded forests.

Degraded forests with sparsely occupied trees and shrubs which are located in closer to seed source should be selected as moderately degraded forest. These lands have the potential to regenerate naturally. Following steps to be followed for restoration of these lands

Step 1: The land should be surveyed and mapped.

Step 2: Establishment of baseline. Existing vegetation should be assessed using samples and status should be recorded. (One sample for four hectares). Photos should be taken at the beginning.

Step 3: Divisional Forest Officer should identify treatments to restore the lands using the information generated by the sample survey and field observation. Followings are the recommended interventions.

- Removal of the obstacles for the growth of the saplings, established seedlings and un established seedlings.
- Removal of invasive species.
- Protection of land from fires. Establishment of fire belt or employment of forest watcher or both can be done to protect the land from fire.
- Protection of the land from cattle and other human interventions.
- Establishment of seeds after doing required soil work.
- If there is an area that needs planting of seedlings, scattered tree planting can be done.
- Establishment of sign board to indicate the land is under forest restoration.
- Continuous record keeping. All interventions and observations should be recorded.
- Photo monitoring.

3) The land should be managed at least for three years

Key Interventions Used in Restoration/Rehabilitation Programme

a) Fire Protection

Fire is the main cause of degradation in this land so intensive fire protection programme was implemented. Places where fire originates were identified and fire line was established covering the area. The width of the fire line is 10m and all the grass was removed completely (Figure 5). The length of the fire line depends on the extent of the forest. The fire line is cleared once a year during the dry season. The villages around the area were informed to be vigilant over the fire occurrence. Forest officers were vigilant about the fire occurrences.

Figure 5. Fire Line

b) Promotion of the growth of young seedlings

There are young seedlings on the degraded land but they cannot grow and establish well due to fire damages and disturbances of grass cover. The grass densely occurs on the land (Figure 6) it suppresses the growth of young seedlings by limiting availability of light, moisture and nutrient to seedlings. Grass were pressed and bent on the ground in order to control them. Since it was not successful grass were up rooted and burnt. It was successful and Figure 7 shows area where grass was uprooted. In addition other invasive species were controlled to promote the growth of the young seedlings.

Figure 6. Grass cover of the land

Figure 7. Grass removed area

c) Scattered tree planting

Planting of small number of trees was done in places where there were no seedlings to grow. Locally available species were planted. Selection of species was done by examining species

availability of forest areas closer to the land and by consultation of key informants who know the history of the land.

d) Direst Seeding

The rate of natural succession is limited by the slow dispersal of seed on the land. Therefore, to accelerate the successions, deliberate reintroduction of seeds is done. Seeds were placed after removing the grass and loosing the soil in patches of one meter diameter.

e) Educate adjoining people

In addition to above technical interventions, Forest Department informs adjoining people about the programme and obtains their support for this. This was done using informal meetings and home visits.

f) Monitoring

The performance of the programme is monitored continuously. Forest officers visit the land at frequent intervals to observe the growth of the seedlings and growth of the grass. In addition, the performance is compared to the baseline also. At the beginning samples were taken from each sites to establish the baseline and these samples will be revisited and study the species composition after three years from the beginning.

Financial Outlay and Sources of Funding

The restoration program was started in 2014 and has been continued during last three years by the Forest Department through its own initiative with the annually allocated treasury funds. However, due to the limitation of funds, the Forest Department is looking for external source of funds for successful implementation of the restoration programme. Forest Department has applied very recently to Department of Environment, Food and Rural Affairs (DEFRA) of England and Green Climate Fund for additional funding.

Annual Outlay on Restoration of Degraded Forests

The areas under forest restoration programme from 2014 are given in the table below.

Year	Area (ha)
2014	4271
2015	4890
2016	600

All these areas are under maintenance at present and continuous for another few years depending on the performance of growth. Future allotment of areas for the programme depends on the availability of funds.

Lessons Learnt

The ongoing forest restoration efforts face a range of challenges and constraints relating to biophysical, socio-economic, policy and financial aspects. These include:

- Natural succession and the growth of naturally established seedlings are very slow in dry and intermediate zones;

- In general, the growth and survival rate of planted native seedlings are low, resulting in low returns on investment (with the exception of *Dipterocarpus zeylanicus* in the wet zone);
- Only a limited number of native species are used for planting, most of which seem inadaptable to the severe site conditions including nutrient-poor soils, exposure to sunlight and wind, high temperature, competition with weeds and browsing by wildlife;
- Beyond hiring as laborers, community engagement and participation is not strong (there are plans to improve this aspect as the restored forests mature, and services of local communities could be used to raise tree seedlings for planting, fires protection and for local knowledge in species selection);
- Indigenous knowledge and practices of forest restoration should be documented and best practices should be adopted;
- Monitoring records are kept (in paper format, no digitization of records), but these are quite basic (sampling intensity is low, some key parameters such as carbon and fauna are not included, and remote sensing is not utilized);
- As the records are kept as papers in files, there is greater chance of misplacement or damage of records, which poses threat in monitoring and evaluation of restoration success.
- Some areas require more intensive enrichment planting where natural regeneration is sparse while some areas particularly in the wet zone can be restored with less planting;
- Maintenance activities are sometimes constrained by lack of funds, and maintenance frequency is below optimal;
- The existing guidelines for restoration is general and quite basic, and decision-making on selection of restoration methods and approach largely depends on the field forester's judgment; and
- Control of invasive species (such as *Lantana camara*, *Chromolaena odorata*, and *Clidemia hirta*) will require vigilant maintenance as these species could prevent natural recovery of native species if their growth is unchecked.

The Way Forward

A draft project document on 'Restoration of degraded forests and wildlife ecosystems' has been developed by the FD and submitted to the National Planning Department for approval, in December 2016. Meanwhile, a potential source of funding has been identified through the World Bank and discussions are on-going. The FD and FAO assess its past and current restoration efforts to improve the national forest restoration programme. Following interventions are proposed for future implementation of the programme.

1. Implement an assessment to identify/prioritize landscapes to be restored following the Restoration Opportunities Assessment Methodology (ROAM) framework

An assessment will be implemented to identify and prioritize landscapes to be restored using the ROAM process, which is a flexible framework to rapidly identify and analyze forest

landscape restoration (FLR) potential and locate specific areas of opportunity at a national or sub-national level.

The process will be undertaken by a small core assessment team through collaborative engagement with other experts and stakeholders. The assessment is expected to deliver the following six products:

1) A shortlist of the most relevant and feasible restoration intervention types across the assessment area;
2) Identified priority areas for restoration;
3) Quantified costs and benefits of each intervention type;
4) Estimated values of additional carbon sequestered by these intervention types;
5) A diagnostic of the presence of key success factors and identification of strategies to address major policy, legal and institutional bottlenecks; and
6) Analysis of the finance and resourcing options for restoration in the assessment area.

2. Awareness raising and capacity building

Awareness-raising and capacity building will include the following outputs and activities:

- Communicating the concept of landscape approach to FD staff, officials of other relevant ministries, the general public and local communities;
- Developing and rolling out a comprehensive training package on the best restoration practices, methods and approaches; and
- Compiling detailed guidelines for forest restoration to guide the planning, implementation and monitoring of restoration activities in each ecological zone.

3. Research and development

As previously described in this report, significant investment in research and development is required to further refine restoration approaches and methods to improve its efficiency and effectiveness. Research activities could focus on the following areas:

- Testing of various silvicultural approaches including denser planting of fast-growing species as nurse crops (e.g., Gliricidia to share out the grass and other herbaceous weeds, which at the same time provide nitrogen inputs to the soil);
- Testing different methods for controlling herbaceous weeds, including grass-pressing;
- Testing different maintenance regimes (frequency) to define optimal maintenance procedures;
- Trials involving different soil amendments (mulching, fertilizing and composting natural and planted seedlings, application of leguminous cover crop).
- Research to identify and test a larger number of suitable native species for planting in different ecological zones to be used as enrichment planting and under the framework specie method; and
- Upgrading nurseries (facilities, capacity and practices) to enable production of more diverse and higher quality seedlings to be used in the reforestation program.

4. Upscale implementation of restoration activities and implement appropriate maintenance measures

Restoration activities implemented to date have had some success, but the scale has been relatively small in comparison to the overall restoration target. The proposed project will provide the resources and capacity needed to upscale the implementation of restoration activities through improved technologies, coordination and planning process.

5. Improve monitoring system

The proposed project will develop a robust system for monitoring the success of restoration activities. The monitoring system will:

- Include other key parameters such as carbon stock, presence of fauna, etc.;
- Make use of freely available remote sensing platforms to monitor changes in vegetation;
- Use higher sampling intensity and a more structured approach to point-photo monitoring; and
- Be suitable for reporting under various goals and commitments, including the national forest cover target, relevant NDCs and REDD+ policies and measures (PAMs).

6. Strengthen community engagement

A plan will be developed to strengthen community participation in restoration activities based on stakeholder inputs and socio-economic analysis. Community engagement is one of the key factors in ensuring the long-term success of forest restoration and also explores linking communities to CSR funds from the private sector. Linking restoration to community forestry (farmer's woodlots program) will also be explored.

7. Control invasive species and monitor new invasions

Management of invasive species, both existing ones and new threats, will require implementation of comprehensive measures. Research on control methods, awareness-raising, implementation of field activities to manage invasive species and monitoring of new invasions will be implemented to minimize threats posed by invasive species.

8. Develop sustainable financing for forest restoration

Development of sustainable financing for forest restoration is critical in order to ensure adequate maintenance and to enable sustainable scaling up of restoration activities. Various financing options for forest restoration including payment for environmental services (PES) schemes, national forest funds, private sector partnerships, etc will be explored.

Summary

The ongoing forest restoration programme has identified several challenges during last three years. It is observed that natural succession and the growth of naturally established seedlings are slow in dry and intermediate zones. The growth and survival rate of the most of planted native seedlings are also low. Only a limited number of native species are used for planting, most of which seem inadaptable to the severe site conditions including nutrient-poor soils, exposure to sunlight and wind, high temperature, competition with weeds and browsing by wild animals. Some areas require more intensive enrichment planting where natural

regeneration is sparse while some areas particularly in the wet zone can be restored with less planting. Community engagement and participation in the restoration activities is considerably low. Monitoring and evaluation of restoration programme could be improved further. Maintenance activities are constrained by lack of fund. The existing guidelines for restoration is general and can be improved further.

Following interventions are proposed for future implementation of the programme. An assessment to identify and prioritize landscapes to be restored using the ROAM process is proposed. The process will be undertaken by a small core assessment team through collaborative engagement with other experts and stakeholders. Awareness raising and capacity building have to be considered as an important tool and more attention is required. Significant investment in research and development is required to further refine restoration approaches and methods to improve its efficiency and effectiveness. Improved monitoring system has to be developed for monitoring the success of restoration activities. A plan will have to be developed to strengthen community participation in restoration activities and also ability to link community forestry (farmer's woodlots program) will also have to be explored. Management of invasive species, both existing ones and new threats, will require implementation of comprehensive measures. Development of sustainable financing for forest restoration is critical in order to ensure adequate maintenance and to enable sustainable scaling up of restoration activities and therefore various financing options for forest restoration will have to be explored.

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Abstract: The socio-economic changes in Thailand have shown that the environmental situation continues to be pressured by continued economic growth with huge impact on the environment especially forest resources. Thailand has an area of approximately 323.52 million rai with an area of 102.24 million rai of the forest land or 31.60 percent of the country's land area (As of Office of the Forest Land Management, 2015). From 1973 to 2015, it was found that during the 43 years, the forest area of Thailand decreased by 36,325,893 million rai with an average annual decrease of 844,788.21 rai. The important problems that have the impact on forest land management, deforestation and degradation in Thailand are as follows; (1 hectare = 6.25 rai , 1 acre = 2.5 rai)

1) Proportion of forest area is not appropriate, There is a downward tendency and lack of unity
2) Forest land conflicts are more violent
3) Watershed areas have been compromised and exploited accordingly
4) Wildfire is a major cause of forest degradation and air pollution
5) The forest land is not effectively used, the distribution of land occupation is not appropriate and fair
6) The forest management system is not as effective as it should be
7) The budget for forest management/maintenance is insufficient
8) Inadequate public awareness and cooperation on forest conservation

The government has then set an immediate policy of maintaining the security of the resource base and balancing conservation with sustainable use in order to accelerate the protection and recovery of forest and wildlife conservation areas. Due to the National Forestry Policy, The 11thNational Economic and Social Development Plan sets the target of forest area to achieve 40% of the country's land area, or about 129.41 million rai, with 25% of the total forest area and 15% of the economic forest area within a period of not more than 10 years. The policy then involve relevant agencies to take urgent measures to recover the forest to achieve the said target as divided into 3 phases;

Phase 1 - To stop deforestation and reforestation from intruders to occupy the target within a year

Phase 2 - To manage forest resources effectively and sustainably within 2 years

Phase 3 – To restore/recover targeted forest land nationwide to be completed within 2-10 years

Introduction

Nowadays, forest resources management is still in difficult and complex situation due to the change of the economic and social development factors of the country, more environmental crisis including conflicts on forest land issues that is not resolved sustainably. The overviews of key issues of forest resources and various external factors that have the impact on the management of forest land are as below;

Important Issues of Forest Resources

Proportion of forest area is not appropriate. There is a downward tendency and lack of unity

- Currently, Thailand has approximately 102.24 million rai of forest land or 31.60 percent of the country
- National Forestry Policy as of The 11thNational Economic and Social Development Plan sets the target of 40% of the country's land area, or about 129.41 million rai, with 25% of the total forest area and 15% of the economic forest
- Forest areas are still being destroyed which affect the balance of ecosystems and biodiversity. During the 43 years, the forest area of Thailand decreased by 36,325,893 million rai with the average annual decrease rate of 844,788.21 rai
- The data of the relevant governmental agencies contain unmatched data and lack of consistent data integration with unclear forest and land boundaries defining

Currently, the boundaries between forest and land are unclear that caused overlapping of forest boundaries. This is due to the fact that Thailand has 19 laws related to land use planning, including several cabinet resolutions. As a result, Thailand has a large number of land parities that have different origins in different contexts. In addition, the attached appendix of each document has different scale, resulting in conflicts or incomprehension and some parties may use as an excuse abuse the use of forest areas.

Forest Land Conflicts are More Violent

Because the land is limited but the population and demand for land use are increasing. At present, the increase of Thailand's population has resulted in increasing demand for housing and for some poor farmers who want to increase productivity. Often it is done by expanding the area of the forest by destroying the forest for economic crops such as corn, rubber, and cassava, etc. In addition, the lack of land titles is another source of forest encroachment because farmers have no security of land tenure so lack of attention to develop soil quality, the soil then has deteriorated, reduced yields. This caused the invasion of forest areas as farmers want to expand the new area.

Monoculture agriculture such as maize, rubber and cassava, has made some areas of the forest damaged especially the erosion of soils on sloping and elevated land that caused leaching of sediment into natural water sources, Contamination of chemicals in water sources and pollution from chemicals to farmers. This improper utilization of forest areas with the inappropriate distribution of land holdings causes below conflicts with more violent land use:

- 6,500 cases of forest resources, during 2009-2011, there were 37,954 cases including 113,862 rai of damaged areas which is around THB 6,195,120,769 as damage cause (Royal Forest Department, 2012)
- There are at least 400,000 - 500,000 forest owners that make use of the forest area, accounting for 6-10 million rai (Office of the National Economic and Social Development Board, 2008)

The Watershed Area Was Invaded and Exploited Appropriately

Some of the watershed areas have been over-exploited and inappropriate use of land, which is one of the causes of water shortages, water pollution and natural disasters. In addition, watershed management is lacking in unity and integration. The watershed management approach is also lacking in academic support for decision-making. High soil erosion with low quantity, quality and flow of water make most of the watersheds unsuitable.

Wildfire is a Major Cause of Forest Degradation and Air Pollution

In Thailand, it is often that a forest fire usually occurs during the dry season where the weather is dry and hot. Also, in the dry season, wild weeds or dry leaves are decayed and can easily cause wildfire. Wildfire then can be caused by two factors: human actions and wildfires which can have an impact on forest ecosystem as follows;

1) Destroy small and large trees
2) Soil deterioration, decreasing of soil fertility and soil erosion
3) Make plant disease outbreaks easily as some of the trees were destroyed
4) Stop the trees from growing and cause the wood stiffness
5) Less soil moisture
6) Forest fires are a major cause of urban or community air pollution too which lead to health and environment of the people issue
7) The inappropriate control and management of forest fires according to academic principles has caused the degradation of forest are as such as forest fires in deciduous forests can cause negatively effects of the natural reproduction of the forest and the growth of some plants

The Unsuitable Use of Forest Land and Inappropriate/Unfair Distribution Occupation of Land

1) The quality of soil is in severe and critical level, about 36.32 million rai or 11.22 percent of the country area

2) Land management by various government agencies operates on a non-unity basis, lack of fairness and no solution to landless people problem. This approach is not sustainable while there are about 700,000poor people that still needs the land for living (Office of the National Economic and Social Development Board, 2008)
3) The use of some forest land that is not suitable for the area
4) Possession or use of forest land without permission and the expansion of the city Industrial and commercial areas also hit more agricultural areas that also cause expanding agricultural land into forested areas

The Forest Management System is not as Effective as it Should Be

1) Integration between agencies involved in forest land management including local and community involvement processes are not effective enough
2) The forest management information system is not yet covered and is not linked to socio-economic data such as the land database system and land use and forest destruction including lack of technical support and knowledge
3) Laws on forest resource management are characterized by local resource management, lack of systematic management, or ecological management practices including lack of enforcement Lack, fairness and transparency
4) Inadequate mitigation and control tools of the forest resources of the economic and social development programs

The Budget for Forest Maintenance is Insufficient

The government budget allocated to maintain and prevent deforestation is inadequate when compared to areas under the assigned responsibility of the (Royal Forest Department, Department of National Parks, Wildlife and Plant Conservation and Mission

Public Awareness and Cooperation on Conservation

The awareness of the general public in the forest conservation is still low because of the popularity of furniture made of precious wood such as teak, wood, macadamia and rosewood, etc. This high demand causes the manufacturers to accelerate the pursuit of more wood to meet the needs of buyers. Hence, there is still illegal loggers problem.

Major Causes of Deforestation and Deforestation

Based on important problematic issues of forest resources and the impact on the management of forest land in Thailand, we can then analyze for the main causes of deforestation and forest degradation that due to the current population in the country is increasing and with rapid economic expansion that make people are increasingly demanding to take advantage of the forest in various ways such as housing, loggers for trade utilization and burning of forest areas for agriculture utilization, or for tourism by creating a golf course retreat and buying illegal land for speculation, etc. In addition, the development of country's structures such as dams,

roads and high-voltage wiring are also one of the causes of disruption in a wider area. In summary, the main causes of deforestation and forest degradation are as follows;

Problem 1: Decreasing of the Forest Area

Direct Cause

- Intrusions to forest for agriculture and resort (Changing natural forest areas into agricultural area such as food crops, energy crops and resort construction)
- Development of infrastructure such as agricultural reservoirs, power lines
- Mining

Indirect Cause

- Unclear forest boundaries and land use classification
- Lack of knowledge and awareness about conservation
- Lack of integration between the agencies responsible for the management of forest resources and the environment
- Poverty leads to the forest for their livelihood
- The conflict between conservation policy and the implementation of economic development strategies;
    - The government and private companies that promote food crops and energy crops by offering products assurance which shows as incentives for farmers to hit more forest area
    - Promoting tourism in the natural forest of the national park without control and the capacity of the area
- Unclear and dispute forest land policy and lack of sustainability in practice
- The population increase
- The conflict between the policy of forest conservation with economic development policies
- The concessionaire does not comply with country's policy
- The unclear area of forest and land use classification
- The conflict between the policy of forest conservation with economic development policies

Problem 2: Forest Degradation

Direct Cause

- Illegal logging
- Lack of control of wildfire

Indirect Cause

- Law enforcement is not strong enough
- The expensive trees cause illegal logging issue such as rosewood, teak and so on
- Lack of knowledge and awareness about forest conservation
- The population increase
- Poverty leads to the forest area for their livelihood
- Demand for commercial forestry

Resolving the Reduction of Forest and Degraded Forest Issues

In 2015 – 2016, the government has formulated an immediate policy about maintaining the stability of the resource base and to create a balance between conservation and sustainable use by focusing on protecting and restoring forest resources and conservation areas. The priority is to solve the country's land invasion problem, to expedite the accreditation process rights to land ownership by using information technology systems to support, to ensure the law is up to date and to enforce the law effectively, to manage land holdings registration, to improve the public and private land management mechanism.

Also in 2017, the government has set a goal of protecting forests by conserving more forest areas which accounted for 40 percent of the land area of 129.41 million rai or by dividing the target area for 25% forest conservation and 15% forest economy by 10 years as per below;

1) Community forest (In condition forest) of 19.1 million rai
2) Forest Industry Organization of 1.1 million rai
3) Economy forest (Private) of 3.0 million rai
4) Rubber plantation in the conserved forest area of 3.1 million rai
5) Palm plantation in the conserved forest area of 0.4 million rai
6) Degraded forest areas 3,4,5 of 5.2 million rai
7) Agricultural Land Reform Office (ALRO) and Others of5.0 million rai
8) Private forest (Land ownership) of 8.6 million rai
9) Forest area in the district (70,000 villages/2.5rai x 20 years) of 3.5 million rai

A total of 49.0 million rai (Royal Forest Department, 2017)

The government's policy for relevant authorities to urgently take measures to reclaim the forest to reach the set forest area goal can be divided into 3 phases;

- Phase 1 - To stop deforestation and reforestation from intruders to occupy the target within a year
- Phase 2 - To manage forest resources effectively and sustainably within 2 years

- Phase 3 – To restore/recover targeted forest land nationwide to be completed within 2-10 years

The important policies and measures to resolve forest encroachment issue in the long run, helping to improve the government's land area is called 'scale 1: 4,000' or 'One Map' which will be used for all agencies to solve overlapping of the land issue, can be utilized in formulating policies for the use of natural resources cost-effectively and to reduce inequalities and restore righteousness for all.

To move forward and to conserve and restore forest resources by the government alone is not able to resist the increasing pressures and threats, so one of the factors listed in the master plan in order to fix the destruction of forest resources, the invading forest land and resource and its sustainability, the government has then appointed The Internal Security Operations Command (ISOC) with the Ministry of Environment and Natural Resources to collaborate, to set the strategies and to raise awareness of the country's forests. The working group has determined the incentives scheme for the ecosystem or Payment for Ecosystem Service: PES to boost economic incentives for those who have forest resources conservation and management roles, use of forest resources and also those affected by changes in forest ecosystems.

Financial Mechanisms to Form a New Forest Management: Pay Back the Ecosystem (Payment for Ecosystem Service: PES)

Payment for Ecosystem Service or PES is a concept incorporating economic valuation of natural resources and the environment of the ecosystem, which will encourage people who works, uses or benefits from ecosystems in order to maintain sustainable services provided by ecosystems so that they have high morale and improvement on working and living conditions.

The main principle of the PES is to reward the person or group of people who take care for ecology and natural resources to ensure the sustainability of ecosystem services which can be formed as below;

1) The government pays individuals or groups

2) Private enterprises pay to individuals or groups

3) Community pays to individuals or groups that maintain ecosystem

Elements of the PES consists of 1) Service Providers or Sellers2) People who benefits and services, the environment or Buyers e.g. Water power plant that use the water resource from the river, tourists visiting the tourist attractions and 3) Ecosystem services or the benefits obtained from ecosystems e.g. Environmental service via watershed areas, biodiversity, beauty of the natural resources conservation, reservoirs and carbon sequestration and the preservation of agricultural land.

Financial Mechanisms to Form a New Forest Management: Pay Back the Ecosystem (Payment for Ecosystem Service: PES)

1. Status analysis and utilization of natural resources and the services provided by ecosystems
2. Analysis of the economic value of natural resources and ecology of the pilot areas
3. The measures relating to the conservation and restoration of resources and recruitment to maintain ecosystems and resources, (Service Provider) from stakeholder groups
4. Determination of remuneration to the Service Provider for the care of natural resources and the environment
5. The estimated cost of implementing PES in the pilot areas
6. The agreement on the burden of the Service Provider of the measures taken to conserve natural resources and environment (Monitoring and implementation of the conditions)

To implement PES in the country should pay attention to 3 issues: 1) Attitude of Thai people as owner of resources 2) Creating awareness of the consequences of the destruction of a variety of biological and 3) The cooperation of the agencies involved in finding right people to carry out the set mission

Apart from PES, there is financial mechanism that use for forest management called REDD or Reducing Emission from Deforestation and Forest Degradation in Developing Countries, which is a policy to release greenhouse gases from deforestation and forest degradation in developing countries by using the same principles as PES but is traded internationally as financial instruments that helps balancing forest resources.

In the past, Thailand doesn't apply PES concretely; the office of the National Economic and Social Development Board has then proposed PES in economic and social development plans of no11, but still lack of clear implementation of PES while there is only small study in most countries aiming to test only the theory. Thailand then tries to tailor PES to the context of Thailand in various pilot projects as follows;

PES is based on an idea of Beneficiary-Pays Principle together with Polluter-Pays Principle which should take into account in proper context such as economic and social aspects of the people where people is ready, willing and has the capacity to pay for environmental management. For the case of Thailand, report says that Thai people seems to be ready and is willing to pay the fee in exchange for the services of natural forest ecosystems in order to have sustainability natural resources management in the long run.

PES Project Study Areas

There are 2 case studies in Chiang Mai that use PES mechanisms for managing forest areas;

Case study: The pilot project of Provincial Waterworks Authority, Chiang Mai branch that pays the incentives as per PES to Hua Lao villagers, Toong Jor watershed area, PaPae,

Mae Taeng that they take care of the watershed area of Mae Taeng and Mae Ping. The project was awarded "Thailand PES Award 2015" from the Biodiversity-Based Economy Development Office(Public Organization) as the best pilot project for implementation of PES, reforestation, building and maintaining a weir, preserving ecosystems and the ecological

Case study: The pilot project of DoiInthanon National Park Conservation Fund for sustainable management and development budget in the management of protected areas by using PES to raise funds with various supports from community leaders, small group studies, private entrepreneurs, NGOs, academics and representatives of the villagers

PES case studies in watershed areas of Pa Pae, Mae Taeng district of Chiang is under responsibility of Department of National Parks, Wildlife and Plant Conservation and covers 258 square kilometers. The Karen community living at the watershed area helps to determine the rules on the conservation of natural resources, support to take care of the forest since 1989 trying to help extinguish wildfires, to build ready-made fire line distance of 36 kilometers, covering 9,929 rai.

Later in 2001, the Biodiversity-Based Economy Development Office(Public Organization) has recognized the benefits of ecosystem services from this ToongJor area, the willingness to take care of the conservation of Pakakayor [Karen] to support PES, the Biodiversity-Based Economy Development Office then acts as a central agency to coordinate the benefits from this ecosystem.

Waterworks District 9 Chiang Mai is the main organization that gains most benefit from this project while the Hua Lao villagers at ToongJor district is the owner of the project with various agencies to support such as ToongJor watershed management unit, Mae Lao Mae-Sae Wildlife sanctuaries, Protected Areas Regional Office 16, and the Department of National Parks, Wildlife and Plant Conservation.

For Payment for Ecosystem Service: PES at ToongJor watershed area project represents a total value of 171,575 baht per rai per year, equivalent to 119,280 baht worth of wood per rai per year, Revaluation lowers the temperature 38,967 baht per rai per year, Revaluation absorb carbon dioxide 6,353 baht per rai per year, Protection of benthic 1,800 baht per rai per year, Water services to utilize 4,987 baht per rai per year and to prevent the loss of soil nutrients 198 baht per rai per year (Biodiversity-Based Economy Development Office)

Payment for Ecosystem Service: PES of Waterworks District 9 Chiang Mai since 2013 which was supported by a budget of 170,000 baht for building a weir, maintaining forest in line with fire patrols and forest fire prevention including the 12-month employment of local people to give people a sense of ownership and administrative areas as if people moves out of the area, the capitalism party will come to occupy the area and lead to the invasion and destruction of forests, also a shortage of water problem.

In 2014, Provincial Waterworks Authority, Chiang Mai branch has encouraged local people to continue carrying out activities to conserve the forest, to build the line of fire patrols and forest fire prevention activities include planting Wild Himalayan Cherry trees to prepare the

area as one of the tourist attractions in order to promote income for the Karen community in the future and providing school supplies to children in the community. In 2015Provincial Waterworks Authority, Chiang Mai branch also created the project '1 meter 1 tree' to raise awareness and as a plan to recover the degraded forests.

Payment for Ecosystem Service: PES at ToongJor watershed area project has the advantage providing the incentives to engage the people who benefit from ecosystem, various related sectors which helps contribute to the care of natural resources and environmental sustainability, creating extra income for local people and decrease social problem like moving out to work outside the areas. However, there are some problems and obstacles;1) Objectives of implementing PES are from the community not from the PWA Chiang Mai branch as organization who benefits from ecosystems2) The limitations of the budget and lack of continuity of PES activities that may lead to unsustainable project 3) Thailand has no supporting law in implementation PES, the current operation is based on volunteerism and a sense of responsibility to the natural system. The compensation is only the inspiration to have better resources 4) Lack of a system to monitor and check the activities.

Conservation Trust Fund for DoiInthanon, Chom Thong, Chiang Mai is from cooperation of government agencies, private entrepreneurs, Local community leaders, Educational institution and NGOs in Chiang Mai under the project of Catalyzing Sustainability of Thailand's Protected Area System or CATSPA, a collaborative project between the Department of National Parks, Wildlife and Plant Conservation, The United Nations Development Program (UNDP) in order to optimize the better management of DoiInthanon.

Developing the mechanisms to fund conservation DoiInthanon is another financial mechanisms form to protect the conservation and management of protected areas through fund-driven in both monetary and non-monetary. The committee then creates Business Plan for Protected Area in the DoiInthanon National Park, preparing details for registration as a foundation [Minimum asset not less than 500,000 baht], which is expected to be a registered foundation that can be clarified and transparency soon. The objectives are;

1. To restore the ecosystem of DoiInthanon
2. To promote research and academic development of DoiInthanon National Park
3. To enhance the prevention and repression of DoiInthanon National Park
4. To enhance recreational and tourism facilities
5. To run activities to promote jobs in the local community, reduce the expansion area of farmers to the protected areas

Conservation Trust Fund for DoiInthanonh as strength points that DoiInthanon National Park is widely recognized as a valuable natural resource, the fund was also established by the participation of all sectors, the fund committee was set up mainly for those involved and benefit from the DoiInthanon National Park directly, the strategic financial plan (Business Plan) which is based on an analysis by the National Park Management Plan, the activities of the Fund in accordance with the requirements of DoiInthanon National Park also all related

parties are aware of the importance of gratitude and ecological potential funding from the business sector.

On the other hand, as Conservation Trust Fund for DoiInthanon is only the pilot establishment of conservation in protected areas in Thailand. It then takes time for other private sectors to understand the conservation park while the operation with parks that has strict rules may cause Fund's lack of mobility, Superintendents migration may also affect the level of cooperation to support the implementation of the fund, the future activities then focusing on the business or tourism matters in national parks than other needy activities.

The establishment of the fund in the past are not succeed because of lack of support. Therefore, in order to have sustainable growth of Conservation Trust Fund for DoiInthanon, the Fund Committee must have a plan to raise funds to continuous support the National Park. They need to build trust among donors, fund must be transparent and verifiable. Plus all planning process for implementing activities under the Fund must at all times ensure that all sectors and especially the public sector involved

Conclusion: Financial Mechanisms to Form a New Forest Management: Pay Back the Ecosystem (Payment for Ecosystem Service: PES)

In the past, conservation of natural resources is leaving under the conservatism of government agencies. Despite a steady stream more than a decade of Conservation of Natural Resources and Environment of Thailand, such efforts grow slower than economic growth which leads to the ecological balance of the area problem.

However, there are some economists have begun to turn their attention to the care of the ecosystem seriously and found that the ecosystem is not valued as it should be. The compensation for damage caused to the ecosystem is not quite right. The environmental activities such as community forestry maintenance, Ecotourism and businesses that create degradation to the environment are growing rapidly and continuously but not paying right fee per damages. While the government has a limited budget to maintain the resources, the economists has then called for the valuation of ecosystem fairly and contribute to the damage or benefit must be paid healing environment which comes a mechanism known as Payment for Ecosystem Services or PES.

PES in Thailand is still ion a pilot program not a national mechanism while the international stage has proposed a mechanism such as REDD, Carbon Offset, Access and Benefit Sharing (ABS), which has principles and the goal of creating incentives for conservation like PES. PES is on voluntary mechanism and the private sector may not interest much as they usually use CSR.

PES can be succeed and requires advocacy leaders from both national and local levels, the rules and guidelines must be clear, Willingness to pay by the private and public sectors, Technical support from international organizations, people capabilities, Support and collaboration of all sectors involved. However, the lessons learned from pilot projects in different areas are operational problems including the uncertainty of resource ownership, the

market for buyers and sellers, cost management, the problem-oriented technique like calculating the value of ecosystem services, which needs relevant agencies such as the Department of National Parks, Wildlife and Plant Conservation, Biodiversity-Based Economy Development Office to collaborate and to drive PES mechanism in right directions as per below;

1) Support and encourage conducting more research to build knowledge in valuation, services provided by ecosystems as per correct technical basis in order to support policy decisions and help motivate the community oversees conservation efforts. However, the results of the valuation to be used as a basis for payment by the PES, even if it is accurate and academically but if not with appropriate deployment, criteria for such payments might not be accepted by all parties involved
2) Promote the establishment of a fund for local conservation in various forms, including those relating to the Conservation Fund to appreciate and benefit from the services of ecosystems, voluntarily pay or appropriate entry fee to some attractions, the funds raised for resource and conservation which all management of the fund must be effective and transparent
3) Support the preparation of regulatory measures in the remuneration system, the local ordinances should start and develop a voluntary and mutual agreement between those who benefit and those who maintain the ecosystem since the beginning and for the long run
4) Urge the private sector in bringing PES to operate in the ready area by creating partnerships between stakeholders in the area, both government agencies, private sector, community institutions and international organizations
5) Support the exchange of best practices of PES in the region plus lessons learned from other countries in other regions of the world

The Way Forward

From the current situation of forest area change, the efforts to conserve the forest areas, to recover the area to balance between exploitation and conservation, there are strategies of forest management for 2016- 2020 as per Royal Forest Development as follows;

Strategy 1: Protect the Remaining Forest Area Keeps it Sustainable

Strategy

1) Ensure that forest protection is more effective
2) Enhance the prevention and control of forest fires
3) Ensure right and clear classification of forest land on the basis of public participation
4) Strengthen the information system of forest resources at the national level
5) Ensure appropriate assessment and classification of forests and forest degradation
6) Control and develop appropriate and fair use of forests and forest land

Strategy 2: Solve People in Forest Areas Issue in a Systematic and Fair Way

Strategy

- Prepare database of possession and use of forest land
- Solve the problem of forest land suitable for integration on fair basis and according to law

Strategy 3: Improve and Integrate the Organizational Development and Legal Efficiency

Strategy

- Improve and integrate forest policy to be more unified and effective
- Improve laws and regulations that are the obstacles of the development of forest management
- Prepare master plan for development of the country's forests
- Improve enterprise management system to respond to forest management and forest land effectively
- Promote international cooperation in the management of forest resources and fulfilling its obligations in international timber

Strategy 4: Integrate and Promote the Participation of All Sectors

Strategy

- Support and develop involvement in conservation and management of forests
- Develop and promote effective community forest
- Improve consistency of the community quality of life which align with local natural local resources
- Support the extension and expansion of forest development works as per HM the King’s projects

Strategy 5: Effective Reforestation of Degraded Forests

Strategy

- Ensure effective reforestation of degraded forests
- Encourage and support all sectors to participate in forest restoration and forest degradation issue
- Enhance understanding and awareness of the restored forest
- Increase forest area
- Strengthen international cooperation in restoring forests along the border

Strategy 6: Increase Forest Areas from Outside of the Forest Laws

Strategy

- Promote and support the forest economy
- Promote and support the planting of trees with a higher value to reduce illegal logging in the forest

- Promote and support the integration of the network reforestation
- Increase and improve green areas in cities and towns
- Encourage and support the participation of additional green space
- Develop the standard forest certification

Strategy 7: Promote and Support Research to Improve ihe Management of Forest Resources

Strategy

- Research, develop the technology of forest innovation by integrating all sectors
- Study the forest effectiveness
- Research, develop forest technology transfer effectively

Conclusion and Recommendations

Forest resources have decreased steadily over the last 10 years, the encroachment on forests for farming, the intrusion of capitalism organization then lead to the increasing of complaint against forest resources. Forest encroachment resulted in decreased forest and ecosystem degradation, haze from forest fires especially in the North. The government then issues guidelines for the prevention and suppression of illegal forest encroachment by incorporating rigorous reclaim the forest, managing forest degradation in steep areas as well as encouraging people to co-exist with wildlife, to develop a community forest and help preserve forests, the corrective action for haze and forest fires, the conservation of watersheds and promote reforestation, the promotion and development of new financial mechanisms to tackle the problem of forest encroachment;

The situation of forest resources	Trends in the last 5-10 years
Forest area	Decrease
The number and area of community forest	Inconclusive
Intruded forest area	Increase
Wildfire (the area that was attack by forest fire)	Increase

Guidelines and procedures to increase forest management efficiency are as below;

1) Promote the participation of citizens in the area to live sustainably with forests which needs involvement of the community and economic stability
2) Accelerate adoption of operating results from scale of 1 : 4000 (One Map) to be used that government agencies and the public sectors can help check for its transparent including accelerating the deed under the Land Code to be issued
3) Promote the economic forest with effective forest land use in forest areas. Based on the people and communities can live with the forest and promote the value of ecosystem services that can also generate revenue for conservation
4) Enforce strict law and prosecute offenders.
5) Raise awareness and create a sense of involvement in the surveillance of forest fires in the community. Develop the technology and implement reuse/recycle/residues used in various forms such as raw materials to produce energy or fertility or organic fertilizer
6) Develop the check and balance system for Supply Chain in order to check the right d\document of the area used for planting

Forest Rehabilitation and Management, Viet Nam

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Abstract: Forest rehabilitation and management are challenging long-term attempts that require thoughtful planning, execution and monitoring. The purpose of forest rehabilitation is to restore the capacity of degraded forest land to offer forest products and services. Both forest restoration and forest rehabilitation are implemented on sites or in landscapes where forest loss has caused a drop in the quality of environmental services. They aim to reinforce the resilience of forest sites and landscapes and thereby to keep future land-use and management options open. An emerging concept is forest landscape restoration, an approach to forest restoration that involves stakeholders in all affected land-use sectors as well as participatory decision-making processes. Forest landscape restoration is an approach to managing the dynamic and often complicated interactions between the people, natural resources and land uses that comprise a landscape. It makes use of collaborative approaches to harmonize the many land-use decisions of stakeholders with the aims of restoring ecological integrity and enhancing the development of local communities as they strive to increase and sustain the benefits they derive from the management of their land.

Forest restoration and rehabilitation may be carried out on unproductive or abandoned agricultural land, deforested grasslands, brushlands, scrublands or barren areas, and in understocked or degraded forests. Forests may be restored and rehabilitated by protective measures (e.g. protection from fire or grazing and erosion control), measures to accelerate natural recovery (e.g. through direct seeding or by planting seedlings in degraded primary or secondary forests), methods to assist natural regeneration (e.g. through weed control on degraded lands and marginal agricultural sites), and the planting of native or introduced trees in single-species or mixed-species plantations, in agroforestry production systems and as trees outside forests

In this report, I would live to present the comprehensive results of forest rehabilitation and management process in Viet Nam during the period of several decades

Introduction

To date, global warming is an alarming problem affected seriously the environment and livelihood of human. Fortunately, forest plays a key role in improving environmental conditions as well as protecting people from natural calamities on account of deforestation.

In the past few decades, the loss of forest in Viet Nam has decline severely due to many reasons, including intentional and unintentional activities. In 19th century, Viet Nam suffered

from the two vicious war lasting for long time against French and American empire. A vast of vegetation had disappear accompanied deteriorated biodiversity system. Consequently, bombs, mines, toxic wastes are direct causes affect seriously the environment conditions. Flora and fauna decreased dramatically in number as well as quality. Hundreds of indigenous plans and wild animals have gone forever. Fielding their habitat for industrial and recreational zones. Currently, the needs of improvement for livelihood are the critical concerns of Vietnamese government. That are the real big challenges for the local government to solve these problems.

It requires the balance between environment and economy. For instance, In many recent years, a large demand of power sources for production has been considered carefully by the authorities. Among these energies, hydroelectricity is take precedence over than others. To reach this target, thousands of forest area has been cut down to serve hydroelectric systems. It causes controversies in social community between biologist, researcher, forest ranger and those of business sector for a long time. As a result, some of hydroelectric projects have been suspended indefinitely .In addition, ethnic group living around forest land mainly earn their living in forestry. Their culture and customs have ingrained in the mind, inherited generation by generation. Conspicuously, shifting cultivation damages forest significantly. To deal with this issues, Vietnamese government and researchers have been taking necessary actions to tackle timely consequences for many decades. According to available data, in 1943 Vietnam had 14.3 million ha of natural forests, accounting for 43% of the country's area. Since that time, forest cover has decreased dramatically, especially during the 1976–1990 period. During that period, about 98,000 ha were annually contracted for logging. Forest cover declined to 27.2% in 1990, but increased again to 28% in 1995, as a result of forest protection and rehabilitation programs. This changing trend, however, still meant that from 1991 onward the area of natural forests continued to decline, although at a slower pace than in previous years. The establishment of plantations increased rapidly. As a result, the total forest area first stabilized and then increased. As of 2004, the Vietnam's forest cover had reached 12.3 million ha, or 36.7% of the country's total area. The causes of forest cover decline between 1943 and 1990 are complicated and diverse, and somewhat debated. Currently, forest cover in Viet Nam reached around 40% just within several decades with many forest rehabilitation projects have been carried out nationwide. With the target of covering bare land and restoring poor forest, the activities partially have obtained significant achievement with striking outcomes. Specially, total forest area has been rising up to approximately 13,8 million hectares, focus on natural regeneration, enrichment, plantation, protection etc…., including special use forest, protection forest and production forest account for 2.08 million hectares; 4.56 million hectares; 6.75 million hectares respectively. Obviously, the pace of rehabilitation partially catch up deforestation in the past few decades. However, sustainable management for upcoming years also need to be implemented immediately along with restoration at intercontinental level Therefore, rehabilitation currently to be the most critical mission for every countries all over the world to joint hand together.

Many Commentators Agree on the Following as the Main Causes:

Land conversion for farm land. This includes conversion of forestland by independent agriculturists and conversion for estate crop production. Vietnam accelerated population growth during much of the second half of the 20th century and its persistent poverty levels were factors that contributed to an accelerated need for agricultural land.

Devastation by war, including two anti-invasion wars, from 1945–1954 and 1961– 1975. During these wars Vietnam lost nearly 2 million ha of forests.

- Forest fires.

- Fuel wood and timber over-harvesting by state organizations, but also illegal logging by individuals and units.

-Poor management capacity of the forestry sector and a deficient institutional and legal framework

In Viet Nam, forest rehabilitation first attracted attention in the 1950s and 1960s. At that time, forest rehabilitation solutions were identified as “forest restoration”. By the middle of the 1980s, the concept of “forest restoration” was officially defined as “forest rehabilitation through promoting regeneration”. In the early 1990s, forest rehabilitation measures through natural regeneration were officially promulgated through the following three sector standards:

- Procedures for silvicultural techniques applied to timber and bamboo production forest (QPN 14-92), issued following Decision No. 200/QD-KT on 31/3/1993, Ministry of Forestry.
- Procedures for forest rehabilitation through promoting regeneration combined with additional planting (QPN 21-98), issued following Decision No. 125/QD/BNN/KHCN on 1/11/1998, MARD.
- Temporary regulations on checking and acceptance contract of forest protection and tending, issued following Decision No 162/1999/QD/BNN/PTLN on 10/12/1999, MARD.

These government standards have led to the regeneration of large areas in Viet Nam. A series of surveys in four provinces where Project 327 was carried out for three years (1993-1995) indicated 265000 hectares had been restored and 762 hectares were considered potential areas for rehabilitation. Moreover, survey results from 10 provinces in Northern Viet Nam indicated that an additional 6.7 million hectares need rehabilitation. These areas occupy 2.4 million hectares of primitive forest (36.2 percent), 0.5 million hectares of plantations and about 3.8 million hectares of bare land and denuded hills (56.6 percent). Of these 6.7 million hectares, 2 million hectares have the prospect to be rehabilitated through forest regeneration. During the last two years of Project 327 (1997-1998), and the first two years of Project 661 (1999-2000), about 0.5 million hectares of forest were regenerated in 10 provinces.

Other large regions were also aimed for natural regeneration. Under projects for implementation from 1998-2001, five million hectares of re-afforestation were planned, comprising 2 million hectares of protection and special-use forest and 3 million hectares of

production forest. Overall, one million hectares were targeted for natural regeneration mixed with enrichment planting in the first eight years (1998-2005)

Two main intervention levels have been defined for restoration purposes, namely:

1. Low-level, in which protection is the main activity
2. High-level, which includes the low level intervention and additional interventions depending on the restoration objectives and site requirements.

By 2017, VietNam has a population of roughly 92 million people. Over half of that earn their living on forestry and agriculture sectors.

Table 1. Household incomes from agriculture, forestry and fisheries (%)

Regions	Income from agriculture	Income from forestry	Income from fisheries
Northwest	73.7	23.0	3.3
Northeast	82.3	11.7	6.0
Red River Delta	94.1	0.2	5.7
Northern Central	77.1	7.2	15.7
Southeast Central	59.0	5.2	35.8
Highland	90.6	7.4	2.0
Southeast region	82.2	2.0	15.2
Mekong Delta	75.9	2.1	22.0

According to statistics, aggregate land of use for the three industries occupying around 26 million hectare. Currently, Vietnamese Ministry of Agriculture and Rural Development has been made essential efforts for land use reformation so as to approach the sustainable management through forestry certification. Indeed, the majority of population live dependently on farming and forestry despite the fact that farming land have destroyed for ages due to deforestation, forest fire, industry development and so on….This degradation causes many natural disasters accompanied by drought, flood, erosion…because of climate change. Besides those, human's self awareness also bring about the loss of land. In fact, Viet Nam still is a developing country. In order to improve livelihood, the government needs to take precedence for industrial field over the other. Farming land are yielding to residential and recreational area. Excessive exploitation and shifting cultivation have increased the pace of deforestation. Controls to ensure effectively forest operations and sustainable forest management, together with settled cultivation and regeneration promotion, are the most efficient measures to rehabilitate the forest. Planting and protection are vital for rehabilitation of barren land. But these measures are expensive, hard to implement, or take a long time to carry out if no regeneration techniques are currently applied.

Taking advantage of natural forest succession processes, it is auspicious to rehabilitate about one million hectares reserved for protection and special-use forests and also for production forests in qualified areas. This process is facilitated through protection, silvicultural measures and additional planting.

With regards to forest restoration activities, five main land-use categories are differentiate in Viet Nam, according to past or current use. These land-use types are subdivided into three groups according to the desired management objectives

1975 by Food and Agricultural Organization (FAO), allocated a substantial amount of its budget for implementing afforestation projects, enhancement of forestry extension services, and agro-forestry production on sloping different projects and programs in the field of forest rehabilitation have been implemented consecutively over many years. The World Food Program, which was launched in Vietnam in 1975 by FAO, allocated a substantial amount of its budget for implementing afforestation projects, enhancement of forestry extension services, and agroforestry production on sloping land. Subsequently, Program 327 was initiated in 1992 with various objectives. The program initially targeted broad areas including forestry, agriculture, fishery and the development of new economic zones, but later focused on the protection and rehabilitation of special-use and protection forests. The continuation of Program 327—the 5MHRP, also known as the 661 project— is one among the key national projects approved by the National Assembly. The Project terminated in 2010. Both Program 327 and the 661 project demonstrate the state's concerns about the rehabilitation of special-use and protection forest and the related commitment of state funds for forest rehabilitation. The protection function of forests, forest environment and conservation of forest biodiversity are clearly taken into account.

The successful results of forest rehabilitation also depend greatly on sectoral and non-sectoral policies. The Land Law clearly states that the land is planned and generally managed by the state but can be allocated to individuals, households, social organizations and communities for long-term use in compliance with agreed purposes. Rights are quite comprehensive as owners can exchange, transfer or inherit land use rights, or use the land as collateral for bank loans. The Forest Protection and Development Law defines the legal opportunities for forest land allocation and the leasing of forests to individuals, households, management boards, economic organizations and communities. The Law indicates the state policy of investing in, encouraging and supporting forest protection and development; expanding the market for forestry products and insuring plantation forest. There are also a number of decrees and decisions issued by the government regarding land allocation and forest contracting. Many policies have been endorsed and amended to make them consistent with the actual situation..

National policies and legislation are being adjusted to reflect new opportunities and needs. The Environment Protection Law, for instance, was revised in 2005, as was the Forest Protection and Development Law, to better assess the role of forests in the provision of environmental services, and to open opportunities for compensation where these services are being provided.

Despite the many shortcomings, however, environmental policy and legislation in Vietnam can be singled out as one of the key factors that has contributed positively to the country's achievements in forest rehabilitation. Vietnam has invested considerable amounts of funds in forest rehabilitation, especially since the 1990s. This national investment has been complemented with significant international support. Despite the amounts invested, observes that funding has been inadequate to achieve the targets set under various programs. Under current arrangements of payments for the protection of forests, state financing of forest protection needs to continue if the forests are to be kept, although the sustainability of

payments for forest protection might be questioned. There is little other funding being mobilized for forest rehabilitation, especially for the rehabilitation of production forest land that is meant to boost the forestry sector's contribution to the national economy. Various authors have pointed out that Vietnam's production forestry is hindered by biophysical, technological and institutional constraints. This may imply that some of the ambitious plans that Vietnam has for its productive forestry sector may only be achievable with considerable state financial contributions.

This funding situation does not translate to optimal conditions for smallholders. Some payments, such as for forest protection contracts, are perceived to be too low. Credits available for forest rehabilitation do have very favourable conditions, but even those conditions still do not convince many farmers that investing in forest rehabilitation is worth their while.

Forested land allocated to non-state economic actors amounts to 3.7 million ha, or 30.32% of the total forest land in the whole country. It also includes around 1 million ha of barren land and denuded hills, which were mostly allocated to households, accounting for 15% of the total barren land that is to be used for forestry purposes. This is slightly higher than the 0.9 million ha of barren land.

By 2006, the total area of allocated forest land (forested and non-forested) comprises only 23.2% of Vietnam's total forest land area planned for 2020. In practice, households are mainly allocated production forest land. The amount that has been allocated to households is 46.2% of the area planned for production forest in the whole country.

The organizational structure of Vietnam's forest sector administration has four administrative levels: the central/national level, provincial level, district level and commune level. At present, Vietnam has 64 provinces, about 600 districts and 10,000 communes. All administrative levels are under the control of the state. Hamlets are under the jurisdiction of communes, but they are not a state administrative level. They function, however, as autonomous organizations, combining several communities in a single hamlet. Heads of hamlets are selected by the local people and are recognized combining several communities in a single hamlet. Heads of hamlets are selected by the local people and are recognized by commune authorities. Hamlet heads act as people's representatives and contact persons for the commune authorities to communicate with local people. In some remote and isolated areas with ethnic minorities, heads of hamlets function together with village patriarchs who act as customary leaders. At the central level, Ministry of Agriculture and Rural Development(MARD) is responsible for forest sector administration, including special-use and protection forest management. The Forestry Department and Forest Protection Department are MARD's agencies tasked with forest administration. Two additional agencies, the Agro-forest Product Processing Department and the Rural Industry Department, are in charge of the forest product processing sector. Additional public service agencies involved in the forest sector are the Forest Inventory and Planning Institute (FIPI) and the Forest Science Institute of Vietnam (FSIV). The Forestry University and the Forestry Extension Division are attached to the Agriculture Extension Department.

At the provincial level, two forest administration agencies are under the control of the Provincial People's Committee (PPC). The first of these is the Department of Agriculture and Rural Development (DARD), in which the Forestry Sub-Department operates as a specialized agency to assist the Director of DARD in forestry activities.

At the district level, the Economics Division Agriculture and Rural Development is under the control of the District People's Committee (DPC) and employs one or two forestry staff responsible for monitoring forestry activities. At the commune level, as regulated by the Forest Protection and Development Law, communes with forest cover are obliged to recruit forest employees. However, because of budget constraints, most communes have so far failed to employ any commune forest staff. Where they operate, Forest Protection Units assign one forest ranger to work in one commune/commune group.

Forestry extension in Vietnam is part of the provincial and district agriculture extension agency. The number of forestry extension workers, however, is very low and they cannot address the needs of all districts separately. Apart from the state forestry extension system, non-state forestry enterprises and forestation projects funded by international donors have, in practice, provided most forestry extension services. In terms of quality, these services exceed the services offered by state forestry extension organizations. Voluntary forestry extension organizations at the local level have gradually been set up under the control of social and professional associations.

Before the 1990s, Vietnam's economy operated under a central planning mechanism. Under this mechanism. State Forest Enterprise(SFEs) were production units that specialized in forestry activities including forest harvesting, forest product processing, forest planting operations and forest rehabilitation. SFEs were also assigned to provide public services to facilitate socio-economic development in mountainous areas, for instance promoting fixed cultivation as an alternative to agriculture, resettlement and new economic zone development. Between 1961 and 1990, SFEs afforested 1.4 million ha of industrial plantations, accounting for 71.12% of the total national area of plantations. SFEs made due contributions to national socio-economic development and national defence and security in mountainous areas.

Since Vietnam has shifted to a market-oriented economy, the state has stopped allocating funds to SFEs and even did not provide financial support for afforestation efforts. Instead, the state extended credit to SFEs, which were expected to self-finance their activities. Many SFEs failed to adapt to this new economic mechanism. In 1998, there were 405 SFEs, but this number has now decreased to 368. Forty of these are managed by the central government (Forestry Corporations and Paper Corporations), while 328 SFEs are managed by provincial governments. The total area of forests and natural land allocated to SFEs was 4.9 million ha. This included 4.4 million ha of forestry land, 3.0 million ha of which was natural forest, 536 thousand ha of plantations and 908 thousand ha of land without forest cover. The total estimated timber stock was 303.2 million m3 (including 287.4 million m3 in the natural forest and 13.8 million m3 in the plantations) and 2.8 million bamboo stems.

On average, one SFE manages 13,502 ha of forest land. However, these averages vary from 5,527 ha in the Northern Mountains and Midlands, to 15,100 ha in the Northern Central region, 18,437 ha in the Southern Central coastal region and 19,785 ha in the Central Highlands. As of 2000, SFEs had a total area of 125,369 ha of forestry land that was granted land use right certificates, or 25.2% of the total land under their control. Almost half of the SFEs suffered from land encroachment by local households and spontaneous immigrants.

The majority of SFEs have failed to manage the natural forest under their control in a sustainable manner, among other reasons due to excessive logging. They are, therefore, an important contributor to the serious decline of Vietnam's tropical forests. The number of SFEs with natural forests eligible for harvesting operations decreased to only 137 from 2001–2005. Many SFEs could only survive by participating in the nationwide forest rehabilitation programs 327 and 661

Forest rehabilitation these days includes many technical approaches comprising plantation, agroforestry, intercropping and natural regeneration.Some form of plantation continues to be the dominant method of forest rehabilitation. Plantation included agroforestry and intercropping methods. Forest rehabilitation through protection using natural regeneration or combined enrichment and natural regeneration, was particularly relevant in protection forest and special-use forest

According to the survey, the executing agencies of forest rehabilitation projects can be grouped into eight categories (Table 4). These eight categories suggest a division between state executing agencies (DARD, forestry agencies, People's Committees), and private and state company executing agencies. An important number of projects had more than one implementing agency, in which case the role and responsibilities of different executing agencies varied. For instance, in many cases forest rehabilitation projects are under supervision of People's Committees and Project Management Boards. In such a case, the Project Management Board is under the supervision of the People's Committee, and is the direct implementing unit.

Table 4. Project executing agencies

Executing agency	Prod	Prot	SpU	Total
DARD		12		12
Forestry agency		10	4	14
People's Committee	2	1		3
Management Board/Project Management Unit	2	18	8	28
SFE/ FE	8	6		14
Donor	1	2		1
Science agency	4	1		5
Others	1	1		1
Totals	18	49	12	79

Funding sources for forest rehabilitation projects can be divided into national and international funds. Each of these two groups can be subdivided as indicated in Table 5. Of

the 280 projects with adequate data, only 46 projects (16%) are funded with international funds.

Table 5. Funding sources for forest rehabilitation projects

National Funds	State budget
	loan
	Direct Investment
	Self-financed
International Funds	Technical assistance funds
	ODA non-repayment fund
	ODA loan
	Joint venture fund

Table 6 shows the distribution of funding sources for the projects. The total number of funding sources is 46; two projects gave two funding sources, and one project three funding sources. The table shows that the majority of projects are supported by Vietnamese funds (31 out of 46). The majority of these projects were funded out of 5MHRP funds, including the state budget from MARD. Five out of seven projects that had foreign funding included production forest-related projects, confirming the results from the survey of 280 rehabilitation projects. The vast majority of protection forest projects and special-use forest projects were funded from Viet Nam's state coffers.

Table 6, which includes information on the funding origin of all the surveyed projects, suggests that funds for rehabilitation of protection forests come mainly from the state budget line for the 5MHRP (equal to 95% or 175 out of 185 projects). International funds are partly non-repayment funds from the World Bank, Denmark and Japan, and the remainder are loans from the World Bank, DANIDA and JBIC. Many international organizations are interested in biodiversity conservation and support the rehabilitation of special-use forests,

e.g. GEF, UNDP, GTZ, EU, DANIDA, WB, and the Netherlands government. International funds for projects on production forest land are mainly ODA non- repayment funds. Only a few larger projects are funded by ODA loans.

Vietnam has a long history of forest rehabilitation, as it started to give tree planting its due importance in the mid-1950s. The country has since then spent a great deal of effort on bringing back tree vegetation where forests have disappeared. There is less evidence, however, of how successful these efforts have been, what the economic, social and political costs have been, and how much benefit they have yielded. There are various indicators that demonstrate the success of Vietnam's forest rehabilitation.

Most of the forest rehabilitation projects included in the surveys had more than one objective). The objectives related to restoration of forest cover for productivity, environmental functions including biodiversity conservation, but also local and wider development objectives. The multiple objectives are a common feature in the majority of projects despite the dominance of forest rehabilitation on protection forest land.

A different indicator that reflects the success of Vietnam's forest rehabilitation is the relation between areas rehabilitated, and the existing area of rehabilitated forest at various points in history. the available data suggest that plantation forest area has increased markedly year by year: 1,050 million ha in 1995; 1,471 million ha in 2000, 2,218 million ha in 2004.. There is no indication of how much forest had been rehabilitated naturally until the early 1990s as a result of active protection or abandonment. However, it is obvious that maintenance and assisted natural regeneration of exhausted forests, especially in watershed areas, has contributed to the increase in forest coverage. Up to the year 2005, assisted natural regeneration has been applied in an area of 723,450 ha of forest under the 5MHRP (accomplishing 72% of the plan). In 1995 forest covered only 28% of the country, but this figure increased to 35% and 36.7% in 2000 and 2004, respectively.

Program 327 established between 397,000 and 640,000 ha of new plantations and protected or enriched between 299,000 and 700,000 ha of forests. By 2003, the 5MHRP had established 1.71 million ha of forests. According to the MARD report on the achievements of the 5MHRP, until 2005, an area of 1,401,667 ha of plantation forest had been established, of which 631,317 ha was protection and special-use forest, 683,396 ha was production forest, and 86,954 ha was fruit tree and industrial crop plantation on forestry land.

We can present only a summary and a fragmented picture of the economic, social and political costs and benefits of forest rehabilitation. Forest plantations have progressively contributed to wood supply in Vietnam. In 2001 the forestry industry consumed 1.6 million m3 of forest plantation wood. In addition, close to a third of Vietnam's saw wood demand is met from rubber and pine plantations. It is difficult to establish how much forest rehabilitation has contributed to the total role of the forestry industry in the national GDP, estimated at 6% .With an area of over 2 million ha, special-use forests, including national parks and natural reserves, have huge advantages in biodiversity and gene conservation.

Table 6. Main project funding sources

Funding agency	**Prod**	**Prot**	**SpU**	**Total**
Vietnamese government funding				
GoV – 661	3	22	4	26
MARD		2	1	3
Central Northern Forest Production & Science Center and other members	1			1
Loan National Support Fund	1			1
Vietnamese private funding				
NFORIMEX II	1			1
NISSHOIWAI Corporation	1			1
Vietnam Forestry Company	1			1
Foreign funding				
German funding	3	1	1	1
Japan government	1			1
Korea government	1			1
BADC		1		1
ZSCSP			1	1
Total	13	26	7	46

Summary

Besides striking achievements, there are several causes negatively impact the outcomes of forest rehabilitation measures. Climate changes bring about unusual phenomenon, affecting seriously the survival of plantation. Technical methods on research field are unsuitable, lack of finance and tough working conditions.

Therefore, In the future Viet Nam should markedly invest in forestry sector, concentrating on research field and wood material. Specially, intensive study on native trees with promising characters, probably providing a large timber source for furniture, construction, pulp as well as reserving biological diversity. These indigenous species should be planted massively to cover the loss of vegetation. As we know, deforestation result in many severe consequences. Tree play important role in absorbing Carbon diocxy and releasing Oxygen, contributing the remarkable decrease of greenhouse effect. To do that, the government needs to appeal foreign investments from developed states specializing in industrial production practices in order to improve environmental condition. For instance, Japanese government has been invested to large- scale reforestation in Viet Nam with the purpose of forest environmental services, using preferential national budget. Applying modern technology in producing potential power sources such as wind energy, solar energy instead of constructing hydroelectric dams. Enhancing people's self-awareness of protecting forest through practical programs, particularly those who depend on forestry for the living. Offering subsidy policies on seeds, techniques, finance for the owner of forest, helping them realize the important role of vegetation. Providing more job opportunities, instead of exploiting excessively forest resources, local authorities need to prioritize tourism development connected closely to forest benefits with establishment of national parks biosphere reserves . This helping youth generation appreciate thoroughly the function of forest in protecting environment.

The following key lessons can be synthesized from the success and shortcomings of Vietnam's forest rehabilitation:

1. Forest rehabilitation should be incorporated in projects and programs at the national level and implemented through projects at the local level with well-defined goals. The more detailed the project objectives and plans of operations are, the more the project achievements will reflect the goals and objectives.

2. The procedure of project assessment , management and monitoring of project operation is essential to ensure the success of the projects. At present, because of inadequate evaluation, the number of projects that focus on protection and special-use forest have outstripped the tentative plan until 2010. One key defining factor of success for the 5MHRP is adequate but relevant coordination from the central to local level, all the way to households and communities.

3. Clear and detailed benefits for households and articulated participation will vastly enhance project results Clarifying land ownership conditions for the party that will hold key responsibility for the rehabilitation, and adequately addressing technical requirements, will also enhance project results.

4. The implementation of forest rehabilitation projects should be integrated with other projects that aim to improve the socio-economic conditions of local populations.
5. Forest rehabilitation projects should be combined with other supporting activities so as to the major goals of the projects are met

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