Content

Co-management Approaches in the Forest Based Protected Areas of Bangladesh & Its Link with Forest Rehabilitation and Management, Bangladesh

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Abstract: Globally, Forest degradation is a severe problem. In Bangladesh, forest is degrading due to over population, changes in land use, encroachment, wasteful commercial logging, illegal felling, grazing and the collection of fuel wood for a large population. People who live near to forests are usually involved in agriculture and they regularly rely on forest products (timber, fuel wood, bush foods, medicinal plants etc) for both their own subsistence purposes and income generation. Recognizing this problem, Bangladesh Forest Department has taken Co-management related projects in 21 protected areas to rehabilitate and restore natural forest resources for future generation and conserve existing biodiversity through involvement of local communities. This paper discusses on Co-management approaches in the forest based protected areas of Bangladesh and how it links with forest rehabilitation and management. Finally, this paper recommends that sustainable protected area management is the only way for rehabilitation of natural resources. The paper is prepared by reviewing documents, reports, records, studies and books related to Co-management practices of different protected areas. This paper exposes the decrease in illegal felling and increase in forest coverage and wildlife species due to introduction of Co-management Strategy. It has also become an alternative income generating source for the surrounding people of the protected area. All of these activities will play vital role to restore and rehabilitate forest habitat and improve forest condition.

Keywords: Forests rehabilitation, Protected Area, Local Community and Co-management.

Introduction

Bangladesh is a densely populated country, lying between 20º34′ and 26º38′ North and between 88º01′ and 92º41′ East (Hossain et al.1997), with an area of 147,570 square kilometers. It occupies a unique geographical area, spanning a relatively short sketch of land between the Himalayan chain and the Bay of Bengal, and it is virtually the only drainage outlet for the river basin complex consisting of the Ganges, Brahmaputra and Meghna rivers (GOB 1992).

The total area of forest land in Bangladesh is 2.53 million hectares, representing17.5 % of the countries total surface area. Total protected area is 1.822% in relation to total country area

throughout the 38 notified (notified PAs of the Country is appended in Appendix-A). Different categories of PAs have been legally constituted in South Asian countries under their respective national Wildlife Acts. For example, three categories of PAs (National Parks, Wildlife Sanctuaries and Game Reserves) have been established in Bangladesh under Wildlife (Preservation) (Amendment) Act, 1974 for their management by Bangladesh Forest Department (FD). The Forest Department is the statutory custodian of the protected areas. Improving Environment situation and conserving bio-diversity will require changes in the approach to protected area planning, establishment and management. Co-management approach is very much potential to address the sustainable development and adaptation of the forest community along with forest conservation and rehabilitation.

Forest Management in Bangladesh

Forest Resources are an important economic sector of Bangladesh. It is renewable resources which can provide timber, pulp, pole, fuel wood, food, medicine, and habitat for wildlife and primary base for biodiversity. It also provides oxygen, controls or reduces the intensity of the cyclones and tidal surges in the coastal areas of Bangladesh, influences the rainfall and sustained water yield in the river systems etc. Moreover these forests are also used for hunting and nature based tourism. Now a day, eco-tourism is the more attractive type of tourism, which could be an alternative mechanism for environmentally sustainable development without depleting the forest resources and its habitat and biodiversity. Considering all these, forest and consequently forest management is getting importance in the world with the passage of time. There are two types of Forest Management in Bangladesh.

1. Past Forest Management

Scientific forest management in this sub-continent started during British rule by the appointment of Sir D. Brandis as the Inspector General of Forest in 1865. A separate forest department was created for Bengal in 1876. Chittagong Forest Division was the first division created in Bangladesh by British ruler in 1872 and the Sundarban Forest Division was created in 1879. In those days, forests were managed primarily for revenue collection under the control of Revenue Department. Only valuable trees were extracted from the forest to get more revenue. Keeping in mind the importance of forest, a forest management plan or work plan is prepared for each forest division. This management plan guides forest manager to manage forest or to perform day-to-day work in the forest. This plan spells out where to cut trees, how much to cut and what to plant to cover up the cleared up forest etc. on annual basis.

2. Present Forest Management

There is a fundamental difference between past and present forest management in Bangladesh. It depends on its objectives and philosophy. Present forest management objectives are not only to produce timber but also to provide clean air, clean water and healthy habitat for wildlife. It also acts as a major source of biodiversity and nature-based tourism. The present philosophy of forest management is to involve people in the management, create an environment where they also have some stakes on trees growing on the forestland and to improve their living standard. To cope with these situations, Bangladesh Government initiated

a community based forest management program in 1981. To conserve and rehabilitate the forest, Social forestry activities are continuing all over the countries excluding Protected Areas. Again, Forest Department adopted collaborative management approach of protected areas in 2003-04 through the implementation of Nishorgo Project for protection and rehabilitation of natural resources in those areas.

Organizational Structure of Forest Management Agencies

Forest Department under the Ministry of Environment and Forest (MOEF) is entrusted with the task of managing the forest. The Chief conservator of Forests (CCF) has overall responsibility for management of forest. The entire forest area is divided into 9 Forest Circles, 41 Forest Divisions for smooth implementation of forestry activities. Protected areas are managed by wild life circle.

Re-organization of the Forest Department of Bangladesh (MOEF 2001) created an independent wildlife Management and Nature Conservation Circle. According to the re-organization, a Conservator of Forests being head of the circle will work under Chief Conservator of Forests. The Conservator of Forests will supervise and coordinate matters related to ex-situ and in-situ conservation of wildlife (flora, fauna, migratory birds etc) and environmental management functions of the country. He will administer, supervise and control the functions of 7 Wildlife Management and Nature Conservation Divisions and 2 Botanical Garden (MOEF 2001). Much scientific and social information are being improved about the management needs of protected areas, administrative structures at field level and equipped for the technical demands of the Divisions entrusted with management of protected areas.

Co Management and Co-management Practices in Bangladesh

Co Management

"Co-management" is very much close to biodiversity. The new concept of the world, "Co-management" is one of the momentous tools to conserve and increase biodiversity in a certain area. Moreover, climate change is very much related to health condition of the biodiversity of an area. Forest protected areas help conserve ecosystems that provide habitat, shelter, food, raw materials, genetic materials, a barrier against disasters, a stable source of resources and many other goods and services of ecosystem and thus can play an important role in helping species, people and countries adapt to climate change (S. Mansourian et al.). World wide protected areas cover more than 12% of the planet's surface area (Chape et al. 2003). In Bangladesh, there are total 38 protected areas. All of the Protected Areas are under tremendous pressure from various sources, including people living in and around them as Bangladesh being one of the World's most populated nations. Most of the people are fully dependent on the protected areas as a source of timber, fuel wood, wildlife and other vital forest products to earn their livelihoods. Many rural populations living near to protected reserves depend on them for land, and other environmental resources and services to meet their livelihoods (Salafsky and Wollenberg 2000). This dependence often contributes to a

state of continuous conflict between local communities who carry out subsistence extraction, and administrators trying to restrict the level of extraction. Due to continuous human pressure, natural forests in Bangladesh have severely degraded over the period.

Co-management or collaborative management of natural resources involves sharing of responsibilities, benefits and decision-making powers among key stakeholders in a particular area. Borrini-Feyerabend et al. (2000) define Co-management as " a situation in which two or more social actors negotiate, define and guarantee among themselves a fair sharing of the management functions, entitlements and responsibilities for a given territory, area or set of natural resources". The Co-management approaches has been a fundamental recommendation of the past three World Park Congresses in 1993, 2003 & 2008, and is actively advocated by the IUCN, The goals of these initiatives include compensating local people for lack of access to protected areas and providing alternative income sources that allow people to benefit economically from conservation while refraining from environmentally destructive practices.

Co-management Practices in Bangladesh

With an estimated population density of 1200 Individuals/km2, Bangladesh is one of the most densely populated countries in the world (data.worldbank.org, 2013). The livelihoods of millions of Bangladeshi depend directly or indirectly on the extraction and utilization of natural resources. In addition to that, a notable amount of governmental revenues is still based on natural resource extractions such as wood. Without any doubt, population density and dependencies on natural resource extraction put enormous pressure on all natural resources in Bangladesh and reveal the urgent need to develop suitable approaches and concepts to

- conserve natural resources
- sustainably manage natural resources
- rehabilitate natural resources
- And most importantly empower the population to participate in conserving, managing and rehabilitating for their own well-being and long term survival.

Until the 1970s, all natural resources in Bangladesh were exclusively managed by the Bangladesh Government with the primary aim to maximize revenue generation. Therefore, former natural resource management strategies and execution plans paid little attention to conserving natural resources or managing them in a sustainable way.

Over the last 30 years, exploitation of natural resources led the approach to change not only in Bangladesh but also worldwide. Concepts and strategies for sustainable resource management have been developed and established in protected areas.

Bangladesh is a good case for forest restoration and conservation in gainful partnerships with local community, who depend on neighboring forests for meeting their subsistence needs including livelihoods. Bangladesh Forest Department adopted collaborative management approach of protected areas in 2003-04 in five forest PA sites namely Lawachara National Park (NP), Satchari NP, Rema-Kalenga Wildlife Sanctuary (WS), Chunati WS and Teknaf

WS under Nishorgo Support Project (NSP, 2003-2008) with financial support from the USAID. Later this approach was scaled-up to 17 forest PAs in the country through Integrated Protected Area Co-management (IPAC, 2008-2013) Project supported by USAID for rehabilitation of natural resources. Since October 2012, CREL has been working to consolidate, sustain and extend Co-management in 21 forest PA/sites. Today the co management approach for natural resources is widely adapted throughout the country and has been successfully implemented in many regions and for various kinds of natural resources.

Under this system of management, the dwellers living within and around the forests were involved in protection of PAs with consequent sharing of benefit arising from the PAs as well as through supporting their capacity building in other income generating activities. For the sustainable management of PAs, all stakeholders of the localities have been involved with formation of Co-management council (CMCs) and Co-management committee (CMC). Total 31 CMC were formed for 21 PAs under NSP and IPAC and CREL projects. Activities are implemented as per the objectives of these projects with support of CMC.

Protected areas have been recognized for several decades as an essential tool for conserving biodiversity. The impacts of climate change now give them a renewed role as adaptation as well as mitigation tools for a changing climate. We review the effectiveness of the Co-management practices on sustainable protected area management and its role to rehabilitate natural resources. It seeks to inform planners and policy makers with reference to forest based Co-management practices to take initiative further as this perception is new for the forest protected areas in Bangladesh.

Co-management Policy Framework and its Enforcement

Relevant policy changes can include any new direction taken by Government supporting the objectives of the NSP, IPAC and CREL Project. This category includes Government approval of laws, acts, policy approval of significant management plans for the PAs, key institutional changes, approvals of new financial mechanisms or changes in existing Government practices in a way that supports the program.

To support the Co-management approaches, some of key policies have been established through the Co-management project. Following Government Order (GO) has been issued for the co-managed PAs to raise awareness and to build constituencies to support PA conservation:

- GO has been issued to establishing the Co-management Committees/Councils on15 May 2006 & 23 November 2009;
- GO has been issued to collect entry fees from the co-managed PAs on 10 December 2006;
- Guideline has been approved by the government to entry fees and 50% retention for the community as well as PA development through the Co-management committee on 29 March 2009 and

- GOB authority has been approved building Community Based Nature Interpretation Center through public private partnership, subject to fitting within Government rules on 2009.
- Revised Social Forestry Rules 2004(Amended 2010) gazette on 13 January 2010.
- Compensation policy for the people affected by wildlife, 2010 gazette on 10 November 2010.
- Wildlife (Conservation and Security) Act 2012 gazette on 12 July 2012.

A protected area is defined as "A clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values" (Dudley, 2008). Simply declaring an area to be a 'National Park' or 'Wildlife Sanctuary' or 'Protected Area' has not worked in Bangladesh as elsewhere to stop the steady loss of biodiversity for a number of reasons. Scholars such as Dove suggested that if local people develop an economically valuable forest resource, elite economic and political interest, they will assume control of it (1993). To realize the situation of the country, Bangladesh adopts new Protected Area Rules emphasizing 'people-oriented' programs to manage the environment, preserve existing values, conserve plants and animals and maximize protected area. Protected Area Rules 2016 is under process for approval.

Case Study

We have received a complete result of the Co-management practiced in NSP project. And so, we have considered the result in this case study. This study reviews the Co-management activities under Co-management practices in the five PAs and evaluates it's functionality as an ultimate protected area management in relation to major set forth objectives of the completed NSP. It also focuses on the effectiveness of Co-management on local ecosystems and community which is linked with forest rehabilitation. We considered the following key indicator issues under protected area Co-management activities to seek effectiveness of Co-management practices based on the NSP completion report, performance monitoring plan and Comprehensive Listing of all PMP Indicators of NSP.

Population Density of Indicator Bird Species in Areas of Biological Significance.

It is envisaged that Co-management greatly supports biodiversity conservation in protected landscapes whereby community based resources management came forefront. The outcomes of enhanced conservation of forest PAs can be measured through biological condition indicators of which an important measurement is the density of indicator bird species specific to forest PAs. Wild animals or birds are absolutely depended on forest for their food, shelter and foraging. Birds are very good indicators of the ecological changes (Johnston 1956, Morrison 1986, Canterbury et al. 2000, Browder 2002) as they are relatively more visible, fast-breeder and more responsive to any change in their habitat. During NSP, eight indicator bird species are selected as indicators of biological diversity and forest health in Nishorgo PA

site. These eight species come from different parts of the forest and NSP applied five sites during 2005-2008.

Results of above Category

Name of the indicator bird species	Year-wise No. found in five NSP sites (/km2)			
	2005	2006	2007	2008
Red Jungle Fowl	8	11	13	15.25
Oriental Pied Hornbill	10	10	9	7.57
Red-headed Trogon	2	2	2	2.13
Greater Racket Tailed Drongo	30	30	30	31.04
White rumped Shama	57	57	57	57.08
Hill Mayna	17	17	17	16.5
White Crested Laughing thrush	4	6	5	1.03
Puff-Throated Babbler	20	24	26	28

Increase in population of species from specific parts of the forest (e.g., under story, middle story, upper crown story) provide indication of change in health of the relevant habitat, and the likely change in biological diversity of that area. This partial result reveals that bird's habitat is improving after Co-management practices in PA areas and so forest resources of this area are gradually rehabilitating as well.

Households Implementing Improved Land-Use Practices And Aig Activities Within and Surrounding Pilot Protected Areas

This category is included to observe economic impact through the Co-management activities on local communities. In this category, selected households have been involved with household production, enterprise creation, employment creation and community livelihood changes for direct income increases associated with the Project. Detailed activities are fish culture, poultry rearing, beef fattening, home gardening, goat & pig rearing, dried fish processing, handicrafts (bamboo, cane, baskets), bamboo production, fish trading, eco-guiding, fuel wood saving stoves , social forestry plantation (PBSA), plant distribution to (homesteads) and improved tree crop cultivation in households under the broad four activities. This category also measures the number of alternative income generating activities which is implemented in targeted landscapes.

Results of above Category

Name of the activities	No. of households		Total
	Male	Female	
Household production	-	-	4076
Enterprise creation	330	106	466
Employment creation	1107	5	1112
Community livelihood changes	-	-	12909
Total			18563

Result of this category provides sufficient information to assess the success of developing alternative income opportunities for targeted population. It is shown that, total of 18,563 households has been involved with NSP project for alternative income generating activities which is a good indication for reducing pressure on the PAs. Through betterment of socio-economic conditions and improvement of people's ability to practice sustainable forest management, AIG opportunities facilitate the protection and conservation of forest.

Number of people trained

To strengthen capacity of the PA management concern person, the Project takes part in related PA management training of the FD staffs, NGO technical staffs and local stakeholders those who are directly and indirectly engaged with the PA conservation about Co-management, Conflict management, Bio-diversity conservation, Good governance, Gender and empowerment, Eco-tourism micro-plan, Restoration of habitat, etc. Total number of trainees in different categories under the NSP is given below:

Results of above Category

	Category of Trainee	Number of trainees (person)		
		Women	Men	Total
1	**Forest User Group & Community Patrolling Group**	3617	2890	6561
2	**Other local**	19	104	130
3	**CMC member**	10	130	140
4	**Field-based FD**	1	86	87
5	**Dhaka-based FD**	3	7	10
6	**Other Prof staff**	2	12	14
7	**3rd country training**	3	26	29
8	**NGO technical staff**	24	72	96
9	**Youth**	7	154	139
10	**Leveraged training**	65	41	106
	TOTAL	**3751**	**3522**	**7273**

Training is vital to the success of the any forest related program as its management concerns with forest degradation, biodiversity loss, forest fire etc. which are the responsible for devastation of biodiversity of a country. In the forestry sector, the priority is to enhance early warning systems and awareness-raising programs to better prepare for potentially more frequent forest fires as a result of climate change; and implement aggressive public-private partnerships for reforestation and afforestation (Bore et. Al 2008).

Habitat Within Targeted Protected Areas Improved

This category measures the participatory habitat restoration activities targeted in the five PAs. This indicator provides indication to direct habitat restoration activities in the PA through better management practices which also contributes directly in the overall.

Results of above Category

Plantation Types	Year-wise total plantation in five NSP sites (hac.)				Total
	2005-2006	2006-2007	2007-2008	2008-2009	
Buffer Zone	96.00	269.42	602.52	263.97	**1231.91**
Enrichment	190.00	123.50	158.89	138.00	**610.39**
Natural Regeneration	100.00	58.86	77		**235.86**
Coppice management	45.00	20.00	13.00	40.00	**118.00**
Special fruit tree	-	100.94	27.27		**128.21**
Fruit & Fodder	-	181.87	43.08		**224.95**
Fodder, grass	-	15.00	0		**15.00**
Total	**431.00**	**769.59**	**921.76**	**441.97**	**2564.32**

From the above table, it is shown that total 2564.32 hector of plantation has been raised during the implementation of Co-management practices. The role of forests in carbon cycle is vital as they account for approximately 80% of CO_2 exchanged between land and atmosphere through the process of photosynthesis. As trees grow, the carbon is stored in biomass by converting CO_2 and water (by using solar energy) into sugars and oxygen (released through the leaves). Forests also release CO_2 during the process of respiration. However, a forest that is growing (i.e. increasing in biomass) will absorb more CO_2 than it releases. So the sequestration and storage potential depends on growing and sustaining forests (IPCC, 2007).

Declining Incidence of Unsustainable and Illegal Use of Natural Resources and the Rate of Deforestation

This category increases level of protection resulting in part in improved capacity of FD and serves as proxy indicator that community groups are actively participating in the protection of the PA. Result shows that, trend of illegal felling has been reduced (except RWS) during the implementation of the NSP. The illegal tree felling is the main threat to our PAs based on the five Site Level Field Appraisal Reports of NSP. This category also measures the reduction of deforestation over time in protected areas as a result of Co-management interventions in protected areas.

Results of above Category

Year	Total no. of Trees illegally felled					Total	Deforestation rate (ha per year)
	LNP	SNP	RKWS	TGR	CWS		
2004	1152	679	81	99	-	2011	0.8

2005	1218	219	58	89	148	1732	0.7
2006	396	135	697	544	128	1900	0.76
2007	486	53	80	260	13	913	0.4
2008	312	70	846	235	13	1476	0.6

It is shown that during the implementation of the project, illegal felling rate has changed positively which is one of the causes for deforestation/degradation. In Bangladesh, a root cause of deforestation/degradation can be traced to widespread poverty that results in over-exploitation of open access natural resources including forests. Climate change due to deforestation is taking place in many tropical countries including Bangladesh where poverty is severe due to poverty alleviation and deforestation inter-linkages. The degradation of forests cannot be reversed unless the livelihood needs of local people for food, fuel wood, fodder and small timber are met. Providing alternative sources of income that meet those needs can reduce the pressure on the resource base and improve sustainable management.

Outcomes of Co-management Practices

Natural Eco-System Conservation

It is seen that indicator bird species has increased, plantation has been raised to restore the forest habitat, and deforestation rate is decreasing in the PAs which provides indication of change in health of the relevant habitat, and the likely changes in biological diversity of that area after Co-management practices. Also to mitigate the negative impact of climate change, carbon project are developing under this practice.

Forests, when sustainably managed, can have a central role in forest rehabilitation and climate change mitigation and adaptation. Forests and trees are also important in carbon sinks. Carbon sequestration by forests has attracted much interest as mitigation approaches, and it has been considered as a relatively inexpensive means of addressing climate change immediately. The protection and sustainable management of existing natural forests and PAs improve forests quality and their ability to sequestrate and store carbon from the environment. Protected areas and the natural habitats within them can also protect natural ecosystem of an area such as regulation of water flow and water quality, prevention of soil erosion, influence of rainfall regimes and local climate, protection of breeding stock etc. which maintain ecosystem health. Some protected areas also provide an opportunity for active or passive restoration of traditional land use practices such as agro forestry and crop terracing, which may help mitigate the impacts of extreme weather events in arid lands. In a changing climate, protected areas will take on added importance as safe environment for biodiversity by offering good-quality habitats less vulnerable to climate extremes, by providing refuges for threatened species and by conserving important gene pools. It will also become more important to protect reference landscapes – ecosystems on which restoration planning is based, and which provides a basis for evaluating the success of restoration (Sayer, 2005).

Community Involvement in the Pa Management System

Co-management organization including different groups has been formed and people participation orientated key polices have been changed or new policy have been established in the PAs to ensure the participation of PA management system. Different training and financial mechanism have been developed to build capacity and strengthen them.

The importance of community engagement has also been seen as a mean of reducing vulnerability in the area of disaster planning. Promoting resilience, is therefore, directly dependent on the recognition of community engagement in resource management particularly in areas where communities rely on ecosystem health for their own well-being or livelihoods, as a means of preserving ecosystem integrity (Folke et al., 2002). Protected areas may provide ecosystem services such as drinking water, carbon storage and soil stabilization; harbor sacred sites for different faith groups; and hold important gene reservoirs of value in medicine, agriculture and forestry. Successful collective actions, in the form of Co-management practices for natural resources can enhance the resilience of communities, as it can maintain ecosystem services and ecosystem resilience.

Economic Activities for the Landscape Area

Co-management practices in the PA provide livelihoods to local economy. Additional benefits mobilize through off-PA activities including alternative income generation activities generate both wage and self-employment. A number of livelihood opportunities are provided to landscape area through the eco-tourism development, landscape development fund and employment generation activities which are to be effective in conservation-linked interventions. Providing alternative income generating activities to local community is designed to reduce extractive harvesting from ecosystems.

Alternative income generation activities can influence socio-economic conditions and improve people's ability to practice sustainable forest management. Many unemployed people are particularly dependent on forest resources in the park area. In light of this reality, it is arguable that Co-management activities generate opportunities for local people to meet their basic needs without degrading protected areas.

The Co-management of PAs means to improve management, development of sustainable uses and provision of increase benefits to local communities from sustainable management and use of natural resources in the surrounding landscape. Development and implementation of a Co-management approach provides the policy and legal basis for engaging communities, individuals and other institutions with a stake in the natural resources of the area to participate more in the conservation and management of those resources, benefiting in a more sustainable manner.

Challenges/Problems of Co-management

- Most people living in and around PA's are dependent for their livelihood on PA's.
- Prepare a comprehensive master plan and investment plan for PA's

- Fund constraints/Sustainable financing
- Identify the alternate income generating activities (AIGA) in each PA without adverse impact on resource conservation to make CMC's self dependent and sustainable.
- Adopt a suitable benefit/revenue sharing mechanism with rights and responsibilities of different stakeholders
- Reduce dependency on development project
- Prepare and implementation of management plans and monitoring
- Orientation of FD staffs with Co-management and sharing experience of Co-management of other countries
- Political interference
- Build resilience of PA's to increased number of visitors
- Enhance technical capacities of CMO's to perform their duties
- Harmonize the challenges of eco-friendly public –private partnership.

Conclusions

Co-management approaches to natural resource management are recognized in many areas of the world (Ostrom 1990). However, in Bangladesh, the Co-management approach was introduced in 2004. During these periods, Co-management approaches are effectively worked in the 21 protected areas. The overall results of this review paper suggests that co-management activities have a positive impact in reducing forest dependency and improving the livelihoods of local people, conserving bio-diversity which is very essential for forest rehabilitation and mitigation and adaptation to climate change. In achieving constant conservation goals, protected area management will need to address the following dimensions to take account of climate change.

Recommendations

Introduce Co-management Approaches in All Protected Areas

The rate of forest loss in Bangladesh is one of the highest in the world. It is estimated that the forest cover has been reduced more than 50% since the 1970s (IUCN-Bangladesh 2000). The simple declaration of protected areas has not worked in our country as conserving biodiversity. Such declaration could not stop the steady loss of biodiversity, principally because people living in and around those areas have perceived PA declarations as a direct threat to their own livelihoods. In this context, it is recommended that to apply Co-management approaches in the all PAs for a sustainable PA management.

Expanding the Protected Area Network

The linkages between forests and climate change are intricate. On one hand, forest can mitigate climate change by absorbing carbon, while on the other it is responsible to climate change if they are degraded or destroyed. In turn, climatic changes may lead to forest

degradation. As per the statistics of FAO, the deforestation rate in Bangladesh is estimated as 2% of the forest area (as quoted in the Asia Pacific Forestry Sector Study, 2011 conducted jointly by FAO and Bangladesh Forest Department). In order to save natural forests from further degradation, good natural forests may be considered for bringing under PA network. At present, total protected area is 1.822% in relation to total country area. In view of small area under PA network, it is urged as a great expansion of the protected area network across the country to secure long-term representativeness of ecosystems and help species adapt to climate change.

Sustainable Financial Activities for the Landscape People

Effective PA management is essential to address forest rehabilitation and climate adaptation. Restoration is important both within protected areas and around them in targeted locations within the wider landscape. In review, the existing Co-management activities, it appears that the financial activities for landscape people are limited and insufficient. In the future, design and management plans for protected areas will need to focus on sustainable financial activities for the landscape people. Decision-makers need to ensure that institutional and legal conditions enable people to take benefit directly from protected area management.

In Bangladesh, there are total 38 declared protected areas. Forest Department should take initiatives to expand protected areas and introduce Co-management approaches for all declared protected areas in the country for rehabilitation and restoration of forest.

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Appendix-A

Notified Protected Areas in Bangladesh

Sl.No	National Parks	Lccation	Area(ha)	Established
1.	Bhawal National Park	Gazipur	5022.00	11-5-1982
2.	Madhupur National Park	Tangail/ Mymensingh	8436.00	24-2-1982
3.	Ramsagar National Park	Dinajpur	27.75	30-4-2001
4.	Himchari National Park	Cox's Bazar	1729.00	15-2-1980
5.	Lawachara National Park	Moulavibazar	1250.00	7-7-1996
6.	Kaptai National Park	Chittagong Hill Tracts	5464.00	9-9-1999
7.	Nijhum Dweep National Park	Noakhali 8-4-2001	16352.23	8-4-2001
8.	Medhakachhapia National Park	Cox's Bazar	395.92	8-8-2008
9.	Satchari National Park	Habigonj	242.91	15-10-2005
10.	Khadimnagar National Park	Sylhet	678.80	13-04-2006
11.	Baroiyadhala National Park	Chittagong	2933.61	06-04-2010
12.	Kuakata National Park	Patuakhali	1613.00	24-10-2010
13.	Nababgonj National Park	Dinajpur	517.61	24-10-2010
14.	Singra National Park	Dinajpur	305.69	24-10-2010
15.	Kadigarh National Park	Mymensingh	344.13	24-10-2010
16.	Altadighi National Park	Naogaon	264.12	24-12-2011
17.	Birgonj National Park	Dinajpur	168.56	24-12-2011
Wildlife Sanctuaries				
18.	Rema-Kalenga Wildlife Sanctuary	Hobigonj	1795.54	7-7-1996
19.	Char Kukri-Mukri Wildlife Sanctuary	Bhola	40.00	19-12-1981
20.	Sundarban (East) Wildlife Sanctuary	Bagerhat	31226.94	6-4-1996
21.	Sundarban (West) Wildlife Sanctuary.	Satkhira	71502	10 6-4-1996
22.	Sundarban (South) Wildlife Sanctuary	Khulna	36970.45	6-4-1996
23.	Pablakhali Wildlife Sanctuary	Chittagong Hill Tracts	42087.00	20-9-1983
24.	Chunati Wildlife Sanctuary	Chittagong	7763.97	18-3-1986
25.	Fashiakhali Wildlife Sanctuary	Cox's Bazar	1302.43	11-4-2007
26.	Dudpukuria-Dhopachari Wildlife Sanctuary	Chittagong	4716.57	6-4-2010
27.	Hajarikhil Wildlife Sanctuary	Chittagong	1177.53	6-4-2010
28.	Sangu Wildlife Sanctuary	Bandarban	2331.98	6-4-2010
29.	Teknaf Wildlife Sanctuary	Cox's Bazar	11615.00	24-03-2010
30.	Tengragiri Wildlife Sanctuary	Barguna	4048.58	24-10-2010
31.	Dudhmukhi Wildlife Sanctuary	Bagerhat	170.00	29-01-2012
32.	Chadpai Wildlife Sanctuary	Bagerhat	560.00	29-01-2012
33.	Dhangmari Wildlife Sanctuary	Bagerhat	340.00	29-01-2012
34.	Sonarchar Wildlife Sanctuary 2026.48	Patuakhali	2026.48	24-12-2011

35.	Nazirganj Wildlife (Dolphin) Sanctuary	Pabna	146.00	01-12-2013
36.	Shilanda-Nagdemra Wildlife (Dolphin) Sanctuary	Pabna	24.17	01-12-2013
37.	Nagarbari-Mohanganj Dolphin Sanctuary	Pabna	408.11	01-12-2013
38.	Marine Protected Area	Southern part of Sundarban including Swatch of no ground	173800	

Forest Rehabilitation and Management in Cambodia

Preap Sam

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I. Abstract

Forest in Cambodia are subject to a wide range of threats, including logging, forest fires, subsistence and commercial agricultural expansion, and the establishment of roads and human settlements. Loss of forest cover is of global significance due to its implications for biodiversity, land degradation and climate change. Forest degradation also poses a major threat to the livelihoods of local people. Decline of forest land started from 2004, but the serious decrease occurred in last 10 years, caused forest resources were deforested and degraded.

According to this loss, the forestry administration representative of the Royal Government of Cambodia (RGC) has been implementing significant reforms in the forest sector since 1998 and has created a new forest law adopted on 31 August 2002 to contribute to rehabilitate and increase the productivity of our degraded forest as well as to expand forest cover. In addition to this reform, the RGC has achieved remarkable results in sustainable forest management, contributing to social-economic development, environment protection, and poverty alleviation through National Forest Programme 2010-2029.

Although we have new forest law, orders, announcements, and declarations, the forest has been cutting to encroach and occupy as private land. On the other hand, it is very complexity in forest rehabilitation and management because of relation to social-economic development such as poverty reduction, land use management plan, illegal activity and limited cooperation, conflict in forest sector, limited capacity and knowledge, especially financial shortage and policy.

The project activities have been fully completed project outputs have been achieved as expected. The outputs, were designed to meet the project objective, to enhance the restoration of community forests in Siem Reap and Kampong Thom provinces for production of timber and NTFPs as a means to improve livelihood of local community.

What We learned from the implementation of the project is that participation of local communities and local FA is the key success in forest restoration and community forest management in general. We observed that local communities at the some project sites have a willingness to learn all aspects of forest restoration because they have a common goal, reverse their forests back to the conditions before they were degraded.

II. Introduction

Cambodia is located in the tropics of Southeast Asia, between 10° to 15° N latitude and 102° to 108° E longitude, on the southern Indochina Peninsula, with area of 181,035 km2, extends 441 km from the east to west, and 560 km from the north to south. Country boundaries share with Thailand in the west and north, Lao in the north, and Vietnam in the east and south.

The population is 13,395,682 million people, urban is 2,614,027 million people and rural 10,781,655 million people with the annual population growth rate of around 1.54%, (National Institute of Statistics 2008), CPI 1.9% (November 2015), GDP per Capita 1,136$ (2014). Approximately 80% of the country's inhabitants live in rural areas with planting rice, orchard, access to natural resource for essential products, energy and food as well as limited electricity and seasonal food shortage.

According to the great variations in rainfall, temperature and topography, there are many tree species and forest types in Cambodia. The evergreen forests situate in the highest rainfall zone, especially in the northern, central and western part of the country. As for the dry forest (deciduous forest) situates in plateau area of western part of national road 5, north-eastern part of national road 6 and eastern part of Mekong river. Mangrove and rear mangrove forest locate in coastal areas, western part of the country, as for flooded forest situates around Tonle Sap lake.

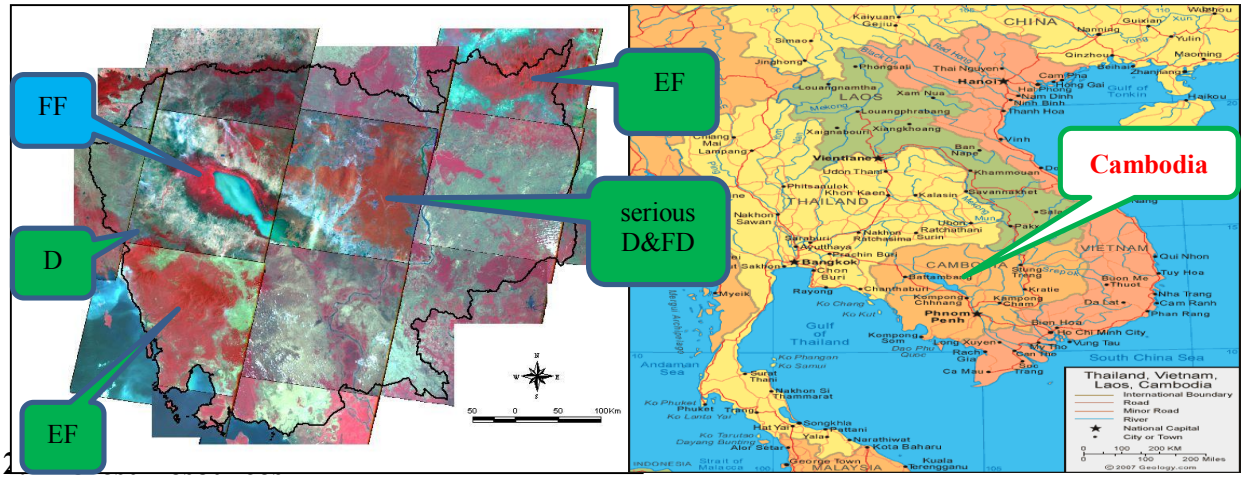
In 1965, forest areas covered an estimated of 73% of the country's territory, but during civil war from 1970 to 1979) it did not has data on forest resources. After finishing civil war, the country has good political stability, the Forestry Administration which is an important entity, responsible for forest sector has conducted a series of forest cover assessments in1992/93, 1996/97, 2000 (partial), 2002, 2006 and 2010 to monitor the loss of forest land. The reasons of forest cover loss is consistent with land use and land cover change patterns associated with population growth and economic developments such as agricultural expansion, illegal logging, a construction boom and economic land concessions. which caused the deforestation and forest degradation, especially occurred in evergreen and semi-evergreen forest areas that are major concerns of government.

Cambodia, has experienced major changes in land use and land cover over the last two decades. The emergence from cold war rivalries and recent major economic reforms result in a shift from subsistence agrarian modes of production to market-based agricultural production and industrialized economies, which are heavily integrated into regional and global trade systems. The Cambodia land uses were divided as National Parks, Protected Areas, Protected Forest, Social Land Concessions, Economic Land Concessions, Community Forestry, Agricultural Land, habitat land and water bodies.

During the last 10 years the people have been an increasing awareness of the importance of forests not only for producing commercial timber but also for providing a much wider range of goods and services. In Cambodia country, non-timber and forest products are important for both subsistence and market purposes. The role of forests in providing environmental services

such as watershed protection, biodiversity conservation and carbon sequestration is also receiving increasing attention.

Figure 2 : Mosaic images of Vegetation Location **Figure 1 : Map of Cambodia**

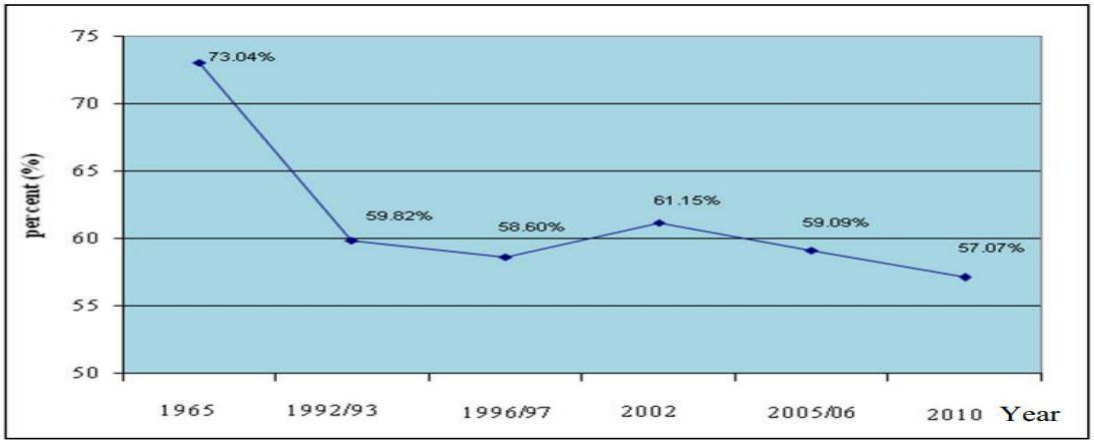


2.1.1- Forest Cover Statistic

The forest cover of Cambodia is 73.04% in 1965 and has declined to 57.07% in 2010 of total land area. The below table and figure will show forest cover data from 1965 until 2010.

Table 1: Forest Cover from 1965-2010

No	Assessment by year	Land				Total Area (ha)
		Forest land		Non forest land		
		Ha	%	Ha	%	
1	1965	13,227,100	73	4,883,400	27	18,110,500
2	1992/93	10,859,695	60	7,293,290	40	18,152,985
3	1996/97	10,638,209	59	7,514,776	41	18,152,985
4	2002	11,104,293	61	7,056,383	39	18,160,677
5	2005/06	10,730,781	59	7,429,893	41	18,160,674
6	2010	10,363,789	57	7,796,885	43	18,160,674



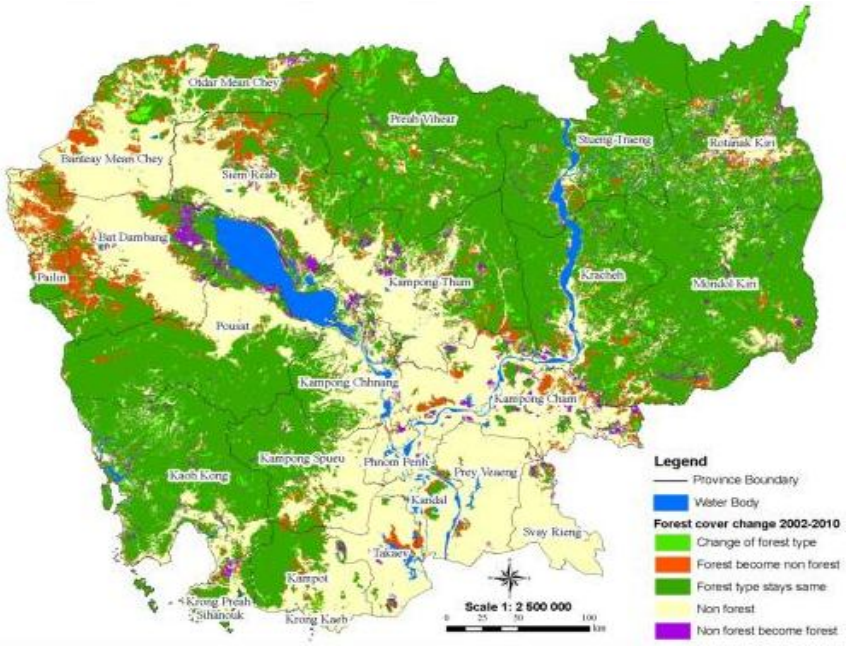
2.1.2- Forest Cover Type/Change 2002- 2010

Referenced to the result of forest cover assessment (Table 1) indicated that forest cover has declined from 61.15% in 2002 to 57.07% in 2010. Base on this data, the forest cover change from 2002 to 2010, representing a decrease of 4.08% equivalent to 740,502 hectares of total land area (Table 2 and Figure 4).

Table 2 : Forest Cover Change 2002-2010

N°	Forest Types	Forest Cover Area				CHANGE	
		2002		2010		2002-2010	
		Ha	%	Ha	%	Ha	%
1	Evergreen Forest	3,720,493	20.49	3,499,185	19.27	-221,308	-1.22
2	Semi-evergreen Forest	1,455,183	8.01	1,274,789	7.02	-180,394	-0.99
3	Deciduous Forest	4,833,887	26.62	4,481,214	24.68	-352,673	-1.94
4	Other Forest	1,094,728	6.03	1,108,600	6.1	13,872	0.08
	Total Forest Land	**11,104,291**	**61.15**	**10,363,789**	**57.07**	**-740,502**	**-4.08**
5	Non Forest	7,056,383	38.85	7,796,885	42.93	740,502	4.08
	TOTAL AREA	**18,160,,674**	**100**	**18,160,,674**	**100**		

Figure 4 : Map of Forest Cover Change between 2002 and 2010



The main purposes of the forest cover assessment from 1992-2010 is to evaluate result with CMDG, monitor forest cover change for preparing proper SFM plan, and as a basic information for preparing forest management and strategic plan.

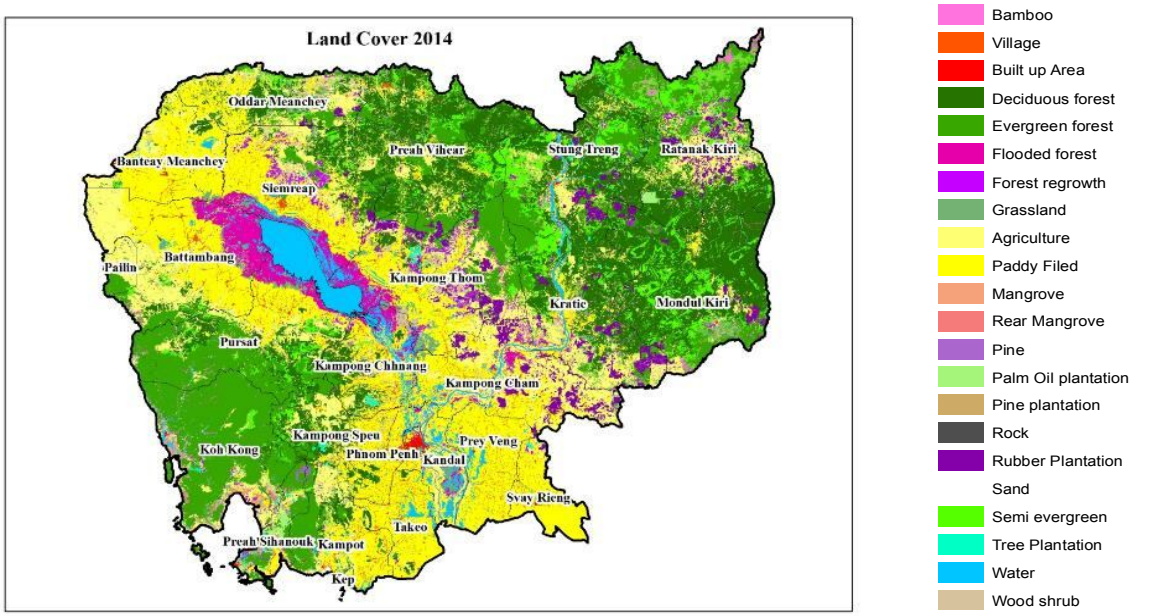
2.2- Forest Cover Assessment for NFMS and REDD+

In order to fulfill requirements of UNFCCC, the Forestry Administration cooperated with JICA-CAMREDD and UN REDD created a team work to assess the forest cover and produce forest cover map 2014 as a based map for monitoring forest cover change in current forest resource trend for preparing proper SFM plan, , and supported REDD+ implementation in Cambodia.

2.2.1- Forest Cover Type 2014

In this assessment, the forest cover type has been classified into 22 classes : 13 vegetation classes and 9 non-forest classes as shown in Figure 5.

Figure 5 : Forest Cover Type in 2014



2.2.2- Forest Cover Change for NFMS and REDD+, 2006-2010- 2014

The forest cover 2014 was regarded as the based map for monitoring the forest cover change to implement the requirement of UNREDD. Therefore, the forest cover type in 2006 and 2010 with 5 classes include Evergreen Forest, Semi-evergreen Forest, Deciduous Forest, Other Forest and Non Forest were isolated into 22 classes of forest cover 2014. So referent to this result, the forest cover change from 2006-2010-2014 is shown in Figure 6 and 7.

Figure 6 : Land Cover Change from 2006-2010-2014

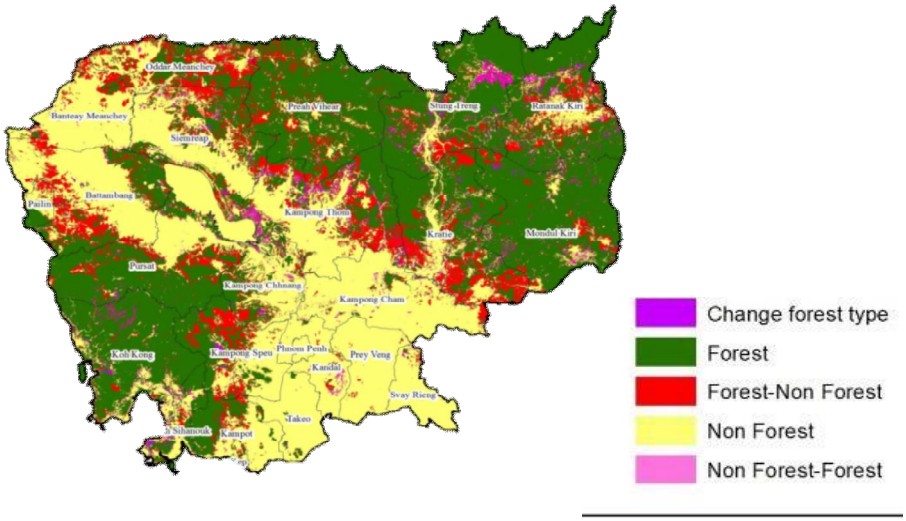
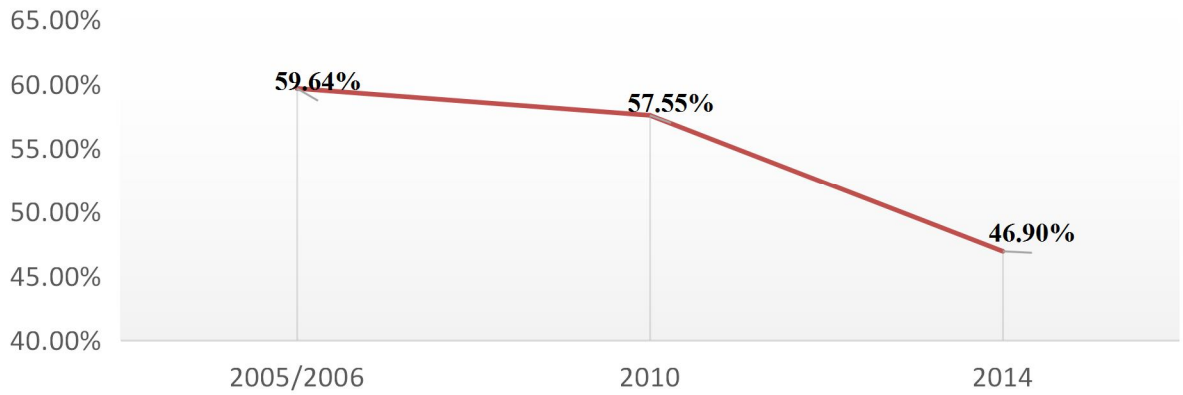


Figure 7 : Forest Cover Change 2005/06-2010-2014



2.3- Deforestation from 1965-2014

According to above result of forest cover statistics showed that Cambodia forest resource and forest land were seriously declined from 73.04% in 1965 to 46.90% in 2014 (informal data). There are some main reasons of this decrease : the government needs finance resource to restore country after the Pol Pot regime was finished in 1979 and civil war was terminated in 1997, people poverty, food shortage and expansion of agricultural land, especially in last 10 years because of population growth and economic development.

2.4- Agriculture

Referent to statistics of Ministry of Agriculture, Forestry and Fisheries showed that in 2014 the agricultural land(Paddy Field) are 3,052,420 hectares, supplemental and industrial crop lands are 165,712 hectares and in 2013 the State rubber plantation are 55,908 hectares, rubber plantation of economic land concession 135,446 hectares and family rubber plantation 137,417 hectares.

2.5- Livestock

Referent to statistics of Ministry of Agriculture, Forestry and Fisheries showed that in 2013, ox and cow are 3,430,895 heads, buffalo are 619,114 heads, pig are 2,436,699 heads, and biped are 27,316,415 heads. These mammals and bipeds are usually feeding by family and small scale farm.

2.6- Restoration/Rehabilitation of Degraded Lands

In Cambodia, restoration/rehabilitation of degraded lands, usually were established in the community forests through the projects. There are about 400,000 ha of natural forests have been placed under the management of local communities, living in or adjacent to the forests for livelihood and income generation. However, the community forests are degraded and the communities themselves do not have the means to restore the forests to a more productive condition. One of the objectives of community forestry system is to improve livelihoods of participating communities through access to timber and non-timber forest products (NTFP). However, the majority of community forests are severely degraded with poorly stocked with

timber and non-timber forest products. Forest degradation has reduced forest quality and diminished forest products which in turn severely threatened livelihood of local communities.

For the scale of restoration/rehabilitation efforts, it could not compare with the scope of degradation, because of poverty, shortage of awareness and knowledge, conflict in forest sector especially related to finance and land use management plan.

III. Key Element Relating to Case Study

3.1- Sustainable Forest Management (SFM)

Specifically, in relation to SFM, three pillars are identified:

1- SFM and the use of forests to improve the livelihood of people living in rural areas and contribute to economic growth
2- A Protected Area system to protect biodiversity and endangered species
3- Establishment of a community forestry programme

The National Strategic Development Plan (NSDP)2006-2010 re-iterates the forestry pillars outline in the Rectangular Strategy. Elaborating on these needs, the NSDP contains a commitment of the RGC to implement a NFP for Cambodia focusing on forest reforms which embraces:

- Strengthening forestry management and conservation
- Promoting man-made plantations to substitute for national forest demands by encouraging private investment and public participation
- Promoting forestry contribution to socio-economic development
- Promoting forestry contribution to poverty reduction by strengthening community forestry initiatives and by involving local communities in forest exploitation plans
- Creating public awareness on the important of and the need to replant and use community plantations to sustainably meet domestic firewood and charcoal demand.

3.2- Forest National Sector Policy

The Royal Government of Cambodia is endeavoring to implement a coordinated set of laws, programs, action plans, and institutional arrangements regarding forest resources which are directed toward enable the achievement of national goals of environmental protection, biodiversity conservation, poverty reduction, socio-economic development, and good governance as well as considers the ecologically, socially, and economically viable conservation and management of forest resources as a major pillar of public welfare. The socio-economic development Plan, poverty reduction Strategy, and the Governance Action Plan are the set of national goals directed to the sustainable development of Nation provides the overall development framework for the conservation and management of the country's forest resources.

The Royal Government of Cambodia commits itself to the conservation and management of the country's unique forest resources in a sustainable manner now and for future generations. The results and the follow up processes of the United Nations Conference on Environment

and Development (UNCED) in Rio de Janeiro in 1992 are taken into account to consider the concept of sustainable forest management within the framework of the sustainable development of Cambodia. The Royal Government of Cambodia acknowledges the multiple perceptions, interests and objectives of the numerous forest interest groups of the country's society, in the region of the Mekong Basin and at the global level regarding the conservation and sustainable management of forest resources.

The objectives of these initiatives within the set of nation goals regarding of forest resources are:

- The conservation and the sustainable management of the country's forest resources shall provide a maximum contribution to the sustainable socio-economic development of the Kingdom of Cambodia.
- The remaining forest resources of the country shall be considered as Permanent Forest Estate and managed by exclusively promoting conservation and sustainable forest management initiatives that directly contribute to the rehabilitation and conservation of a maximum stock of forested land and forest resources.
- Within the context of conservation and sustainable forest management initiatives, a maximum involvement of the private sector and participation of the local population shall be achieved in order to ensure food security, poverty reduction and socio-economic development.
- A wide range of coordinated multi-stakeholder processes shall be implemented to enable the harmonization of the different perceptions, interests and objectives of the various forest interest groups at all levels.
- To continue to support forestation of arable land and to protect those trees for the development of forest resources.

The commitment to accomplish the national forest goals:

For the achievement of the national goals of environmental protection, biodiversity conservation, poverty reduction, economic development, and good governance, the Government will endeavor to accomplish the following tasks:

a. Forest Resource Conservation

- To reclassify and to dedicate the major parts of remaining natural forest stands to their ecosystems protection and biodiversity conservation functions.
- To promote conservation and protection strategies such as protected forest, watershed management, genetic and wildlife resources conservation, eco-tourism, and special management areas with a maximum participation of the local population.
- To implement the strict application of the Code of Practice as regulatory framework for the sustainable management of forest resources and forest concessions.
- To conduct extension, education, and public awareness campaigns at all levels of the Cambodian society.

b. Good Governance

- To implement capacity building, institutional strengthening and research programs at all levels.
- To conduct education, training and public awareness campaigns with particular regard to the participation of local populations within conservation and sustainable forest management plans.
- To establish a forest administration in which necessary steps of devolution of decision-making power can take place and in which functional procedures for multi-institutional collaborations are grounded.
- To encourage, implement and coordinate multi-stakeholder processes that enable the harmonization of the different perceptions, interests and objectives of the various forest interest groups at local, regional and international levels.
- To promote transparent information for the forest sector.

c. Socio-Economic Development:

- To promote the high socio-economic value of forest ecosystem protection and biodiversity conservation function of natural forest resources.
- To promote the substitution of timber supply from natural forest stands by timber plantations through encouraging private investment and public participation.
- To optimize the use, processing and marketing system for forest products, especially plantation forest products to support domestic demand, and export markets.

d. Poverty Reduction:

- To recognize legally and protect the traditional rights of local populations to use forest resources under the framework of food security and poverty reduction considerations.
- To optimize the benefits to local populations from the use and management of forest resources through the implementation of forestry and wildlife conservation concept based on the participation of local populations.

3.3- Vision, Mission and Objectives of National Forest Programme 2010-2020

The Royal Government of Cambodia has been implementing significant reforms in the forest sector since 1998 and has achieved remarkable results in establishing social order and foundation for enhancing sustainable forest management, contributing to social-economic development, environment protection, and poverty alleviation and for future generation. In order to sustain effective forest reform, the Royal Government of Cambodia has been embarking on an intensive process of developing and implementing a National Forest Programme aimed to place good governance and effective partnerships at the center of sustainable forest management.

The National Forest Programme would serve as an appropriate mechanism and provide a transparent and participatory process for planning, implementation, monitoring, evaluation and coordination of all forestry activities. And the National Forest Programme will closely follow the principle of:

- Sustainable forest development: observing social, economic, cultural and environmental aspects

- Good country leadership and forest good governance: conflict management, commitment and alignment with national policies
- Regular participation through multi-stakeholder consultation: technical working groups, technical assistance and partnerships to fit the Cambodia context
- Holistic and cross-sectoral approaches: using landscape planning approach through collaboration with relevant government agencies, local government and civil society
- Monitoring mechanism: its implementation for improved performance and for public information and awareness raising among stakeholders including national and local government, civil society and the private sector.

The National Forest Programme consists of main six integral implementation programme each comprised of one broad theme of particular priority for 2010-2029 in order to achieving sustainable forest management in Cambodia as below:

3.3.1- Vision and Mission

Cambodian's Vision and Mission were determined in multi-stakeholder workshops. During these discussion and the subsequent six public consultations, a share value emerged- "Sustainable Forestry for our people". The vision describes aspirations and direction for the future as a broad long-term goal. The mission is derived from the vision and is ashort directive statement on how to meet the vision.

NFP Vision	NFP Mission
"It is the VISION of the Royal Government of Cambodia that ecologically, socio-economically, culturally and environmentally sound management and development of forest resources forms a major pillar for public welfare."	"Our overall MISSION is to advance the sustainable management and development of our forests for their contribution poverty alleviation, enhanced livelihoods, economic growth and environmental protection, including conservation of biological diversity and our cultural heritage.

3.2.2- Strategic Objectives

There are nine strategic objectives in the National Strategic Development Plan (2009-2013):

a. Maximize sustainable forest contribution to poverty alleviation, enhanced livelihoods and equitable economic growth
b. Adapt to climate change and mitigate its effects on forest based livelihood
c. Macro land-use planning that allows for holistic planning across sectors, jurisdictions and local government borders
d. Forest governance, law and enforcement at all levels.
e. Develop a conflict management system
f. Raise awareness, capacity of institutions and quality of education to enable sustainable implementation of the National Forest Programme
g. Ensure environmental protection and conservation of forest resources
h. Apply modern sustainable management models adaptive to hanging context
i. Develop sustainable financing systems

National Forest Programme Framework

3.2.3-. Programme Ⅱ: Conservation and Development of Forest Resource and Biodiversity

Forests are an intrinsic part of Cambodia life and culture. Most rural people are on forest products for livelihood. The Royal Government of Cambodia considers the implementation of environmentally, sociologically and financially sustainable management of forest resources an important public asset that, if properly managed, can contribute significantly to poverty reduction and socio-economic development. Currently, it encounters challenges in forest management due to some factors such as ambiguous land rights, lack of demarcation and proper management plans continue to contribute significantly to deforestation and habitat degradation. However, the Royal Government of Cambodia had achievement in term of policies, strategies and measurement of forest resource prevention in sustainable way and also commits implementing the Cambodian Millennium Development Goals aim to maintain forest cover at 60% of the total land area by 2015 Thus, the NFP has been formulated by the RGC to carry out sustainable forest management in Cambodia in the conservation and forest resource development and biodiversity programme as follow: To improve national land-use planning and national forest resource.

- To support implementation of forest management systems
- To conservation of genetic diversity and biodiversity
- To enhance effetely and benefits from forest services
- To support wood processing technology development, and enhance quality forest products and market promotion.

Sub Programme 2.1: Forest Management Action Plan

The development of Forest Management Action Plan (FMAP) is a key activities to be undertaken by the Forestry Administration (FA) and development partners in consistent to NFP and the Royal Government of Cambodia policies on forestry sector. The overall purpose is to ensure sustainable conservation and forest resource development and biodiversity programme in Cambodia. Specific objectives obtain three priority areas in following:

First priority area: Forest development action plan formulation:

-develop and implement forest development action plan formulation and forestry inventory

-Pending on potential future prosperous viable system of reduced emission from deforestation and forest degradation, develop a national carbon accounting.

Second priority area: Strengthening management system and conservation at Forest Management Unit level:

-Develop and implement management system for productive forest outside forest concession

-Develop and implement management system including biodiversity conservation and eco-tourism development

-Conserve in-situ and ex-situ forest genetic resources and establish seed banks for restoration programmes

-Develop multi-purpose forest plantations.

Third priority area: Supporting for wood processing technology development and enhancing quality of forest products and market promotion:

-Develop timber processing technology and activities for value added products
-Promote forest product processing and marketing.

3.2.4- Institutional Aspect

Forestry Administration, especially department of forest plantation and private forest development responsible for forest restoration and plantation through under cooperation with relevant stakeholders such as civil society and private sector, NGOs, and projects. But, the actual activity of department of forest plantation and private forest development has been undertaking only tree plantations by using governmental budget and cooperated with one private sector.

As for forest restoration/rehabilitation was implemented by the institute of forest and wildlife research and development in community forest areas with small scale, through budget grant from other projects.

3.2.5- Project Application

In 2009 the forest restoration was applied first time in Siem Reap province in cooperation with FORRU-CMU, under supported by Darwin Initiative, England. In this activity was focused on : 1-tree phenology trial which was established to study the flowering and fruiting of the tree for seed collection, 2-constructed a nursery to test seed germination, and seedling growth, and 3- established a field trial plots.

Currently, Multi-function forest restoration and management of degraded forest areas in Cambodia was established under the provision of financial support by The Asia-Pacific Network to a three-year project for 3 years from 2011 to 2014 and extended to March 2015. The project sites are located in two community forests (CF), O Soam CF in Kampong Thom province and Tbneng Lech CF, in Siem Reap provinces, respectively. The objective was to enhance the restoration of community forests in Siem Reap and Kampong Thom provinces for production of timber and NTFPs as a means to improve livelihood of local community. In order to achieve the defined objective, three outputs were identified: 1) Community nursery established in each pilot site; 2) Models of forest restoration plots established in each pilot site; and 3) Knowledge and experience on multi-functional forest restoration published and disseminated to relevant stakeholders and general public.

The outcome of the greatest importance arising from this project has been developed capacity of local communities to produce seedlings and conduct forest rehabilitation. Knowledge and skills on seed collection, seed pretreatment, preparation of potting mixes and, particularly, the nurseries and affiliated facilities did not exist at the two CFs before the project intervention. Importantly, the two CFs have become a model of community forest restoration. Every year, these CFs have attracted different visitors (visitors from other CFs around the country, university students, local and international participants attending workshops in Cambodia) to

their sites to learn the techniques of forest restoration. Adding demonstration plots to CFs means that visitors have something new to learn.

The project brought about significant improvement on local environment and socio-economic of the two communities. In addition to the nurseries which become a source of income generation, thousands of multiple species, rattan, bamboo, fruit trees, and particularly HVT, planted for enrichment the community forests will become significant sources of livelihood and income generation in the future.

IV. Lesson Learnt

Up to the present time, forests in Cambodia have been viewed by powerful people as being a very valuable commodity, easily able to be liquidated for financial rewards. Approaches by the government to forest management have largely reflected this view. These past approaches and views are currently being questioned and a new political and bureaucratic environment is evolving. However, there are major constraints to moving ahead. By and large, there is no clear picture of policy objectives in terms of optimum forest coverage in each province, what forest quality criteria are important, and what purposes should be assigned to various forest areas. In addition, the question of what balance should be sought in terms of forest functions such as biodiversity conservation, watershed protection, and supply of timber and non-timber forest products, has not been systematically formulated. Some of these issues have been addressed at a national level, including the identification of land for inclusion in a system of protected areas, although implementation has proven problematic.

Cambodia had had little experience in rehabilitating its degraded forests, and the current experiences provide only limited guidelines for future planning. However, as long as a forest policy to address the points raised above (as well as many others) is not in place, it will be difficult to be precise about the role and focus of forest rehabilitation. While it is incontestable that vast areas of forest in Cambodia have been lost and severely degraded in recent decades, it is clear that a priority need exists to put in place an effective system for land use planning. Such a system should involve a wide range of stakeholders at all levels and should respect customary user rights of local people. The question of rehabilitation of degraded forest land needs to follow on from a consideration of the optimal use of the land--keeping in mind a range of communal, national, and global interests.

It would be naïve to believe that effective land use planning could take place nationwide within a short period of time. At the moment, there is barely sufficient capacity available at the national level to initiate and steer such a process. At the provincial and district levels similar problems exist, impeding such a process from being implemented. In addition, in the absence of guidance from a land use policy and unclear/unstable tenure systems, national government authorities show little inclination to devolve authority for land use planning to provincial levels.

In spite of these constraints, several donor supported projects and NGOs have been involved in land use planning at the local level. These projects have carried out land classification for forest and agricultural use and some may attempt to inventory forests. Experience has

suggested that the guiding principle during the process is the question of land use to satisfy people's basic needs. The question of the best ways of rehabilitating existing degraded forests is a secondary issue. However, in many instances, vested interests of private persons or private sector industries are able to override the principle of optimum use of land, and in such cases implementation of any land use plan is very difficult. In spite of these difficulties it seems likely that the best hope for rehabilitation of degraded forests lies with land use planning and implementation at the local level.

v. The Way Forward

The forestry sector is given high priority in the National Program for Rehabilitation and Development of Cambodia to encourage a national approach to sustainable development of forest for both production and biodiversity conservation. The Royal Government of Cambodia (RGC) is endeavoring to manage its forest resources on a sustainable basis for socio-economic development and environmental protection, emphasizing greater involvement of rural people in the planning, implementation and management process. This is acknowledged in the draft National Forest Policy. It is recognized that participation of local people in forest management would result in sustainable supply of forest resources, instill a sense of ownership for the forest,

reduce conflicts between local people and the government, and contribute to their individual and collective benefit.

In this connection, the Department of Forestry and Wildlife (Forestry Administration "FA", now) with the assistance of FAO and other organizations has been carrying out forestry projects with the participation of local people to arrange and implement the Sustainable Forest Management and Rehabilitation in their territories. In addition, it has collaborated with several NGOs that have initiated community forestry projects in several parts of the country.

Many forest deficient areas exist in the central and southern parts of the country, where population density is high and wood supply, which local people depend on for fuelwood and building, is scarce. Managing these vast areas would be difficult for the government. The FA believes that promotion of community forestry programs would be the most feasible approach to managing many of the forest deficient areas. This would involve the government in granting long-term leases of deforested and degraded lands to local communities to establish community forests. However, practical knowledge and skills of government staff (FA, Environment and Rural Development ministries and their provincial counterparts) and local communities in this field are too limited to successfully carry out community forestry projects on this scale. Indeed, the approach must incorporate extension, education, awareness raising and promotion programs into an implementation strategy. This would increase understanding of community forestry concept by government staff and local people and promote greater people’s participation.

VI. Summary

Base on the National Forest Policy and National Forest Programme and National Goals directed to the development framework for the conservation and sustainable management of forest resources, the Royal Government of Cambodia acknowledges international issues, processes and commitments occurring as a result of the United Nations Conference on Environment and development (UNCED) in Rio de Janeiro in 1992 and its follow-up processes relevant to the country's forest resources.

The Royal Government of Cambodia envisions that a long term National Forest Programme (NFP) will be implemented consistent with the framework of the Intergovernmental Panel on Forests/Intergovernmental Forum on Forests promoted by the International Arrangement on Forests with the United Nations Forum on Forests and the Collaborative Partnership on Forests.

Relates to forest rehabilitation/restoration is not just about the forests but also about people depending on the forests for livelihood and income generation, especially for biodiversity and eco-tourism. A holistic approach has to be adopted when forest rehabilitation was planned. Therefore, it is recommended that future forest restoration/rehabilitation programs should include components other than activities closely related to forest restoration. Activities related to improved livelihood of local communities, promotion of wood-based enterprise at the communities and community-based ecotourism.

In Cambodia, the forest rehabilitation/restoration can be done in the community forests (CF), because it has Term of CF Agreement. Community forests are forests owned by the state that have been allocated to communities under a 15-year agreement. But the development of the CF within 15 years may not be sufficient for many CFs due to the degraded condition of their forests. If a community starts rehabilitating the forests, it will take time before the forests recovered. The forest restoration is long term in nature as the growth rate of many indigenous species, particularly the HVT species, is relatively slow. Longer term of CFs will motivate the communities in developing and investing on rehabilitation of the degraded forests and they can be assured to get benefits from their investments.

In order to improve deforestation and habitat degradation, forest Plantation is main part of increasing forest cover and economic potential forest management of national economic as follow forest sector reforms of the Royal Government of Cambodia and main factor in order to reach policy of Royal Government on social-economic development and poverty alleviation. Forest plantation is not only improve forest resources, but it also decrease on natural forest utilizations and prevent animals and plants through sustainable ecosystem preservation.

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Forest Rehabilitation and Management in Fiji

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Abstract: The Fiji islands have been blessed with an abundance of natural resources and serene beauty. Its sandy beaches coupled with the warmth of her people have earned it's name as a Paradise on earth. Magazine researches worldwide have confirmed Fiji as one of the dream holiday destination.

Over the years its natural resources have diminished as the increasing population competes for the limited available resources. There are twenty four major ecosystems that contribute to society's wellbeing. Fifteen of these ecosystems are on the decline as determined by the Millennium Ecosystem Assessment. The Forest biome is among the 15 identified diminishing ecosystems which will be witnessed by the future generation with a widespread of depletion and degradation of the habitats; water resources and most probably change in climatic patterns. In the last decade people were so concerned with making a living and never thought of the consequences of our diminishing natural resources. It has been reported that the world's forests have been diminishing at an alarming rate of forty per cent in the last hundred years. Illegal logging, extension due agriculture pursuits and development has been identified as the main reasons for the depletion of forest resources in Fiji. We depend on nature for the regeneration of forests and little was done to restore or rehabilitate our scarce forest resources.

Intervention in the past have been minimal and not well coordinated which amounts to the exacerbation of our dwindling forest resources. As a story was told of a sinking ship where passengers asked a reverend for a prayer and to which the reverend replied "Now is not the time to pray but the time to swim". Valuable lessons were learnt in our quest for progress and prosperity but time is not on our side. As a nation we must restore and rehabilitate our forest resources if we are to leave behind a legacy let alone a hope for our future generation. This is not the time to be concerned with policies but we need to restore our forests. As an island nation we must involve all Fijians in the restoration of Fiji's forest resources.

1.0 Introduction

Location, Size, and Extent

The Republic of Fiji Island is situated in the South Pacific about 4,450 km (2,765 mi) south west of Hawaii and 1,770 km (1,100 mi) north of New Zealand. The Fiji Islands comprises some 850 islands, of which only about 100 are inhabited. The island of Rotuma, added to Fiji in 1881, is geographically separate from the main archipelago and has an area of 44 sq km (17

sq mi). The total area (including Rotuma) is 18,270 sq km (7,054 sq mi).The largest islands are Viti Levu, with an area of 10,386 square km (4,010 square mi), and Vanua Levu, with 5,535 sq km (2,137 sq mi). Fiji's total coastline is 1,129 km (702 mi).

Fiji's capital city, Suva, is located on the island of Viti Levu.

Population

The population of Fiji in 2005 was estimated by the United Nations (UN) at 842,000, which placed it at number 154 in population among the 193 nations of the world, but ranked it second (after Papua New Guinea) among the Pacific Island nations. In 2005, approximately 4% of the population was over 65 years of age, with another 30% of the population under 15 years of age. There were 103 males for every 100 females in the country. According to the UN, the annual population rate of change for 2005–10 was expected to be 1.5%, a rate the government viewed as satisfactory. The projected population for the year 2025 was 939,000. The population density was 46 per sq km (119 per sq mi), with about 70% of the population living on the island of Viti Levu.

The UN estimated that 46% of the population lived in urban areas in 2005, and that urban areas were growing at an annual rate of 2.11%. The capital city, Suva, had a population of 210,000 in that year.

Land Tenure

Land in the Fiji Islands is managed through three complementary systems- Native Land , freehold land and Crown Land . Freehold land can be bought and sold. Native Land and Crown Land cannot be bought and sold but is available only on a leasehold basis. Leasehold land can be developed as much of it is available on a long-term lease basis (often 99 years). Each type of land tenure has different implications for the development and planning processes.

Native Land

Approximately 83% of land in Fiji is Native Land. All Native Land belongs to village groups or 'land-owning units'. Typically a portion of each land area is set aside for the site of the

village, and the rest is Native reserve. Land within native reserve may be made available for use and development by others through short- or long-term lease. In order for development to take place on Native Land, the developer must obtain a lease. Leases of Native Land are available through the Itaukei Land Trust Board (ITLTB), a statutory authority which administers all such lands on behalf of the Fijian owners. All applications for leases of Native Land are made to the NLTB. Any agreement or dealing concerning Native Land made with any other person or group has no legal standing. Once an NLTB lease has been issued, the land must go through a process of de-reservation before development can take place. Any application for development permission, subdivision, or rezoning of Native Land must be accompanied by a copy of the lease document(s) as evidence of the applicant's legal right to the land, and the NLTB's consent to the land's development. Development leases are issued for particular types of development (residential, commercial, tourism, etc) and if a lessee wishes to carry out a different type of development, the agreement of the lessor must be obtained.

Freehold Land

Approximately 10% of land in Fiji is freehold land registered under the Torrens system of land registration, by which titles to land are guaranteed. Freehold land can be purchased, transferred, or leased, subject to the conditions of the Land Sales Act, which among other things restricts the quantity of land which can be purchased by individuals who are not resident in Fiji , and by companies not wholly owned by Fiji citizens.

Crown Land

Approximately 7% of land in Fiji is Crown Land, administered by the Department of Lands. In addition, all foreshore lands below mean high water mark, the soil under Fiji waters and the beds of navigable rivers and streams are Crown Land. Like Native Land, Crown Land is not sold outright but some is available on a leasehold basis. Crown leases are granted and managed by the Director of Lands.

Topography

The larger Fiji islands are volcanic, with rugged peaks and flatland where rivers have built deltas. Coral reefs surround the islands. Viti Levu's highest point, Tomanivi, is 1,323 m (4,340 ft). About 28 other peaks are over 910 m (3,000 ft). The lowest point is at sea level (Pacific Ocean). The main river, the Rewa, is about 150 km (95 mi) long, but only navigable by small boats for 113 km (70 mi).

Climate

Temperatures at sea level range from 20–29°c (68–85°f); easterly trade winds blow during the greater part of the year. Annual rainfall is well distributed and averages 305 cm (120 in) in Suva. At sea level on the leeward sides of the islands there are well-defined wet and dry seasons, with a mean annual average of 178 cm (70 in) of rain.

The cyclone season, from November to April, brings storms that generally cause extensive property damage and loss of crops as well as numerous deaths.

Flora and Fauna

The larger islands have forests on the windward side and grassland on the leeward slopes. Mangroves and coconut plantations fringe the coasts. Among indigenous fauna are bats, rats, snakes, frogs, lizards, and many species of birds. A red and white flowering plant called the tagimaucia is found only on the banks of the Tagimaucia River in the mountains of Taveuni island.

Environment

The main challenges to the environment in Fiji are deforestation, hurricanes, soil erosion, and pollution. Apart from these approximately 30% of Fiji's forests have been eliminated by commercial interests. The rainfall pattern, the location of agricultural areas, and inadequate agricultural methods contribute to the loss of valuable soils. Fiji is also concerned about rising sea levels attributed to global warming caused by the burning of fossil fuels in the industrial world.

The land and water supply are polluted by pesticides and chemicals used in the sugar and fish processing industries. The nation has about 6.9 cu mi of water with roughly 60% used for farming purposes and 20% used for industrial activity.

Fiji's natural environment is protected by the National Trust, which under the 1981–85 development plans began to establish national parks to conserve the island's unspoiled landscape, reefs, and waters, as well as indigenous flora and fauna. According to a 2006 report issued by the International Union for Conservation of Nature and Natural Resources (IUCN), threatened species included 5 types of mammals, 13 species of birds, 6 types of reptiles, 1 species of amphibian, 8 species of fish, 2 types of molluscs, and 66 species of plants. Threatened species included the Fiji banded iguana and crested iguana, the Fiji petrel, the insular flying fox, and the Samoan flying fox. The bar winged rail has become extinct.

Forestry

Around 45% of the land area is forested, and 253,000 hectares (625,000 acres) are suitable for commercial use. Large scale planting of pines under the 1986–90 development plan involved reforestation of 50,000 hectares (120,000 acres) in the drier parts of the main islands. Output of logs in 2003 totalled 303,000 cu m (13,520,000 cu ft). Exports of sawn timber and other wood products were valued at $20.6 million in 2003. The first exports of pine logs started in 1980. Replanting of pine usually commence after logging or harvesting in a particular logging area. Replanting of logged out natural forest areas is usually undertaken if the landowning units request so but otherwise the area is left for natural regeneration.

Agriculture

In 2004, agriculture comprised about 31% of Fiji's export earnings. More than three-quarters of all households engage in agriculture, livestock production, forestry, or fishing. A total of 285,000 hectares (704,000 acres), or over 15.6% of Fiji's area, was used for crop production in 2003. Sugarcane production was 3,000,000 tons in 2004. In 2004, sugar exports accounted for about 15% ($103 million) of total exports and 48% of agricultural exports. Fijians retain

legal ownership of the lands, but Indians farm it and produce about 90% of Fiji's sugar. In 1995, the average sugarcane farm was four hectares (9.9 acres), produced 183 tons of cane, and made f$9.810. Cane is processed into raw sugar and molasses by the Fiji Sugar Corporation, which is 68% owned by the government. The sugar industry is vital to the national economy; as such, the government plays a leading role in all aspects of its production and sale.

Production of coconuts in 2004 was 140,000 tons; paddy rice output was 15,000 tons. Corn, tobacco, cocoa, ginger, pineapples, bananas, watermelons, and other fruits and vegetables are also grown.

Economy

Agriculture, mining and fishing have dominated the economy in the past, but manufacturing and tourism are becoming progressively more important in Fiji. The first five years after independence (1970–75) were years of high growth for Fiji, when growth averaged 5.9%, driven by primary commodities. In the next five years, growth continued but at a slower rate—about 3.5% per year. In 1980–86, Fiji suffered the effects of high inflation, especially in energy prices. It also endured three recessions. In 1986, growth rebounded, with GDP increasing 8.1%. This was immediately stopped by the 1987 coup. From 1987 to 1996 the economy grew at average annual rate of 2.5%; counting from independence to 1996, the average annual growth rate for GDP was 3.3%. In 1996, the economy grew 3%, but then, caught in the Asian financial crisis, it declined 3.9% in 1997 and grew at only 1.4% in 1998. Fiji saw a burst of recovery in 1999, as GDP shot up 9.7% (7.8% in real terms), only to be cut short, as happened in 1987, by a coup that sent the economy into recession, registering a 2.85% fall in GDP for 2000. Amid continued high political tensions the GDP increased in real terms only 1% in 2001, an improvement attributed mainly to some recovery in tourism.

The economy expanded by 3.8% in 2004, up from 3.0% in 2003, but down from 4.2% in 2002; in 2005, the GDP growth rate was estimated at 3.1%. The inflation rate was fairly stable, and at 3.3% in 2004 it did not pose a problem to the economy. Fiji is one of the most developed economies in the Pacific, but it continued to have a large subsistence sector, and more than a quarter of its population lives under the poverty line. Tourism and sugar processing are the major sources of foreign exchange, but while visitor numbers have recently increased, the sugar sector is threatened by a subsidy cut by the European Union—the main export market for this commodity.

Income

The US Central Intelligence Agency (CIA) reports that in 2005 Fiji's gross domestic product (GDP) was estimated at $5.4 billion. The CIA defines GDP as the value of all final goods and services produced within a nation in a given year and computed on the basis of purchasing power parity (PPP) rather than value as measured on the basis of the rate of exchange based on current dollars. The per capita GDP was estimated at $6,000. The annual growth rate of GDP was estimated at 2%. The average inflation rate in 2002 was 1.6%. It was estimated that agriculture accounted for 16.6% of GDP, industry 22.4%, and services 61%.

It was estimated that in 1991 about 25.5% of the population had incomes below the poverty line.

History of Management and Restoration

The colonial Government passed its first legislation known as "Rivers and Streams Ordinance" in 1880. Since then Fiji has enacted 26 pieces of legislations and mandated fifteen ministries, statutory bodies and other agencies for the protection of its environment and natural resources. Through the years there have been reviews conducted on legislations in place but sadly not much was done on the recommendations of the review.

Issues for Land-Use in Fiji

1. Increases in Fiji's population over recent decades have placed pressure on the land, particularly marginal land, and this has resulted in significant land degradation and soil erosion. Land availability and quality, land tenure, labour mobilisation, depopulation in some outer islands and sugar cane areas and, in the Fijian village context, a changing balance between subsistence and commercial agriculture are all factors why fewer people are being supported directly in primary production.

2. The environmental impacts of uncontrolled urbanisation combined with land degradation are seriously impacting on the quality of living and the sustainable income-generating capacity of Fiji's natural resources.

3. Soil loss measurements clearly demonstrate that the agricultural productive base in many sugar cane areas, and with ginger on slopes, is running down at a rate that is well above what would be regarded as economically acceptable.

4. Because of the predominantly poor adoption and application of land husbandry practices and the resultant degradation of land and water resources, the impacts from natural disasters are becoming increasingly more acute, in particular, vulnerability to droughts and flooding.

5. There is serious under-resourcing by Government for line ministries having responsibility for agriculture, forestry and land use in general and the public sector commonly lacks effective funding, resources and trained technical staff to undertake environmental planning, management and enforcement.

6. Expertise in the areas of agricultural extension, soil conservation, land use planning and environmental planning, management and enforcement is below critical mass in the responsible line ministries.

7. The resources devoted to soil conservation are inadequate for the implementation of significant measures, either in terms of providing information or incentives, and there is reluctance by NLTB to exercise its legal rights with respect to bad land husbandry practices.

8. There is a poor awareness of the interdependence of conservation and development. There are widely held views in some influential ministries that conservation and environmental management are obstacles to development or, at best, irrelevant to it.

9. Poverty can be seen in all communities. The impact of poverty is offset by the relatively high level of subsistence and food security, but 25% are living below the poverty line and this has probably increased as a result of the impact on land use from the recent droughts and subsequent floods. Clearly, rural incomes have been reduced (both for farmers and those on wages) and greater rural unemployment exists as a result of these climatic events.

10. A major limitation to sustainable rural development in Fiji is the lack of a National Land Use Plan and an institutional responsibility for land use planning to facilitate the national plan. Land resources are limited and finite. If demographic trends continue there is an increasingly urgent need to match land systems, soil types and land uses in the most national way possible, to maximise sustainable production and meet the needs of society. Land use planning is fundamental to this process.

2.0 Key Elements of Restoration

Restoration of Degraded Forests

Regulation and policy on environmental protection has been implemented and in force since 1950 when the first Forestry Policy was adopted. Much emphasis has been placed on the formulation of policies yet not much work done on the ground

The Department of Forests in 2015 funded $300,000.00 to the Reforestation of Degraded Forest (RDF) Projects to afforest/reforest 150 ha of degraded forest with communities and business partners, with the purpose of expanding the forest resources and with the vision of creating future opportunities by supporting plantation development for future socio economic needs such as wood lots establishment, food security, fuel wood availability, generating employment in the primary industries and also expending the sectors ability through education and research. The Reforestation of Degraded Forest project planted a total area of 164.72 ha in 2015. A total of 67,846 seedlings, were planted at 19 different communities; with the likes of Nanukuloa, Delakado, Uto, Tonia and many more. Initiative like this is important especially with the involvement of the local communities who will benefit the most. Forests have the ability to store large amount of carbon through greenhouse gas sequestration roles as played by trees thus contributing towards climate change mitigation. In addition, tree planting also plays a vital role in the improvement of soil and water quality, provision of biomass source for energy, decrease in soil erosion, reduction in waterways sedimentation, biodiversity conservation and food security.

To this end Fiji is making a positive contribution to global change and sustainable development through the afforestation programmes by contributing to the reduction in carbon emission, stabilization of carbon stocks in forests and conservation of biodiversity; which are all positive efforts in curbing the overuse and destruction of Fiji's natural forests however, imminent threats to the forest ecosystems such as forest fires, illegal logging, phase shift of colonization of invasive species needs to be addressed for the sustainability of the replanting program. For 2015 a total of 162.74 hectares was planted with native and mahogany species.

Key Stakeholders and Their Roles

Government agencies have been mandated on their roles to ensure that resources are utilized sustainably; proper policies are developed, implemented and enforced. The effective coordination of roles and responsibilities between government agencies, non-government organisations, groups and individuals have not been fully exploited.

Land Resources

1. Promotion of Rural Land Use Policy at Provincial Level.

2. Enforcement of the Land Conservation and Improvement Act.

3. Ensuring Sustainable Land Utilization and Management Practices.

4. Promoting Sound Land Use Planning.

5. Promote the organization of Community Groups Involving all Stakeholders in different localities for resource conservation.

6. Promote strategic Partnership

7. Develop and enhance land Resource Information system (G.I.S)

8. Education, Training and awareness on Sustainable Land Management

9. Legislation review and amendment.

Environment

1. To minimize degradation of Natural Resources and Protect Biodiversity

2. To maintain a healthy and clean environment through the reduction and elimination of pollution and proper management of wastes.

3. To raise awareness of the importance of Sustainable Development.

4. Initiate environmental audit in other organizations operations.

Disaster Mitigation and Management

1. To mainstream disaster management in the National Development Decisions Making Process.

2. To invest in infrastructure to mitigate the impacts of disasters.

3. To improve community awareness of risk, preparedness and response.

Crop-Farming and Livestock

1. To accelerate Agricultural Diversification into areas of competitive advantage.

2. To promote food security

3. To ensure Sustainable Development in non-sugar agriculture

4. To provide work throughout year.

5. Mixed farming increases social status of the farmer.

Forestry

1. To provide appropriate Institutional and Physical Infrastructure to support the development of the sector.

2. To ensure the sustainable development and management of Forestry Resources.

3. Promotion of community owned and managed forestry processing and value adding facilities based on indigenous forests and community owned plantations.

4. Promotion of the production and export of value added timber products.

5. Ensure sustainable development through the Certification of native tropical timber and plantation species for trade

Tourism

1. To increase economic contribution and the retention of the tourist dollar.

2. To increase resource owners participation in the tourism industry.

3. To promote human resources development in tourism.

4. To promote sustainable eco-tourism development and public awareness at all levels of society.

5. Diversification-In addition to bringing prosperity to an economy, it also allows an economy to develop a new form of income

6. Infrastructure improvement

Minerals and Groundwater Resources

The demands for minerals and groundwater are increasing and becoming more complex. The growth of population and the economy is putting pressure on the quality of water resources. Fiji is continuing to develop water sources to provide water for essential domestic needs and water must also be available for agriculture, commercial and industrial, mining and tourism.

1. To ensure security of land tenure and occupational health and safety standards.

2. To increase public awareness of resource exploration and development.

3. To ensure sustainable development of groundwater resources.

3.0 Lessons Learnt

The outcome of rehabilitation is quite minimal at this stage and coupled with the fact that achievements of non-government organisation, community groups and individuals in terms of rehabilitation and restoration of forests have not been fully recorded.

- Ownership of forest restoration/rehabilitation and the importance of this concept to communities have not been fully realized which portrays that awareness by government agencies is not effective. There is a need to create awareness to communities, groups and individuals to take ownership of the restoration and

rehabilitation of their forests in the wake of current disasters faced and that everyone is affected and everyone needs to take part.

- Forest policies are out-dated and inconsistent and are under review awaiting government to approve amendments and are expected to address emerging issues such as climate change.

Unless communities and individuals take ownership of restoration and rehabilitation of their forests efforts by the government will be in vain.

4.0 Way Forward

Numerous efforts and resources have been allocated for the formulation and review of policies and guidelines. What is needed is a collective effort that includes all government agencies, non-government organisations, communities and individuals to address restoration and rehabilitation of forests. The following points highlight the priority areas that need to be undertaken as a way forward for Fiji;

- Wider consultation and awareness of the need to restore and rehabilitate our forests with concerned stakeholders and all communities.
- Drawing up of a plan of action including a realistic timeframe with the necessary resources, responsibilities of each specific agency or group and targets.
- Appointment of committees that will overlook the operations and logistics of the restoration and rehabilitation process.
- Recording and reporting of updates and achievements

The time for planning has long gone and now is the time for action, to put in place what has been in paper for a very long time.

5.0 Summary

Fiji is committed to honoring the international conventions, treaties and agreements signed by the Government. This has further allowed the government to strengthen its institutional framework, relevant sectorial policies and regulations for mainstreaming degraded forest restoration into the national development framework.

The Green Growth Development Framework was initiated in early 2014 by the government at a national level that encourages collaborative effort for financing and support for more greening initiative in the country and implementation in 2015.

The most important lesson learnt is that if communities or the grass root people do not take ownership of the restoration and rehabilitation of forests then sadly the current cycle will continue. Government agencies, non-government organisations and groups will continue to waste their resources in trying to force something that communities and individuals take no interest in. Changing the mindset, attitude and setting a new direction will have to be considered as a priority. This needs to start from pre-school level and upwards

Now is the right time to implement these changes since the evidence is right before their eyes. Fiji is still in the restoration and rehabilitation mode after the destruction of tropical cyclone

Winston which probably will be felt in the next three to four years to come or will extend if another cyclone visits Fiji

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Forest Rehabilitation and Restoration in Lao PDR

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I. Introduction

1.1 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.

(Source: Forest Inspection and Planning Division, FIPD, 2010)

1.2 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

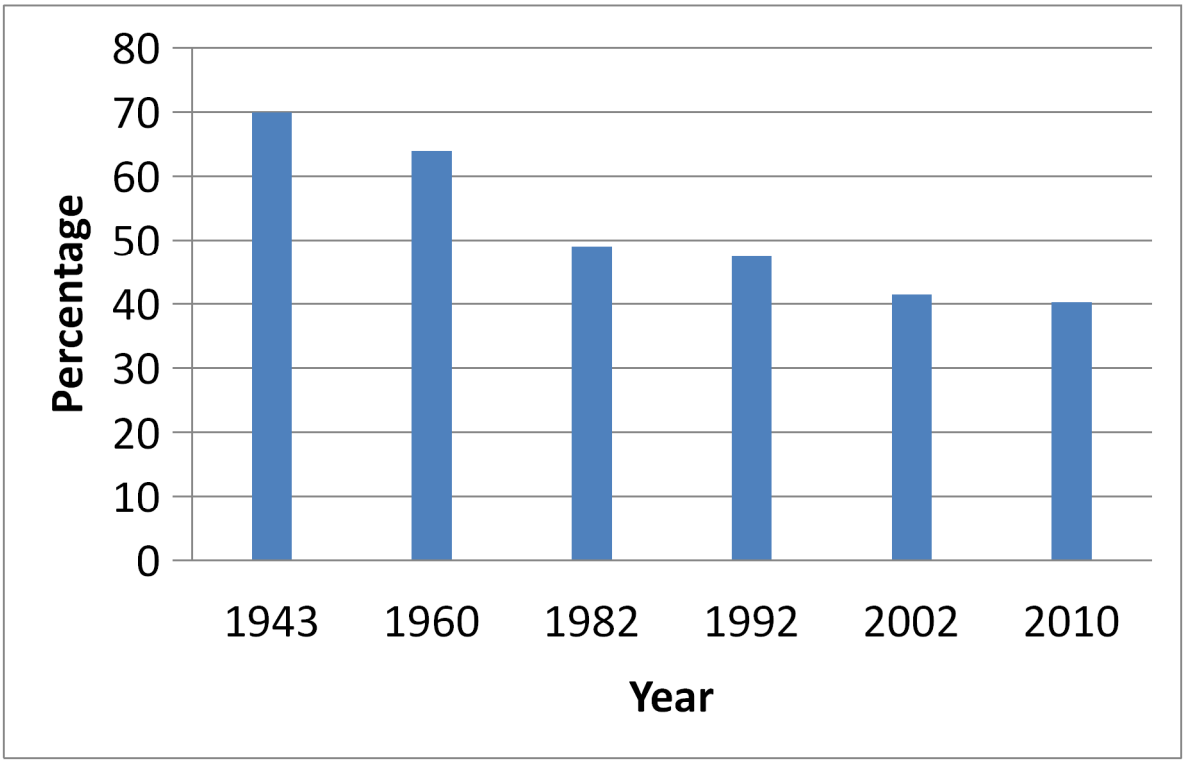
Production forests area forests and forestlands used regularly in providing timber and other forests products on a sustainable basis for national economic and social development requirements and for people's livelihoods without any significant negative impact on the environment. About 3.1 million ha 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

II. Forest Trend in Lao PDR

2.1 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).



2.2 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 (Sayyasouk, 1999; Gilmour, 1999; Xong and Gilmour, 2000; Lang, 2001; Gilmour et. al, 2000; Duangsavanh et al., 2003; Morris et al., 2004; ADB, 2005; GoL, 2006; Lee, 2006).

III. Related Policy and Regulation on Rehabilitation and Restoration in Lao PDR

3.1 Policy and Regulation Framework

There are many policies and strategies in Lao PDR in relation to land use and restoration / rehabilitation programmes. The most important ones are listed.

- Master Plan Study on Agricultural Development in Laos
- National Growth and Poverty Eradication Strategy (NGPES)
- The Government's Strategic Vision for the Agricultural Sector
- National Land Use Planning Programme
- Forestry Strategy to the year 2020 (FS 2020)
- National Strategy on Environment to the years 2020 and Action Plan for the years 2006-2010
- National Biodiversity Strategy to 2020 and Action Plan to 2010 (NBSAP)
- National Agricultural Biodiversity Programme (NABP)

The most recent national forest strategy prescribes an increase in the country's forest cover of 70% in the year 2020 through the natural rehabilitation of 6 million ha of degraded forest and 0.5 million of plantation (GoL, 2005) , In order to achieve this, 9 programmes and 146 action plans are outlined. These 9 programmes include:

1) Land and forest use;
2) Production forest;
3) Non-timber forest products;
4) Tree plantation development;
5) Harvesting/logging plans and royalties;
6) Biodiversity conservation;
7) Wood processing industry;
8) Protection forest and watershed management; *and*
9) Village land use and forest management.

3.2 Lao Forest Strategy to 2020

Goal of strategy to 2020 are listed as following: tree Plantation area is expected to reach 500,000 ha, the total area of rehabilitation and restoration is set to 6,000,000 ha, rehabilitation and restoration area in Production area 600,000 ha, rehabilitation and restoration area in other forest land (not included in 3 types forest lands):2,500,000 ha.

3.2.1 Tree Plantation Development

Formulation of National Tree Plantation Development Plan

- Formulate a national tree plantation development plan with comprehensive coverage from tree breeding to plantation management, processing with clear target groups and incentives

Improving Tree Plantation Profitability

- 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

IV. Forest Rehabilitation and restoration in Lao PDR

a. 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 restoration work during 1975 to 2015, 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.

b. Financing of Forest Rehabilitation and restoration

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.

V. 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.

VI. 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 restoration and rehabilitation works

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An Update to the Degraded Forest Rehabilitation Initiatives in Peninsular Malaysia

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Abstract: Peninsular Malaysia is fortunate to be endowed with large tract of tropical rainforest. This forest, rich in flora and fauna, is one of the most complex biological ecosystem on earth. It is imperative that these invaluable forests be sustainably managed under the Sustainable Forest Management (SFM) concept for social, economic and environmental benefits. Forest rehabilitation, an important component of SFM, needs to be emphasized and effectively implemented to achieve maximum productivity in the Permanent Reserved Forest (PRF). This paper highlights about degraded forest rehabilitation initiatives undertaken by Forestry Department Peninsular Malaysia and discusses the issues / challenges encountered and way forward to ensure successful implementation of the degraded forest rehabilitation initiatives.

Key words: SFM, degraded, rehabilitation, issues & challenges

Introduction

Malaysia is a federation of thirteen (13) States and three (3) Federal Territories with eleven (11) of the States and the Federal Territories of Kuala Lumpur and Putrajaya located in Peninsular Malaysia, while the State of Sabah, State of Sarawak and Federal Territory of Labuan are located in the island of Borneo respectively.

Located in equator line, Malaysia is fortunate to be endowed with large tract of rich tropical rainforests. These forests are very essential and contribute significantly to the livelihood of communities at large in terms of endless valuable benefits generated from the usage of various forest products and environmental services.

Forest in Malaysia is highly regarded as one of the 12 “mega-biodiversity storages” of the world, consisting 15,000 species of flowering plants, 195 species of palms, 500 species of orchids, 1,159 species of ferns and fern allies, 400 species of fungus as well as 432 species of mosses. As for fauna, there are 286 species of mammals, 736 species of birds, 268 species of reptiles, 158 species of amphibians, 449 species of fresh water fishes and 150,000 species of invertebrates (NRE, 2006).

Conservation of such diversity is crucial for economic, social and environment stability as each species, no matter how small, all have an important role to play. In this context, State

Governments in Peninsular Malaysia set aside sufficient forest areas and gazette them as PRF and be managed continuously under Sustainable Forest Management (SFM) practices for the benefits of present and future generations.

The tropical rainforest in Peninsular Malaysia covers about 5.78 million hectares or 43.85% of its total land area (FDPM, 2015). These forests consist of unique and complex ecosystems which are home to the country's rich flora and fauna. Of the total forested area in Peninsular Malaysia, 4.92 million hectares are PRF, 0.28 million hectares are State/Alienated Land Forests and 0.58 million hectares are National Park/Wildlife and Bird Sanctuary. In the year of 2015, approximately 3.01 million hectares of the PRF are designated as production forests managed under sustainable forest management and the remaining are conserved and being protection forests. In Peninsular Malaysia, the major forest types consist of 4.56 million hectares dry inland forest which is the main forest cover, 0.25 million hectares peat swamp forest and 0.11 mangrove forests.

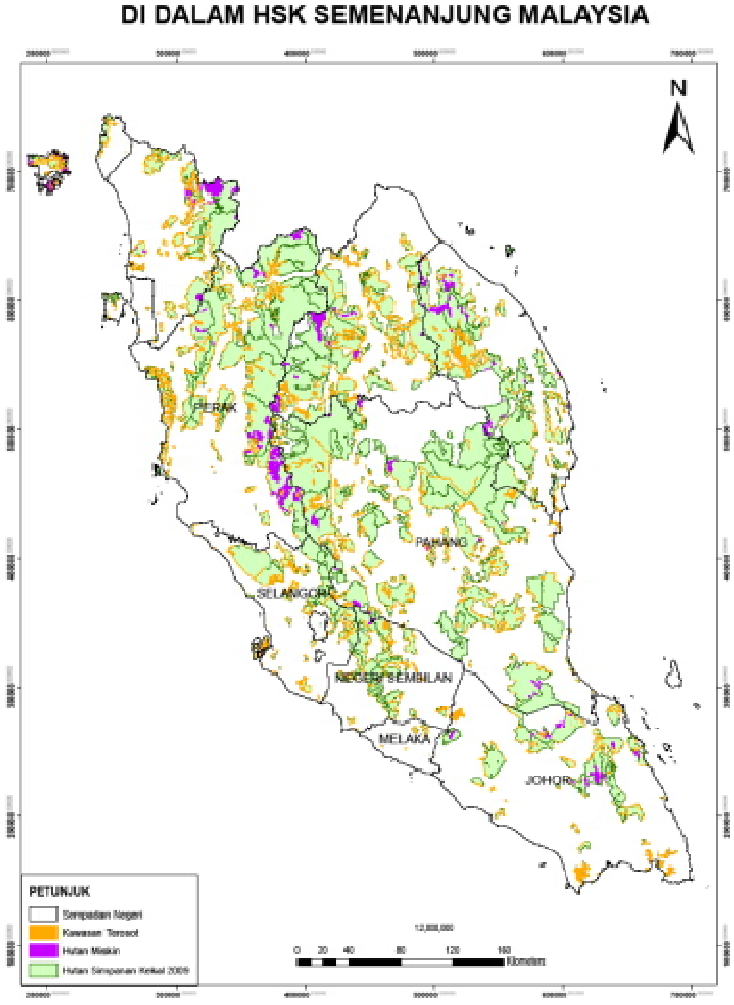
Besides its rich in bio-diversity, these forests have contributed significantly to the socio-economic development of the country. In addition, this tropical rainforests also play an important role in both adaptation and mitigation measures for favorable climatic and physical conditions of the country, safeguarding of water resources, and environmental quality hence helping to prevent natural disasters, such as flood and land slide. Hence, it is of paramount importance to set aside sufficient areas of PRF to be managed sustainably for the benefit of present and future generations.

An Overview of Degraded Forest in Peninsular Malaysia

The International Tropical Timber Organization has defines the term of forest degradation to the reduction of the capacity of a forest to produce goods and services. A degraded forest delivers a reduced supply of goods and services from a given site and maintains only limited biological diversity. It has lost the structure, function, species composition and/or productivity normally associated with the natural forest type expected at that area.

Degraded forest usually occurs in PRF because of natural factor (forest fire, flood, landslide, etc) and human factor (aggression, shifting cultivation, logging, etc). Of all factors, the main course of degraded forest in Peninsular Malaysia is forest fire. It is usually occurs in peat swamp forest area due to climate change which is one of the ultimate concerns face by nature and humanity today. In 2015, it was recorded that a total of 180 hectares was effected by forest fire which occurred mainly in peat swamp forest.

Figure 1: Degraded Forest distribution in Peninsular Malaysia



However, degraded forest through proper planning silvicultural treatment will provide good potential to the environment and human being especially biodiversity, increasing the commercial value of forest product and improve soil fertility. Thus, FDPM has produced its development plan for degraded forest in the PRF. The objective of this plan is to restore and rehabilitate degraded area in PRF to become a high value rich forested area which can provide yield. It is also can be a habitat for biodiversity, food, medicinal and water catchment for human being and create climate stability.

FDPM Perspective in Rehabilitation of Tropical Forest Towards Sustainable Forest Management

According to the International Tropical Timber Organization, Sustainable Forest Management (SFM) has been defined by as “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 (Anon., 1992).

This is in-line with the National Forestry Policy (NFP) 1978 (Revised 1992) which emphasizes that the PRF will be managed in accordance with the principles of Sustainable Forest Management for the maximization of the social, economic and environmental benefits of the nation. Significant statements in the NFP with regard to the forest rehabilitation are:-

- To manage the Permanent Forest Estate in order to maximize social, economic and environmental benefits for the nation and its people in accordance with the principles of sustainable management.
- To implement a planned programme of forest development through forest regeneration and rehabilitation operations in accordance with appropriate silvicultural practices, as well as the establishment of forest plantations of indigenous and exotic species to supplement timber supply from the natural forest.

Amongst others critical factors that are need to be addressed in achieving SFM, is forest harvesting practices. In this respect, FDPM has taken conscientious efforts directed towards research and development to formulate more environmentally friendly harvesting technologies such as the use of reduced impact logging (RIL) so as to minimize the negative impact to the environment. In affirming the commitment to SFM, Malaysia has also developed a set of Malaysian Criteria and Indicators (MC&I) in line with ITTO's C & I for monitoring and assessing SFM and also for the purposes of forest management certification to be undertaken at the forest management level. This is to ensure and prevent that there will be no poor and degraded forest occur within harvesting area.

One of the strategies is to utilize PRF based on the inherent capability of the forest, its optimal use and on comprehensive forest land use through forest regeneration and rehabilitation. Forestry Department Peninsular Malaysia has defined Forest Regeneration and Rehabilitation as a co-ordinated programme of forest development through regeneration and rehabilitation operations based on appropriate silvicultural practices in order to achieve the maximum productivity from the PRF.

Degraded Forest Rehabilitation Initiatives

Recognizing the importance of degraded forest rehabilitation in ensuring the sustainability of timber production and biodiversity conservation, FDPM has embarked on the following forest rehabilitation initiatives:

i. Selective Management System (SMS)

During 1970's, the Selected Management System (SMS) was implemented for management of the hill dipterocarp forests based on preliminary and indicative growth rates of logged over forests obtained from studies conducted by the UNDP and FAO (Pakhriazad et al., 2004). The system focuses on a flexible timber harvesting regime which has a cutting cycle. The cutting cycle for each forest type is different as the natural regeneration of different forest types varies, for example 30 years for dry inland forest or up to 50 years for mangrove forest.

The SMS involves three key stages, namely forest inventory before logging (Pre-F), harvesting (felling) and forest inventory after felling (Post-F). Selective harvesting with prescribed cutting limit is regulated by predetermined Annual Allowable Cut which is revised every 5 years. In dry inland forests, under SMS, only 7 to 12 matured trees are felled in every hectare and 32 residual trees are left to form the next crop to be felled in the next rotation in 30 years. As a result, the system can guarantee the economic forest harvesting and to ensure a sustainable level of log production for the next cutting cycle.

It is also to safeguarding environmental quality and the maintenance of ecological balance. In addition, the harvesting of forests are also coordinated and regulated to ensure its compliance to environmental standards and full resource utilization. However, the success of the SMS will depend on the way the forest harvesting practices was implemented.

ii. Enrichment Planting Programme

The World Conservation Union defined enrichment planting as the planting of desired tree species in modified natural forests or secondary forests or woodlands with the objective of creating a high forest dominated by desirable species (Anon, 2006). Enrichment planting enhances the productivity of an area by increasing the composition of high quality commercial timber species. In Peninsular Malaysia, enrichment planting is carried out in 'poor forests' and 'open areas'. 'Poor forests' are referred to as forests that have stocking of 153m3/ hectare while 'open areas' are degraded forest areas or gaps created through activities such as shifting cultivation, forest encroachment and logging.

Enrichment planting practices involve the planting of high quality commercial timber species such as Shorea leprosula (Meranti tembaga), Shorea parvifolia (Meranti sarang punai), Dryobalanops aromatica (Kapur), Hopea odarata (Merawan siput jantan) etc. Two (2) types of planting approaches are practiced i.e. line planting and group planting. To date, a total 37,285 hectares of PRF in Peninsular Malaysia had been rehabilitated through the enrichment planting programme as in Table 1. These total areas are not inclusive of 101,069 hectares of Planted Forest established in the PRF with exotic timber tree species (teak, pine, hevea, and acacia). Continued efforts are being taken to identify the 'poor forests' and 'open areas' within the PRFs for rehabilitation through enrichment planting approaches.

Table 1: Enrichment Planting Sites Planted with Indigenous Timber Tree Species in the Permanent Reserved Forest (PRF) in Peninsular Malaysia from 1970 -2015

State	1970-2012 (ha)	2013-2014 (ha)	Total Planted (ha)
Johor	2,664	15	2,679
Kedah	1,706	384	2,090
Kelantan	4,370	40	4,410
Melaka	475	0	475
N. Sembilan	1,433	118	1,551
Pahang	11,175	463	11,638
Perak	7,221	279	7,500
Perlis	260	5	265
Pulau Pinang	21	11	32
Selangor	4,480	45	4,525
Terengganu	2,091	11	2,102
TOTAL	**35,896**	**1,389**	**37,285**

iii. Retention of Selected Timber Trees for Fauna Conservation

Tropical rainforest of Peninsular Malaysia is a complex ecosystem with dynamic interdependency of flora and fauna forming the rich forest biodiversity. Realizing the important roles of fauna in maintaining the richness of forest biodiversity, FDPM under the SFM practices has embarked on various in-situ and ex-situ flora and fauna conservation programmes with the cooperation of the Department of Wildlife and National Parks (DWNP). One of the outcome from this programme is, FDPM has taken the initiative to forbid the felling of 32 timber species during logging operations in the PRFs as in Table 2. These timber species produce fruits and seeds as food for many fauna such as primates, birds and squirrels.

Table 2: List of 32 Timber Species Retained for Fauna Conservation

Under-Story Species		
No	**Scientific Name**	**Consumption**
1	*Aglaia sp.*	Fruit (Primates & Birds)
2	*Archidendron bubalirum*	Fruit (Primates, Birds & Squirrels)
3	*Archidendron jiringa*	Fruit (Primates, Birds & Squirrels)
4	*Ardisia sp.*	Fruit (Primates, Birds)
5	*Artocarpus heterophyllus*	Fruit (Primates, Birds & Squirrels)
6	*Artocarpus integer*	Fruit (Primates, Birds & Squirrels)
7	*Artocarpus rigidus*	Fruit (Primates, Birds & Squirrels)
8	*Baccaurea maingayi*	Fruit (Primates & Birds)
9	*Baccaurea sumatrana*	Fruit (Primates & Birds)
10	*Barringtonia sp.*	Fruit (Birds)
11	*Boucea macrophyla*	Fruit (Primates & Squirrels)
12	*Durio sp.*	Fruit (Primates, Birds & Squirrels)
13	*Dysoxylum sp.*	Fruit (Primates & Birds)
14	*Eugenia (Syzygium) sp.*	Fruit (Primates & Birds)
15	*Garcinia artoviridis*	Fruit (Primates & Birds)
16	*Mangifera indica*	Fruit (Primates, Birds & Squirrels)
17	*Nephelium lappaceum*	Fruit (Primates & Birds
18	*Sandoricum koetjape*	Fruit (Primates & Birds
Over-Story Species		
No	**Scientific Name**	**Consumption**
19	*Castanopsis spp.*	Fruit (Primates & Squirrels)
20	*Dialium sp.*	Fruit (Primates, Birds & Squirrels)

21	*Ficus spp.*	Fruit (Primates, Birds & Squirrels)
22	*Irvingia malayana*	Fruit (Primates & Squirrels)
23	*Knema sp.*	Fruit (Primates & Birds)
24	*Koompasia excelsa*	Depository of wild honey (Seed for squirrels)
25	*Lithocarpus cyclophorus*	Fruit (Primates)
26	*Mangifera longipetiolata*	Fruit (Primates & Birds)
27	*Myristica sp.*	Fruit (Primates, Birds & Squirrels)
28	*Parkia sp.*	Bean / Fruit (Primates, Birds & Squirrels)
29	*Podocarpus sp.*	Hill / Beach conservation (Primates)
30	*Santiria laevigata*	Fruit (Squirrels)
31	*Sterculia foetida*	Seeds (Birds & Squirrels)
32	*Sterculia parvifolia*	Fruit (Squirrels)

iv. Coastal Rehabilitation and Conservation Programme

The tsunami tragedy in 2004 which involved 18 countries had highlighted the importance of mangrove forests in stabilizing the coastal environment especially as a mitigation to natural disaster. It is also had created the awareness to public. On 26 January 2005, Honorable Prime Minister of Malaysia in the Cabinet has recommended and urged to increase the efforts of conservation and protection the coastal. To date, this awareness and recommendation are enhanced the public support on the initiatives undertaken by FDPM in protecting the mangrove forests.

This programme along the National Coastlines is intended to achieve the following objectives:

a. To conserve natural coastline which served as natural protection to minimize the damage caused by natural disaster and soil erosion;
b. To create buffer zones to withstand the high waves and strong wind as well as prevent environmental pollution;
c. To restore coastal habitat that serve as the corridors and enrich the biodiversity; and
d. To improve environmental quality and aesthetic value as a tourist attraction.

Since 2005 to 2012, an area of 2,384.34 hectares of land have been successfully planted with 6,261,626 trees. It is including about 5,923,139 Mangrove tree species (Rhizophora apiculata, Rhizophora mucronata, Avicennia alba, etc), 194.434 Rhu trees (Casuarina equisetifolia) and 144,053 trees from other species (Calophyllum inophyllum, Xylocarpus moluccensis, Nypa Fruticans, etc).

v. Tree Planting Through Public Awareness Programmes

Under the public awareness programmes in Malaysia, there are a few of tree planting campaigns / activities were organized by FDPM and participated by various of government

agencies, NGOs, private companies, school children and general public. Among the public awareness programmes involving tree planting activities are as follows:

i. 26 Million Trees Planting Campaign

In the efforts to preserve, conserve and protect Mother Nature and ultimately the Earth, tree planting is one of the most effective and relevant way to do it. In conjunction with World Earth Day on 22 April 2010, the Ministry of Natural Resources and Environment Malaysia had launched the 26 Million Trees Planting Campaign in Putrajaya carrying the theme 'Green the Earth: One Citizen, One Tree'. This campaign is in-line with Malaysia's commitment during the Rio Summit 1992 in greening 50% of the country land area. The campaign was 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. The campaign was also one of the strategies to meet Malaysia's commitment to voluntarily cut 40% of the country's carbon emission by 2020. A total of 26 million trees was targeted to be planted during the period 2010-2014 over approximately 13,066 hectares throughout the country. At the end of year 2015, a total of 76.32 million trees had been planted over 94,852 hectares. Various agencies are involved in this tree planting campaign and FDPM is responsible for monitoring the progress of planting under this campaign.

ii. International Year of Forests 2011 (Iyf 2011)

IYF 2011 was launched on the 9th United Nations Forum on Forests on 2 Feb 2011 in New York with the theme of celebration: "Forests for People". This year, the theme is "Forests and Water Sustain Life and Livelihoods" which raise the awareness on the interconnections between forests and water and their contribution towards the sustainable development. Sarawak State become the host of the event for the International Day of Forests 2016 at National level celebration.

Issues / Challenges and the Way Forward

Forest rehabilitation involves manpower and constant funding. As years goes by, the cost involved in forest rehabilitation programme are increasing as FDPM tries to capture larger target area to achieve Malaysia commitment in greening 50% of the country land area and in line with SFM concept. Trees planted needs to be treated periodically to ensure good survival and production of quality timber. Collaboration with various Government and its related agencies as well as NGOs are required to overcome funding issues. Under the Federal Constitution, forestry and land are State matters. Therefore, full commitment and strong financial support from the various State Governments are essential for the successful implementation of SFM and in particular the implementation of forest rehabilitation programmes by FDPM.

The regeneration of forest depends on the climatic, edaphic and biotic factors of an area (Symington, 2004). Each forest is unique and required different silvilculture treatment to achieve the maximum productivity. Failure to understand the dynamics of forest stand structure particularly the effect of soil and climatic condition on natural regeneration of forest

may lead to inappropriate silvilcultural prescriptions. More research on the dynamics of tropical rainforests needs to be carried out to ensure the successful implementation of forest rehabilitation programmes.

Landscape level information on the species composition and stocking of flora and fauna in the various forest types are essential for the rehabilitation of tropical rainforest. Currently these information are limited and insufficient. Therefore, further research needs to be carried out to determine a practical and cost-effective technique of forest inventory. Besides, to ensure biodiversity conservation under sustainable forest management, long-term monitoring and R & D programmes are required to test the validity of the concept of forest rehabilitation initiatives that has been taken. However, this requires long-term financial, institutional, logistic and intellectual commitments. In that purpose, it is vital to build networking and cooperation with forest research institute and universities not only in the national level but also international level.

Adverse human activities in the forest, which include poaching / hunting and illegal logging, are threats to conservation of biodiversity. Reduction in the stores of soil organic matter commonly follows conversion of natural forest to other form of land use including plantation establishment.

There is no doubt that the awareness among local community towards the importance of forests and biodiversity has increased. However there are still individuals who are not yet fully understand the importance of this matter. Therefore, community awareness programmes is essential to educate community, loggers and forestry department staff on its beneficial sharing, the potential of using selected fauna species as indicators of forest biodiversity richness and the importance of biodiversity conservation for the future enhancement of SFM.

Conclusion

Forest rehabilitation is essential for the enhancement of timber productivity, sustainable supply of timber, conservation of biodiversity and stability of environment. It is an important component in the Sustainable Forest Management practices implemented by FDPM. Recognising this, FDPM has taken initiatives to implement various forest rehabilitation programmes under different forest environment. To enhance the successful implementation of these programmes, R & D needs to be carried out by Forest Research Institutions and Universities particularly on the dynamics of tropical rainforests at landscape level. However, forest rehabilitation and R & D require manpower and constant funding. As forestry and land are State matters, it is imperative that State governments are committed to the implementation of SFM and provide sufficient funding for the various SFM practices in particular on forest rehabilitation programmes. Although the current level of forested land is expected to decline by 2020, the total forest areas under the PRFs in Malaysia at the end of 2020 is expected to increase with forest rehabilitation practices. This will contribute to meeting the four global objectives on forests of the Non-legally Binding Instrument on All Types of Forests, especially Global Objective 1, among others, in reversing the loss of forest cover worldwide through sustainable forest management.

Acknowledgement

The authors would like to thank the Director General of Forestry, Peninsular Malaysia for giving the opportunity to present this paper.

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Local Institutions for Participatory Forest Management and Forest Policy Regulations in Mongolia

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Abstract: Mongolia is a country that increasing concerns about forest loss and degradation, and since the 1990s have led the Mongolian government to look for new ways to manage forests. The study focus on building robust and effective Forest User Groups (FUGs) as a basis for Participatory Forest Management (PFM) in Mongolia. In addition to developing a further general understanding of FUGs as effective institutions for PFM, this study specifically examined institutional and organizational issues arising from the flow of benefits (or absence of benefits) from FUG's approved management plans. The main findings of the study an important spin-off benefit from effective FUGs is a general strengthening of capacity for collective action in non-forest related areas. This especially applies to pasture control. This study found that, these uses aside, there is limited connection with forests in most, but not all, cases. However, we need to be careful of having too narrow an interpretation of the importance of dependence on forests or interest in forests. In the case study areas forests are generally seen as part of a wider territory for which people feel a sense of ownership. Further, regardless of the legal separation of pasture and forests, FUGs are seen as an opportunity to consolidate claims on pasture. There is sometimes relatively limited direct concern about forests as such, but this concern will build if benefits flow. Furthermore, FUGs can broadly contribute to building social capital, not just for forest management, but for other activities and also contribute to a sense of ownership of forests.

Introduction

Mongolia is often mentioned that increasing concerns about forest loss and forest degradation because of forest coverage are only 11.79 per cent of total area (result of national forest inventory, 2014). Gilmour et al (2011) mentioned that is Mongolia has become particularly necessary with the decline in the size and capacity of the forest administration in the 1990s. Since the 1990s have led the Mongolian government to look for new ways to manage forests. On the other hand, an important element of the strategic policy response to the forest loss has been the introduction of Participatory Forest Management (PFM).

There was a provision for leases on forest areas to be issued to industries and communities in the 1995 Forest Law. Subsequently, the Law on Environmental Protection was amended in 2005 to allow for the formation of user groups (Nukhurlul) for forests. The legal framework

was further refined in the Forest Law (2007) which allows local forest user groups to develop forest management plans and to harvest and sell some limited forest resources for up to sixty years. (Commercial timber can be harvested after the first three years, subject to the management plans.) Since 2007 many FUGs (the English term adopted for Nukhurlul) have been formed and issued with leases. However, although considerable progress has been made, the success of the program has been inhibited by the absence of relevant experience and understanding of the requirements of appropriate local institutions for forest management. Therefore, to reduce forest loss and degradation and to compose sustainable forest management in Mongolia, it is necessary to understand political regulations and socio-economic impacts on forests.

Gilmour (2010) pointed out that supporting the development of FUGs required better understanding of the "sociology of collective decision making and action". The project subsequently commissioned a sociological study (Fisher et al 2010) to explore these issues. The sociological study examined seven case studies. The focus was on the way decisions were made about forests and the extent to which formal decisions led to (or didn't lead to) collective action. Fisher et al 2010 reported the study has assessed the effectiveness of decision making before management plans allowing real benefits have been approved, it is recommended that a follow up study be undertaken 6-12 months after implementation in order to assess changes to decision making when real benefits are involved, and in the more successful examples the sustainability of the institutions may change if people lose interest and this is a real risk. It is also important to realize that benefits may lead to new conflicts. When benefits start to flow the need to manage the distribution of money or other resources may cause new institutional difficulties. In other words, there is a need for benefits to flow before it is possible to judge longer term success and sustainability.

Since 2010, the management plans developed and enough time has passed to explore changes that have occurred to the institutions since the plans have been approved. Therefore, the following study was aimed to understand whether the project's FUG model for local organizations and institutions is a sound basis for collective action associated with forest management. To a considerable extent collective action depends on how decisions are made and implemented by a group.

The case study on capacity development of FUGs

The Impact of Benefit-sharing

A key aim of this study was to assess the changes to FUGs as institutions after management plans had been approved and implemented. Each of the five FUGs studied had approved management plans, but the ways these affected the individual FUGs were somewhat different.

In the case of FUG-1, the high expectations evident in 2010 had been frustrated by the lack of expected benefits from firewood collection and sale. For a variety of reasons for which it is difficult to assess the relative impacts, the expected harvesting and sale of 150m³ of firewood did not occur. Part of the explanation may lie in the timing of approval and competition with other economic activities; part may lie in the relatively low market prices combined with cost

of collection and transport; regulations preventing sale in Darkhan where prices were higher certainly affected the economic appeal of the activity. Whatever the relative merits of these factors as causes of the lost opportunity for income, it is clear that very high expectations about potential income were not met and this contributed to a loss of commitment to the FUG and to a loss of support for the FUG leadership. As a result of this loss of support it is difficult to see the sense of shared goals evident in 2010 recovering without considerable outside facilitation.

In the case of FUG-2, the situation in 2010 seemed to be a case where suspicions about who would benefit from FUG activities led to a somewhat factionalized FUG. However, once benefits began to flow in 2011 (from vegetable growing and, to some extent from firewood sale) these concerns seemed to disappear and a sense of shared mission and objectives emerged. To a large extent this is probably a result of the fact that the FUG is based on a fairly closely linked group of kin with a strong sense of identity.

In FUG-3, people have continued to make modest income from forest-related activities. There has been some diversification and new opportunities are emerging. There has not been any apparent conflict over access to or distribution of benefits from these forest-related activities. Expectations of benefits were not over-optimistic and there has been some flow of these benefits for some time.

In FUG-4, there are relatively limited direct benefits from FUG activities. Some people earn income from firewood sale under the management plan, but there do not seem to have been very high expectations about income from this source in the first place.

In FUG-5, direct economic benefits from FUG activities have not developed. In the limited time available for the visit no sense of the previous level of expectations emerged and it is not clear whether the FUG membership has been concerned with forests as a source of income.

The project's activities for forest-related income generation have focused on two major elements at this stage. These are based on activities and products identified by the FUGs through the MA&D (Market Analysis and Development) process. One of these is income from collection and sale of firewood according to approved management plans. The second is income from Non-Timber Forest Product (NTFP) production/collection and marketing. In this study we have not been able to pay much attention to NTFPs as a source of income. Of the FUGs visited FUG-3 is the only one where NTFPs have been a major FUG activity so far.

Income from firewood harvesting and sale remains a major focus. Some FUGs have benefited from this activity. However, there have been consistent concerns that the benefits have not been as much as expected. Partly this is because the prices have not been as high as expected; partly it is because access to markets has been limited by regulations that restrict where firewood can be sold. These regulations often lie outside the direct control of forest authorities and local government. Others can be addressed at the local level.

We regularly heard complaints that prices were low because the firewood available for sale was of low quality. This was seen as a result of the reluctance of soum governors to allow

harvesting of good quality firewood. FUGs are limited to harvest firewood derived from "cleaning" operations and are not allowed to harvest and sell saw quality logs for firewood. Project staff pointed out that the national policy is to try to get people in Mongolia to shift away from the use of high quality logs for firewood towards the use of branches and other material which is just as effective for heating. (The soum governors have simply been implementing that policy.) The use of high quality saw logs is unnecessary and inefficient. The policy is aimed at changing the pattern of use.

A cultural change like this may be desirable in the interests of sustainable forest use. Nevertheless, the fact that the type of firewood which FUGs are allowed to sell attracts low prices remains a reality for the FUGs and means that income is less than anticipated. The fact that these low prices relate to a sound policy does not change the fact that the prices are very low. As the sustainability criteria increasingly applied replaces the past "open access" approach to firewood collection it is possible that the market and consumers will adapt to a different type of product and FUGs will benefit accordingly.

Increased Capacity for Collective Action

In the case of several of the FUGs studied, it was striking that an outcome of FUG formation and activity was an increased capacity for collective action in areas outside the primary concern with forest management. FUGs showed a capacity to cooperate in a variety of activities, including vegetable growing (at FUG-2) and pasture protection and management in several cases.

It is tempting to see this as an unintended or unexpected consequence of FUG formation, but it seems to have been a clear (if not much documented) project strategy. This is quite consistent with sociological views of collective action which suggest that a capacity for collective action in one field strengthens capacity and confidence to act in other fields.

Consolidated Findings from 2010 and 2011 Studies

The report on the 2010 study (Fisher et al 2010) presented a number of findings and observations. Most of these are supported by the 2011 study. Some of the key findings and observations are presented below, with some minor qualifications.

These consolidated findings represent an analysis of the sociology of FUGs as institutions.

- One of the key findings of the study is that the most effective FUGs seem to have several characteristics in common:
  - They tend to have a population that has been living in the FUG area for some time;
  - There is a close connection between the FUG membership and the FUG territory and boundaries (.i.e there is some sense of ownership of the territory by the members of the group);
  - There is good two-way communication between the committee and members.
  - There is a broadly shared vision about the objectives of the FUG.

The 2011 study clearly supports these observations about shared characteristics of successful FUGs. However, we think it is important to make some qualifications. The point about the value of people "living in the FUG area for some time" remains broadly correct, but what is perhaps more important is that FUG members have known each other long enough to develop the sort of social capital that allows cooperation. In the case of FUG-2, the FUG members were relatively new to the area, but these people already had close kinship ties and this was the crucial factor rather than where the people lived. The second qualification is that the idea of living in the area for some time does not imply multiple generations. There have been extensive movements of people around Mongolia since the end of the socialist period and not many people can claim to have great continuity in terms of living with the same people in the same area. The point is that people develop relationships over time through proximity and familiarity with each other. A period of 15-20 years is often enough to allow people to see themselves as "locals".

- The motivations for joining and participating in FUG activities include:
  - A strong interest in the conservation of forests and especially protection from illegal logging by outsiders.
  - The potential for livelihood improvement or future income through FUG membership.
  - The perception that FUGs may provide an opportunity for making claims for pasture rights.
- The requirement that FUGs have well designed constitutions is sound because formal constitutions make leaders responsible to the group. This is the reason for requiring annual general assemblies and quorums. However the study identified at least two cases where leaders have taken over and the constitutional provisions are ignored. Having a constitution seems to be no guarantee. It seems that the process of developing constitutions has often been too rapid. Usually there are just one or two assembly meetings to introduce, discuss and approve the constitution. This leads to superficial understanding and possibly lack of commitment.
- This has some implications about the need for more intensive extension and community development work involved in introducing the idea of constitutions and for follow-up visits to make sure people are aware of their rights under the FUG constitution.
- It was clear from this study that people were often unaware of or unconcerned with the formal details of the constitution, even where the FUG functioned well as an institution. People did not fully understand the importance of annual assemblies or the need for a quorum. In itself this is not so important, as long as there is a general understanding of the way the FUG should function. The importance of the formal requirements of the constitution relates more to situations where the underlying institutional arrangements are not functioning properly.
- There is a need for fuller investigation of geography and use patterns before FUGs are formed and approved, focusing on the resource boundaries and customary use patterns,

otherwise unviable membership may be locked in. The study did not identify cases where major problems of this type occurred, but the cases of the split user groups at FUG-1 and FUG-3 suggest that the potential for problems does exist.

- The voluntary nature of FUG recruitment allows for people living in an area (with customary rights) not being members. The consequence of this is that they will not benefit from forests under FUG control unless the FUG is willing to allow them access. While this voluntary provision makes sense and is desirable, there might be value in considering an opt-out principle for eligible people who do not wish to be members. The assumption would be that eligible people are members unless they specifically opt-out.
- It is often claimed that PFM may not work in Mongolia because people in the forested areas are often not particularly interested in forests and have no strong interest in them as they do not use forest products extensively. This study found that there is limited connection with forests in most, but not all, cases. However, we need to be careful of having too narrow an interpretation of the importance of dependence on forests or interest in forests. In the case study areas forests are generally seen as part of a wider territory for which people feel a sense of ownership. Further, regardless of the legal separation of pasture and forests, FUGs are seen as an opportunity to consolidate claims on pasture.
- There is sometimes relatively limited direct concern about forests as such, but this concern will build if benefits flow. Furthermore, FUGs can broadly contribute to building social capital, not just for forest management, but for other activities and also contribute to a sense of ownership of forests. In other words, providing benefits flow, FUGs will lead to increased interest in forest management as such.
- An important conclusion from the 2011 study is that the activities of FUGs create a wider capacity for (non-forest related) collective action. This is especially relevant to collective action involving pasture. FUG structure also provides organizational advantages for pasture management.

The Mongolian Government has committed to a green development pathway, notably through the preparation and approval of the Green Development Policy, Forest Law and commitments to the Sustainable Development Goals in Mongolia. To support this effort, the UN-REDD Mongolia National Program was established to provide technical capacity development assistance to the Government of Mongolia.

Conclusions

This study can present only a partial picture of the complexity of FUGs as institutions for PFM in Mongolia. It is clear that FUGs can work to achieve group goals and that the program has great potential. The model for institutional development piloted by the project is a good one. An important lesson for forestry extension is that attention must be paid to the way decisions are actually made and implemented as well as to the formal constitutional processes.

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Country Case Study of Forest Rehabilitation in Myanmar

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Abstract: Re-afforestation in Myanmar got momentum in early 1960s and large-scale plantation forestry begun in the 1980s. Since then the annual plantation programme has been intensified gradually till it has reached the present target of over 40,000 ha by fully funded by the government. This case study rehabilitation project is funded by APFNet entitled on "Sustainable Forest Rehabilitation and Management for the Conservation of Trans-boundary Ecological Security in Montane Mainland Southeast Asia" demonstration project. It is regional project implemented by Lao PDR, Myanmar and China/Yunnan from 2013-2016. The specific objectives are identify and adapt the best practice for forest rehabilitation in the target areas and around the MMSEA; experiment and demonstrate good practice for forest rehabilitation, especially use of locally preferred, rare and endangered native tree species as well as local knowledge; develop capacity in sustainable forest rehabilitation and reach out to farmers and policy makers; integrate project lessons and network with other initiatives for a regional strategy on sustainable forest rehabilitation. Demonstration site is located in Nyaung-Htauk village, Naung-Cho Township, Kyauk-me District, Northern Shan State of Myanmar. Based on the landscape of selected village, 9 rehabilitation and demonstration models about (37.5) ha had been established. Training and workshop were designed along two thematic areas: (a) sustainable forest management and (b) enhancement of food availability and income More than 100 farmers and 12 young researchers have been trained. Compared to rare and endangered trees species and locally preferable species, locally preferable species are likely to be acceptable to local farmers because of endangered trees species takes time to harvest the benefit. Security of tree tenure, financial support for initial investment and market demand will be necessary for promoting local preferences on forest trees.

Introduction

Achieving sustainable forest management (SFM) is the constitutional mandate of Myanmar Forest Department (FD). Plantation forestry has a complementary role to natural forest in order to control deforestation and forest degradation. The objectives of plantation establishment in Myanmar have been to rehabilitate degraded forest lands, restore deforested areas and supplement various timber yields from the natural forests. Plantation forestry has a complementary role to natural forest in order to control deforestation and forest degradation. Re-afforestation in Myanmar got momentum in early 1960s and large-scale plantation forestry begun in the 1980s. Since then the annual plantation programme has been intensified

gradually till it has reached the present target of over 40,000 ha by fully funded by the government. FD establishes four types of plantations, of which local supply plantations and watershed plantations especially aim at satisfying wood-fuel demand of local communities and rehabilitation of degraded watershed areas.

With the support of APFNet, "Sustainable Forest Rehabilitation and Management for the Conservation of Trans-boundary Ecological Security in Montane Mainland Southeast Asia" demonstration project has been implemented to integrate lesson learned among three regional countries: Lao PDR, Myanmar and China/Yunnan commenced in January 2013 for three years. In Myanmar, the project was undertaken in Naung-Cho Township, Kyauk-me District, Northern Shan State. The project site was selected based on security, deforestation, forest degradation and existence of traditional knowledge for forest conservation. It was observed that shifting cultivation is one of major the factors leading to forest degradation in study area. The area is primarily endowed with moist upper mixed deciduous forest and composed with commercially important timber species. Teak Tectona grandis and Indaing or Dipetrocarp species are abundant in the study area. These tree species and forest types are dominant in Myanmar and it represents about 38 percent of the forested area of the country. Logging was done until 1980s.

Last 20 years ago, the main income comes from cutting timber and selling, charcoal making (commercial), agriculture (including shifting cultivation) and casual labour. Last 10 years ago, the priority of livelihood had changed into agriculture, charcoal and fuelwood and casual labour. Currently, the local communities rely on agriculture, lime baking, casual labour, charcoal (subsistence), selling fuelwood and making bricks. Local farmers had occupied degraded forest areas inside the Reserved Forest for shifting cultivation. Since 2004, Sweden fellow is likely to convert into sedentary agriculture under the system of customary land tenure.

Based on the base-line assessment and Win (2003); community-based forest management approach was recommended by project members by integrating traditional knowledge on forest conservation: homegarden, planting trees in monastery, forest safeguarded by spiritual belief and scientific approach of forest rehabilitation: community forest by means of agroforestry and natural forest conservation.

By introducing Community Based Forest Management (CBFM) approach, which is well balanced to develop economically and environmentally rehabilitation models/technologies; it was intended to achieve the following benefits at the end of the project:

a) To demonstrate securing customary land tenure by granting 30 years land lease of community forest

b) To improve securing customary right of forest resource use

c) To strengthen the community a sense of ownership and address their needs of forest products as well as income from crops

Socio-Ecological Setting of the Study Area

Case study is carried out in Nyaung-Htauk village (Table 1), which is closed to Nyaung-Htauk Reserved Forest in Norther Shan State where local people occupied the degraded forest land for farming. Village is comprises of Danu ethnic community. The village's land use consists of cemetery forest, residence area, and scared forest, forest for spring water resources, agricultural land and village common land (scrub land). Socio-economic conditions have dramatically changed compared to last 20 years ago, 10 years ago and now. Nowadays, 95 % of household are working farms and shifting cultivation areas become semi-permanent farm land. The reasons of changes of land use and livelihood scenario are: increased population; blooming of market for selling hybrid variety of maize; and weak law enforcement. The local people have customary rights of management and utilization on traditional forests: forests safeguarded by spiritual belief and spring water resources. The village administration organization is empowered to make decisions about how the resources of traditional forests are used and managed.

Table 1. Ecological and socio-economic conditions of village

Feature	Value
Number of households	220
Population	800
Elevation	
Annual rainfall during 2003 to 2012	1200 mm to 1800 mm
Mean temperature during 2003 to 2012 (Min)	7.8°C
Mean temperature during 2003 to 2012 (Max)	32.3°C
Land use	
Sedentary farm	607.28 (ha)
Degraded secondary forest	1600 (ha)
Traditional forest areas	30 (ha)
Residence areas	46 (ha)

Methodology

The rehabilitation strategies comprise the following steps: (1) baseline assessment of study area; (2) synthesis review on traditional forest rehabilitation and scientific approach; (3) formulation of participatory forest rehabilitation; (4) implementing planned activities and monitoring the impacts of forest rehabilitation (see in figure 1). In order to collect the base-line data of forest resources and socioeconomic profile of study village, preliminary survey was carried out by using the participatory tools such as resource mapping; wealth ranking; focus group discussion; key informants interviews and households interviews. In the meantime, synthesis reviews on scientific/ conventional forest rehabilitation practices were done. Traditional knowledge in study area was identified by survey of the area, key informant interview with elder group members, village administrative groups and household visit. Then, participatory forest rehabilitation management plan was formulated and consulted with local farmers. The activities were monitored by project members monthly with the participation of local farmers.

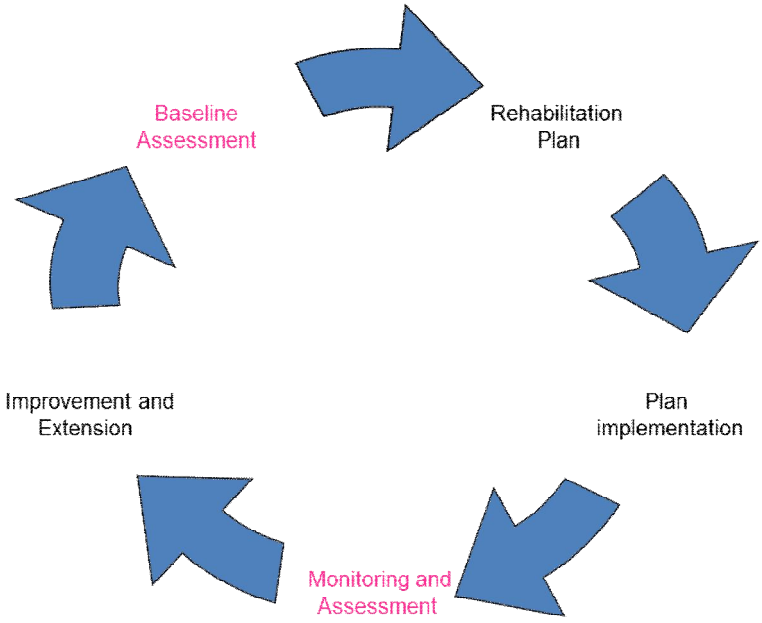


Figure 1 Steps of rehabilitation strategies

Activities Implemented in Case Study

The following interventions are carried out to rehabilitate study area:

- establishing different rehabilitation models based on landscape
- social fencing of the sites
- giving training to local farmers

Model 1: Community Forest Demonstration Plots

Under this model, there are about 8.41 ha of degraded lands to demonstrate inter-planting of annual crops and forest trees; and 15.89 ha of degraded secondary forest with assisted natural regeneration activities.

a) **Agroforestry Models**

In the agroforestry plots, nine farmers (community forest user group members) have intercropped maize; rice and groundnut with locally preferred species of Sterculia versicola for generating short term alternative income. Along the farm boundary, *Cassia siamea, Gmelian arborea*, and *Mangifra indica* are planted to enrich soil mineral and get fuelwood, pole and post as shown in Figure 1 and 2.

Figure 3 Demonstration of agroforestry including ground nut and Sterculia versicolor

Figure 4 Demonstration of agroforestry including farm boundary of Yemane and Mezale

Design of the model

- ✓ Explain and discuss about agroforestry practices and its advantages and disadvantages

- ✓ Conduct the consensus meetings with community forest user group members to sketch the preferable agroforestry design from each farmers based on socio-economic conditions and individual land holdings
- ✓ Request farmers to illustrate design with their preferable species to be planted
- ✓ Give suggestion by project members on the design and list down the tree species they want
- ✓ Request the members to consult with households members concerned with agroforestry design before the final consultation

b) Assisted Natural Regeneration Models

Assisted natural regeneration is one of the sivlicutlural tools to rehabilitate the degraded forest areas and *Imperata cylindica* grass land (FAO, 2005). Of the 15.89 ha of degraded secondary forests, assisted natural regeneration activities such as pruning, thinning, coppicing, fire protection and enrichment planting of *Pterocarpus macrocarpus*, *Xylia xylocarpa*, *Terminalia oliveri*, *Gmelina arborea* and *Delbergia cultrate* were carried out in 10. 89 ha while others areas are conserved as control plot without doing any interventions. Gap planting of bamboos including *Bambusa tulda*, *Dendrocalmus membranceus* and *Tectona grandis* was also done. ANR was practiced in about 10. 89 ha of degraded forested area to involve user group members in developing forest to produce forest products for consumption and sale; to include rare and endangered species chosen by villagers through enrichment planting; and to provide local employment through assisted natural regeneration activities such as coppicing, climber cutting, enrichment planting and fire protection.

Major Implementation Process and Tending Operations of Enrichment Planting

- ✓ Layout the sample plots in May 2014
- ✓ Cut the understory and weeds except seedlings and saplings of valuable species for line making (Line width is 3 feet and length is 360 feet).
- ✓ Staking with 24 feet to 24 feet
- ✓ Dig the pitch of 1' x 1' x 1'
- ✓ Refill the soil of upper layer with litter
- ✓ Transplant the seedlings in June- July 2014

After planting trees in July 2014, 1st weeding and patching, 2nd weeding and survival counting were done in August, October and December respectively.

Model 2: Improvement of Traditional Home Garden

The practice of home garden is a traditional practice of local farmers and consists of a house surrounded by cultivation of annuals and perennials crops and trees. In accordance with baseline assessment, species composition of existing home garden system in study area is shown in the following figure (5). To provide food consumption and alternative subsistence income as well as to enhance local farmers participation in forest rehabilitation, this model was implemented. Preferable seedlings of seedlings to be planted by local communities; 850 mangoes *Mangifra indica*, 85 hybrid jack fruits, 72 lemon, 5 viss of Horlan flowers, 30 avocados and 20 danyin were distributed to requested households.

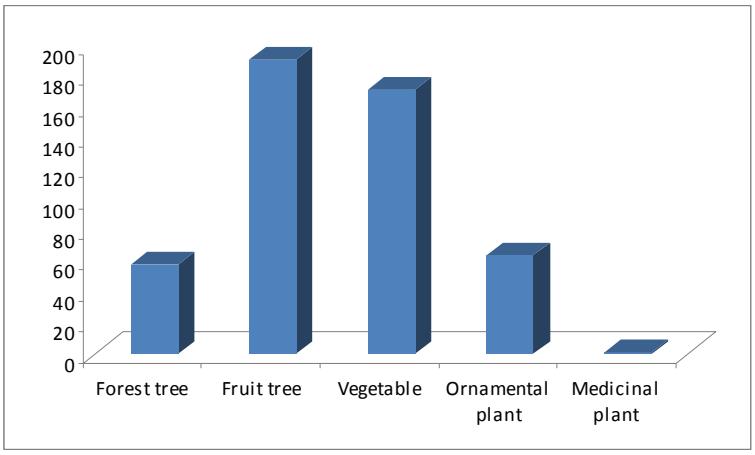


Figure 5. Species composition of home garden

Model 3: Activities in Spring Water Resources (Informal Traditional Management)

In Nyaung-htauk village, there are about ten spring water resources which are supplying water for communities and livestock as well. In local terms, they are known as "Yae Oo Yae Htwe'' which is a cultural element of forest conservation. The practice of understory cultivation to conserve and demonstrate rare marketable non-timber forest product *Amophophallus campanulatas*; planning trees along the outer boundary of spring water resources and demonstration of soil erosion control measures were carried out.

Model 4: Planting Trees around the Farm

Farming is common basic livelihood in the village and about 95 % of households are small farmers. Farm land areas cover about 59 % of village total land area. Farmbers'preferable tree species Tectona grandis, Mezale Cassia siame and Eucalyptus camendulensis were planted along the farm boundary and on the farm with the aim of demarcation between the farms, getting income from selling timber and getting fuelwood. This will be very good example of outside of the forest (TOF) on the farm for other villagers.

Model 5: Planting Trees in Monastery

Myanmar people are used to plant the shaded-trees in the Monastery and Pauk *butea monosperma*, ficus trees, mango and other fruit trees are grown in nyaung htuak village monastery. With the collaboration of local FD staff, local farmers and project members,

shaded trees and fruit trees were planted in the Monastery. Monastery is an impressive place and can easily be careful by villagers. Plantings in monastery campus can promote the morale of villager to be grown of trees. With the project support, Padauk *Pterocarpus macrocarpus*, *Terminalia oliveri*, *Delonix regia* and other ornamental plants, Avogada and good variety of Mango trees were planted.

Technical Challenges

This rehabilitation project was integrated by traditional knowledge and scientific approach. Though local farmers have experienced on tree planting, conserving and traditional social fencing; they are not aware of nursery techniques, enrichment planting, pruning and direct seeding. As such demonstration approach (working together with local FD staff and project members) is appropriate ways apart from giving trainings.

Participation of Local Communities

- In the process of rehabilitation, the main challenge of introducing community based forest management approach is trust building with local farmers. The project can build the trust between project members and local FD staff though it takes time to some extent by frequent visit to the village; providing preferable species (fruit trees, forest trees and seasonal crops) to be planted in the homegarden; home visit; arranging study visit to successful community forest; close communication with village organizations especially for elder groups, village head and women group.
- Local farmers are found to be more concerned with immediate income than long term benefits of tree planting. Compared to rare and endangered trees species and locally preferable species, locally preferable species are likely to be acceptable to local farmers because of endangered trees species takes time to harvest the benefit. Security of tree tenure, financial support for initial investment and market demand will be necessary for promoting local preferences on forest trees. The strategies that address local needs particularly for short-term returns are the ones likely to secure local participation and provide opportunities for persuading interests for environmental conservation.
- Frequent visit and close communication (two-way communication between team members and communities) makes communities to increase understanding on project activities and mutual relationship.
- Planting density was decided by local farmers based on land availability and socio-economic conditions. Project members facilitated on the process.

Financial Issues

Rehabilitation in developing countries that serves both local and global interests will have to be promoted as a fully funded government or donor initiative because of the limited capacity of ordinary hill people (Saxena et.al; 2001). In this project, all costs of rehabilitation are provided by the APFNet. Some rehabilitation activities are done by voluntary by local farmers for their individual plots. Some activities such as establishment of assisted natural regeneration plots, making fire line and monitoring the tree growth are employed local farmers to meet labour needs paying wages out of the project fund.

Table 14 The estimated costs for agroforestry and assisted natural regeneration

No.	Items	Demonstration area (acre)	Costs (Kyats)/acre	Costs (USD)/acre
1.	Agroforestry	20. 7 acre (8.41 ha)	450000	450
2.	Enrichment planting	(0.5) ha of 6 sub-plots	240000	240
3.	Making fire protection		450000	450
4.	Coppicing		300000	300
5.	Weeding		800000	800

Sustainability of the Project

Follow-up activities would by necessary because 3 years project period is short to generate income and benefits from demonstration plots. It is too early to assess the sustainability of the demonstrated practices but communities are hoping that they will succeed in forest rehabilitation with the help of Forest Department and good market access for cash crop species such as *Sterculia versicola*.

Lesson Learnt from Project

The main challenge of introducing community based forest management approach is trust building with local farmers. Furthermore, the following lessons were learnt throughout the project implementation:

- Need to aware and understand traditions, culture, belief and custom of the local communities.
- Need to recognize and learn the indigenous knowledge of forest conservation
- Need to develop social fencing and management practices based on existing traditions and local practices
- Need to mobilize communities and encourage to come out a good leadership among community
- Need to share information and success story of rehabilitation process through multi-media such journal, newspaper, local FM radio and monthly forestry journal of Forest Department as well as through Community Core Unit of Forest Department
- Need to engagement of NGOs, CSOs, private sector and relevant stakeholder for the sustainability of success of rehabilitation of degraded forests and conservation of mountain mainland.

Way forward

(1) Continue to monitor and assess the rehabilitation trials/models

(2) Replicate the rehabilitation trials/models as much as possible

(3) Develop regional standard for degraded forest land rehabilitation, including regional strategy, technical approach, criteria and indicators.

(4) Establish a MMSEA region research network for degraded forest land rehabilitation to coordinate international joint research and demonstration

Conclusions

Through this case study, it can be said that community based forest management approach is acceptable for rehabilitation of degraded forest land with the support of government or donor at the local level. However, local people should be involved in every steps of rehabilitation strategies: baseline assessment of study area; synthesis review on traditional forest rehabilitation and scientific approach; formulation of participatory forest rehabilitation; implementing planned activities and monitoring the impacts of forest rehabilitation. We found that local farmers are found to be more concerned with immediate income than long term benefits of tree planting. Compared to rare and endangered trees species and locally preferable species, locally preferable species are likely to be acceptable to local farmers because of endangered trees species takes time to harvest the benefit. Security of tree tenure, financial support for initial investment and market demand will be necessary for promoting local preferences on forest trees. The strategies that address not only environmental concerns but also existing local needs are the ones most likely to secure initial local participation and provide opportunities for achieving higher returns at lower rehabilitation costs. The previous Deputy Minister admired good practice of community forest model in project site and he had encouraged to replicate such model in the whole area of Naung-cho Township as an alternative approach of shifting cultivation.

Rehabilitation of Degraded Chure Forest: an Integrated Practice of Watershed Conservation and Forest Management, Nepal

Loknath Ghimire

Assistant Forest Officer, Ministry of Forest and Soil Conservation

Abstract: Nepal comprises distinct three physiographic zone among them Chure has a distinct geographical and bio-physical specificities lying on the foothill of Himalaya. It is the youngest mountain of the world, and suffering from mass erosion, landslides, degradation, deforestation and other environmental externalities which make the region vulnerable. However this region has a significant potential on forest resources, biodiversity stock and capacity of water recharging to the most economically viable Tarai eco-zone similarly, Chure region has many opportunities of employment and income generation through establishment of environment friendly green enterprises. So Government has given greater emphasis on the rehabilitation and protection of Chure through initiation of 'Rastrapati Chure Conservation Program' since 2009/10. It is an attempt to identify the problems, challenges and issues of Chure forest conservation and elaborate positive impact then scale up it and propose an effective conservation plan using qualitative as well as quantitative methods of analysis. Thus it is an urgent need to formulate and broaden short-term to long-term strategies with policy priorities actions and result-oriented efforts in order to establish Chure as a rehabilitated rich bio-diversity forest zone, with hazardless and improved livelihoods of its people.

1. Introduction

a) Nepal at a Glance

Being landlocked between China and India a small and beautiful Himalayan country Nepal possesses 147,181 sq. km (14.7 million ha) land area. There are three major physiographic zones in Nepal i.e. a) Tarai and Siwalik–Chure zone having altitude 67-2000msl b) Middle hill zone having altitude 2000-4000msl c) High mountain zone having altitude 4000-8848msl . The climatic and biodiversity variation among these zones are determined by altitudinal difference thus forest types and ecosystems are also varies in each zone. There are 35 types of forest types (tropical and Siwalik-Chure forest to Alpine forest up to Mt. Everest 8848 msl and found 118 ecosystem types in Nepal. The recent Forest Resource Assessment project data shows total forestland occupied in the country is 5.6 million hectare (44.7 percentages). It is increased in previous assessment was carried out in 1999 which had showed 5.45 million hectare (39.60 percentage).

b) Socio-Economy and Population

Accordingly Centre Bureau of Statistics, 2011 total population of Nepal is 264, 945,04 .There is annual rate of population growth is 1.35% .The literacy rate is 65.9% . HRD index is 0.463 and Gender inequality index is 0.485. Nepal is predominantly agriculture country having 43% contribution of this sector to National GDP. Tourism sector is second largest contributor to GDP. The economic growth rate lies between 3-5% and the per capita income is 470 US$.

c) Physiographic Regions of Nepal

Nepal has mountainous and rugged terrain having lowland to high Himalayan peaks. Now there is coverage with green patch and good natural regenerated forest which was degraded and being barren before 30 years ago.

Major three physiographic regions of Nepal are:

Table no.1 Physiographic regions of Nepal

Regions	Percentage	Altitude msl	Bioclimatic zone
High mountain / high himal	42%	4000-8848m	tundra /alpine
Middle hill	29%	2000-4000m	temperate
Siwalik-Chure and Tarai	29%	67-2000m	tropical/subtropical

d) Land Use Change over 2-3 Decade

Land Resource mapping Project Nepal had done first forest resource mapping during 1977-1984 that been showed 6.30 million hectare (53%) forestland in Nepal. The second assessment has been done by Nepal Forest Inventory (NFI) Project in 1999 that concluded the overall forestland was decreased to 4.30 million ha. (29.6%) and proved the condition of various national forestland were degraded.

Table no.2 Land use change in Nepal

1978/79 LRMP (000 ha)					1998/99 NFI (000 ha)				
cultivated land	29,69.4	20%	-	-	3090.8	21%	-	-	
forestland	5612.4	38.1%	-	-	4268.2	29%	-24	-	annual decrease rate -1.6%

Forestland decrease rate in Nepal – 1.6% between 1978/97 to 1998/99 . Forestland decrease rate in Tarai and Chure siwalik was – 1.6 % between 1978/97 to 1998/99. Recent FRA Report published in 2015 and this report shows there is increased forestland dramatically in mid hill Physiographic region whereas it is still decreased in Tarai chure Siwalik in the rate of 1.3% per annum.

e) Population Distribution

Table no.3 population distribution in Nepal

Regions	percentage
High mountain / high himal	6%
Middlehill	44%
Siwalik-Chure and Tarai	50%

f) Population Pressure on Forest Resource

Majority of population (70%) derives energy from fuel wood that ultimately creates heavy dependency on forest resources. Several development works such are roads, irrigation canal, transmission lines are constructed inside forestland. Timber, fodder and other so many products are derived from forest; hence there are still a huge pressure to exploit forestland its resource in Nepal .The increasing rate of population also adds further pressure on forest and natural resource. Population growth is the prominent drivers for degradation and denudation of forestland and thus deforestation is still a great problem in forest management in Nepal in three physiographic regions. Now Chure (siwalik) forestland is exerting higher pressure of degradation and denudation due to large population alive in this region.

2. Rehabilitation of Degraded Chure Forest: a Challenge in Nepal

Chure region as well as Chure forestland has a distinct geographical and bio-physical specificities lying on the foothill of Himalaya. It is the youngest mountain of the world, and suffering from mass erosion, landslides, degradation, deforestation and other environmental externalities which make the region vulnerable. Resource depletion, for example deforestation, due to natural as well as human induces factors in the Chure forestland has accelerated, and livelihood opportunities have been retreating. Degradation of watershed, lowering the underground water and disturbing the ecological niche in and around the region makes the region more sensitive and fragile. The rate of Forest degradation and deforestation in Tarai, Chure Siwalik is 1.3% .So Government has given greater emphasis on the rehabilitation and protection of Chure through initiation of ‘Rastrapati Chure Conservation Program' since 2009/10. It is an attempt to identify the problems, challenges and issues of Chure forest conservation and to propose an effective conservation plan using qualitative as well as quantitative methods of analysis. The ecological, geographical, and bio-physical conditions of the Chure region have rapidly degrading since last 30 years. Increasing landslides and flooding, and human intervention makes Chure more fragile and weakest zone where lacks/inadequate of livelihood assets and food insecurity are noted. However, Chure region has many opportunities of employment and income generation through establishment of environment friendly green enterprises. Thus it is an urgent need to formulate short-term to long-term strategies with policy priorities actions and result-oriented efforts in order to establish Chure as a rehabilitated rich bio-diversity forest zone, with hazardless and improved livelihoods of its people.

General Feature of Chure

Chure zone is extended up to India, Bhutan & Pakistan from Nepal, its Nepalese topography id under the green/yellow zones hold the Inner Tarai valleys. Chure covers 33 districts of Nepal with 12.6 % of country area. Chure is also commonly said Siwalik in western part of Nepal.

Fact and Figure of Chure

Expansion	**Ilam to Kanchanpur (33 districts) 10-40 Km width**
Area coverage	**12.6% of the country (1.23million hac)**
Population	**About 5 million (CBS ,2011) with 392/Km2**
Altitude	**200-2000 m**
Forest coverage	**72% (FRA, 2014)**
illegal settlers	**About 65% of the total household**
Rainfall	**1500-2000 mm /year**
Socio economic status	**High poverty rate and intensity**

Objectives of the Case Study

1. To explore existing situation and initiations taken to rehabilitation of Chure forestland and its watershed conservation.
2. To discuss on further course of actions to move forward.

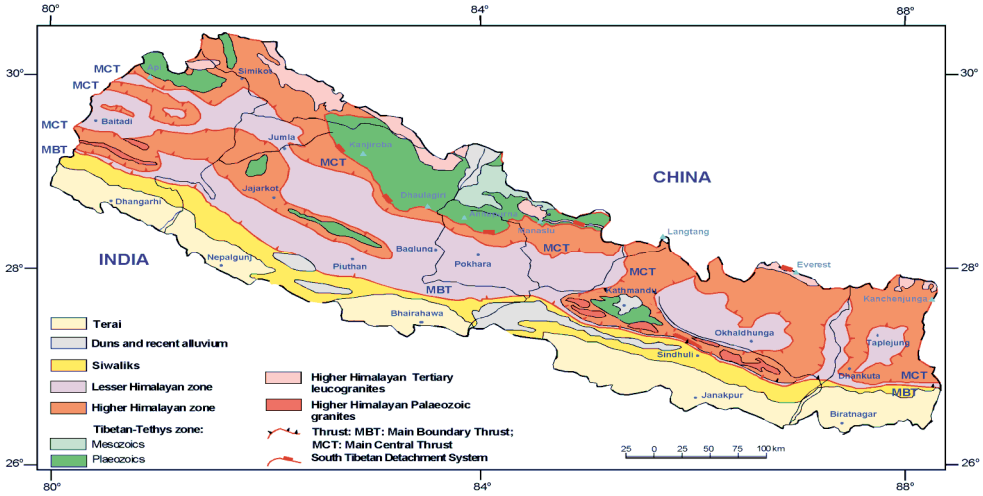
Methodology

To conduct this case study, I have done literature review works; field visit from Ilam to Kanchanpur, Sample observation done and met with key informants like DFO, DISCO. Somewhere I have made interaction with stakeholders and conduct focal group discussion with local inhibiter. I would like to give thanks to our senior Mr. Damodar Sharma, Central President of DFAN and Mr. Sekhar Yadav, President, NFA for their valuable suggestion as well information sharing.

Agenda For Study

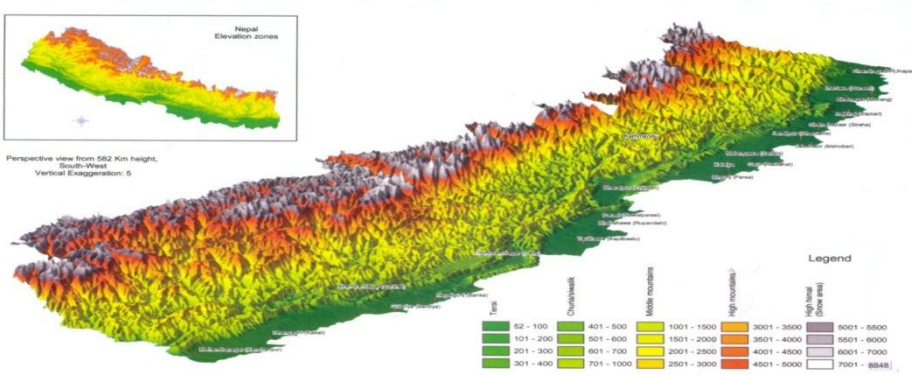
- Chure forest and its existing situation of degradation
- Chure rehabilitation and Conservation : Efforts made so far
- Chure forest management related Issues
- Recent decision made by the government of Nepal - cabinet
- Future roadmap

Generalized geological map of Nepal

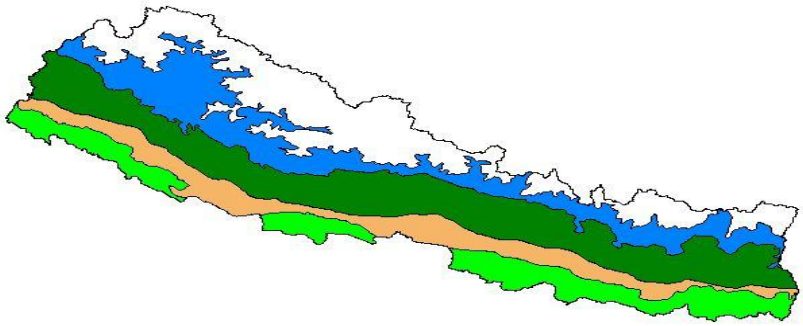


Elevation Zones : 67 m to 8848 m elevation up to Mt. Everest

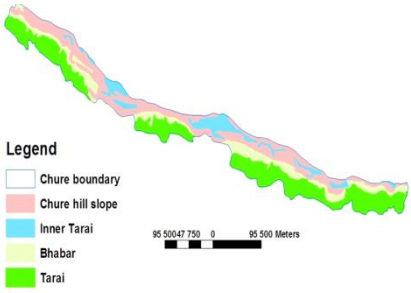
Nepal 8788 m difference within 193 km N-S , rugged mountains, steep slopes, high reliefs

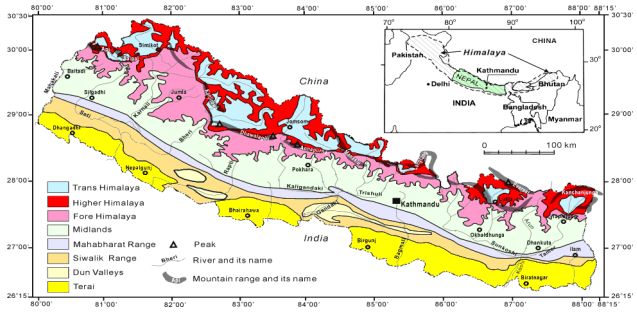


Physiographic Division, sharp physiographic and climatic contrast, Two third of the country hills and mountains



Chure and it's Boundary





Observation

Chure Hill: having a most vulnerable Watershed and degraded forestland

Geo-morphological reasons

- Weak geo-morphological configuration
- High intensity of rainfall in monsoon and water scarcity in winter.
- Susceptible to earthquake
- Higher degree of slope

Anthropogenic /Human reasons

- Unsustainable land use
- Overexploitation of Churia resources and felling of tree
- Free Grazing on forest land and high frequency and intensity of forest fire
- Lack of integrated mission to conserve Chure

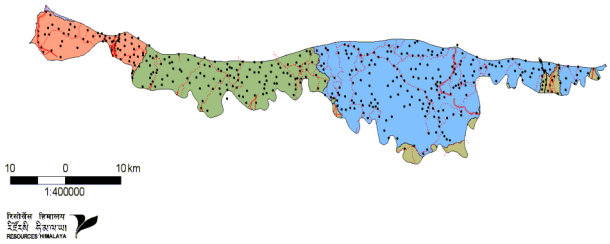
Life of > 50% Nepali relies on Chure and it resources

Drivers: Political, biophysical, socio-economical, environmental, institutional etc.

1. Settlement /land tenure (5 million estimation)
2. Massive erosion (max. 20,000 ton/sq.km/yr)
3. Illegal extraction/harvesting of timbers,
4. Encroachment ,cutting trees (East-west)
5. Unmanaged extraction of sand/boulders
6. River bed expansion (200 m to 4 km)
7. Political instability/transitional benefit

Some pictorial glances

Forest encroachment, tree cutting



Inappropriate land use/degradation of forestland, agricultural practices

Construction of physical infrastructure along Forestland

Such as roads and irrigation schemes without conservation measures

3. Forest Degradation in Chure and emerging it's rehabilitation concept

Forest degradation generically defines as the reduced capacity of a forest to provide goods and services (FAO, 2002). Some major causes of forest degradation include –selective logging, conversion of land, natural disturbances likes fire, landslide, flood etc. Forest degradation hence leads to the deterioration/depletion in structure of vegetation and composition leading to a lower productive capacity of forest .One of the important indicator of forest degradation that can be measured in the reduction of canopy cover/stock of forest.

Findings the Causes of Deforestation and Degradation of Chure Forest

a) human settlement in or nearby forest

b) conversion of forest into agriculture practice / shifting cultivation

c) over grazing , higher number of unproductive cattle

d) tree cutting, forest fire

e) no suitable forest management activities done such are : plantation , regeneration protection, adoption of proper silviculture treatment etc

f) development works on chure forest –road, school, other infrastructure

Impact of Chure Forest Degradation

a) loss of forest product and forestland then adverse effect on ecosystem

b) adverse impact on watershed – downstream side

c) adverse impact on forest biodiversity

d) adverse impact on national economy – forest sector contribution to national GDP is 15% .

Realization of Chure Rehabilitation and Programme Implementation

At first realization of Chure rehabilitation and Conservation was done by head of the state-president of Nepal then Government arrange the rehabilitation and conservation programme through annual budgetary system by Rashtrapati Chure Conservation Program since 2009/10

2010: Initiated as pilot study (7 districts)

2011: Named as Rashtrapati Churia Conservation Program, approval of budget for MOFSC Started in 23 districts and latter to 26/27

2013: Included as National Pride program Shared with at Office of the President

NPC, and central region. Involvement of the other line agencies eg.

Agriculture, Livestock from 2070/71.

2014 : Rastrapati Chure, Terai and Madesh Program (Cabinet endorsed high level Chure Board) to promulgate all rehabilitation an forest management activities

Program Guiding Principles

Multidimensional interlinked problems i.e., integrated approach and rehabilitation of degraded forest in chure

- ✓ Multidisciplinary, integrated planning and intervention,
- ✓ River system/landscape (North-south connection (T model)

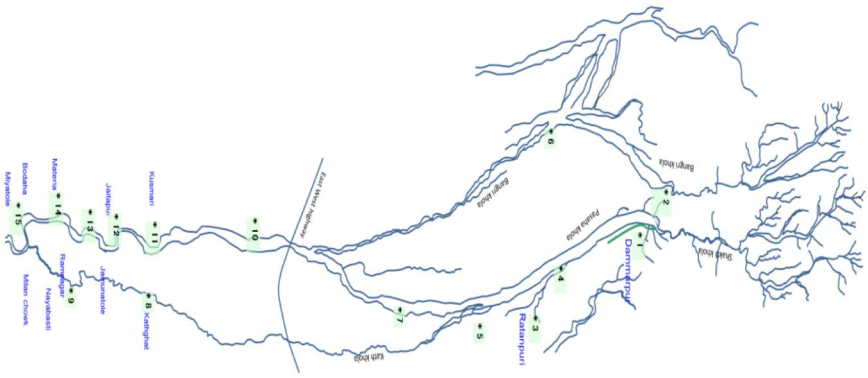
Involved Agencies/Institutions

- ✓ Department of Forests/District Forest Office
- ✓ Department of Soil Conservation and Watershed Management,
- ✓ Department of Plant resources
- ✓ Department of National Parks and Wildlife Conservation
- ✓ Department of Livestock services
- ✓ Department of Agriculture
- ✓ DWIDP, and DDC/Local bodies/NGO

Adopted Major Programme Types

- ✓ Forest Degradation control
- ✓ Greenery promotion
- ✓ Water management (harvesting and use)
- ✓ Livelihood support and Community mobilization, strengthening, networking
- ✓ Land rehabilitation and reclamation
- ✓ Forest management
- ✓ Other local resources management linked with livelihood eg. NTFP, MAP, etc.
- ✓ Regulating/optimum uses of the sand, gravel, stones
- ✓ Biodiversity conservation

4. Approaches: Integrated practice of rehabilitation of degraded forestland and watershed conservation on the basis of River basin system



Program Intervention Area

Area 1. Churia Hill slope protection and rehabilitation

Forest cover promotion, forest rehabilitation

Forest protection and management

Sediment control

Area 2 : River Flow course

Embankment construction

Massive vegetation along the river course

(Planting bamboo and other species)

River networking system

Area 3 : Sub surface water harvesting and link with agriculture system

Area 4 : Wetland conservation

Area 5: Forestland rehabilitation, management and massive plantation

Area 6: Livelihood promotion NTFP and MAP plantation Cash crop, livestock

Policy & Legal Framework

Multi-Sectoral

- ✓ Constitution of Nepal
- ✓ Periodic Development plans
- ✓ Forest acts 1993 and bylaws 1995
- ✓ Soil Conservation and Watershed Management policies and act.
- ✓ Environment law and bylaws
- ✓ Plan and guidelines of Municipalities
- ✓ Infrastructure and road construction related working guidelines.
- ✓ Agriculture related policy and plan
- ✓ Local development related act, policy and plan

Institutional Framework

Chure conservation involves public, private, communities, NGO/INGOs related organizations

- ✓ Ministry of Finance
- ✓ Ministry of Home
- ✓ National Planning Commission
- ✓ Ministry of Federal Affairs and Local development
- ✓ Ministry of Forests and Soil Conservation
- ✓ Department of Forests /Dept of Forest Research and Survey/DSCWM
- ✓ Ministry of Physical Infrastructure and Transportation.
- ✓ Community based Forestry Organizations
- ✓ NGO/INGOs, Local club/communities

5. Success Programme and Effort of Forest Rehabilitation and Watershed Conservation in Chure

Government of Nepal has conducted Chure rehabilitation and conservation programme since fourth year development plan in 1970-75 through few government agency .The pace of programme implementation was slow. When President Chure Conservation Programme (PCCP) has been launched from 2009/10 the rehabilitation effort are being highly remarkable. Furthermore the speed increases after 2013/14 while Government endorsed high level Chure Conservation Board .

Some Successful Programmes

a) Programme focused on rehabilitation and forest management conducted by District Forest Offices in 33 districts (from 2009/10-15)

- forest regeneration protection, forest area rehabilitation - 52000 hac
- seedling production and distribution (tree species, broom grass, bamboo) – 167million
- bamboo plantation in degraded land - 960 hac
- forest management activities - 2600 hac
- control forest fire - 26 district annually
- control open grazing - 26 district annually

b) Programme conducted by 24 DISCO - focused on soil and watershed conservation from 2009/10 -15)

- gully treatment - 560 items
- river check dam / vegetation treatment - 26 kilo metre
- wetland conservation/small pond protection - 262 items
- degraded land, barren land rehabilitation - 1436 hac

Total programme expenses - 17400 million NRS

Total population benefited - 5 million people inside the Chure as well as it's downstream

Beneficial Impact from Rehabilitation and Conservation of Chure

Although the implementation of Chure rehabilitation and conservation programme been moving on a short term time period several positive and beneficial impacts are started to be observed. Some socio–economic and environmental benefits are :

- increased/improved water recharge capacity
- improve the forest condition and availability of firewood and grasses are raised
- reducing open fire incident
- controlling open grazing that directly enhanced to regeneration of forest
- reducing soil erosion by gully control and improved terrace farming
- control flood incident
- positive impact on income of people by selling fruits, banana, cow milk and plantation of other cash crop
- social benefit through harmony with local people upstream and downstream linkage
- improved biodiversity and ecosystem services

Issues Related to Chure Rehabilitation and Conservation: Poor Governance

- **Policy issues:**
  - Conflicting sector policies and laws

- Lack of clear-cut Management policy to conserve fragile Churia landscape.
- Lack of integrated Churia watershed management policy, legal instrument and modality

Institutional issues

- Fragmented organizational setting.
- Institutional bottleneck
- Integrated Chure conservation mission is lacking

Lack of coordinated efforts

Program related issues

- No or very rare interventions made in actual Churia hill (Upstream)
- No any program to bring land use/cover change and livelihood improvement of Siwalik residences
- Activities are more focused in downstream
- Question in governance of activities implementation
- Thus, effectiveness of Rastrapati Churia program has become questionable

Overexploitation of Churia resources

- Unsustainable use of Stone, Gravel and Sand
- Deforestation
- Shifting cultivation
- Forest land encroachment and degradation

illegal settlers and poverty

- Lack of Land title of >60% people
- Poverty rate/intensity is higher

Different interests within the key the stakeholders

6. Special Decision of the Government of Nepal-Cabinet on 02/03/2071

- ✓ Chure hill declared under Vulnerable area and proposed to designate as the protection area under Environment law 2053 (article 10)
- ✓ Ban to export and overexploit of stone, sand and gravel from the area.
- ✓ Formation of higher level Development committee / Chure Board to look after Churia.
- ✓ People centric Chure Conservation and Rehabilitation programme adopted

7. Action Agenda for Future Course

Broadly, Following Key Initiations Require: Immediate Processes

- ✓ Bringing key players together (Need coordinated efforts and mechanism).
- ✓ Re-vitalizing the Rastrapati Chure , Terai and Madesh Program (Review the programs)
- ✓ Chure conservation,rehabilitation and management intervention by using existing policy, legal instruments and institution (need to review and analysis).

8. Conclusion

- ✓ Chure is the most degraded forestland and watershed area having highly degraded forest of Nepal
- ✓ Life of southern people depends upon conservation and sustainable use of Churia resources .ie, forest resource and water
- ✓ Initiation of chure conservation and rehabilitation made by the Rt. honorable head of state to conserve and manage Chure forest has become mile stone to bring the issue in forefront.
- ✓ Recent decision of the cabinet has given clear direction to handle the Chure matter having high priority
- ✓ Integrated watershed management and forest management policy, plan, program and missions are required for the sustainable management of Chure forest and landscape.
- ✓ Chure forestland / conservation and rehabilitation model must be further broaden and implemented with people who live inside Churia and reliant upon its resources.

Advances in the Policies of the Forestal Management in Relation to the Rehabilitation of Land Degraded in Peru

Sara Yalle

Director of Sustainable Management of National Heritage
National Forest and Wildlife Service – Perú

Abstract: Peru is one of the countries with the largest area of tropical forest in South America, second after Brazil; however, the degradation of forests and deforestation is one of the problems that is on the rise. Bad practices in the development of the agriculture, livestock, alluvial, unplanned, gold mining in addition to illicit crops, with consequential environmental impacts, and the illegal extraction of timber, are the main causes of forest degradation. According to reports from Global Land Degradation Assessment Model, GLADA, between 1982 and 2002, the degradation affected 15.3% of the Peru, of keep up this trend, until the end of the century, it is estimated that land degradation processes can affect 62% of the surface of the Peru. Currently more than 9 million hectares have suffered the loss of original forest cover, of whom 5.5 million are considered degraded or abandoned.

In recent years it comes promoting work articulated between the sectors to promote actions for the recovery of degraded areas, generating information and maps to the situational status of lands and strategies for rechabilitation. The Ministry of agriculture and irrigation (MINAGRI) through the National Forest and Wildlife Service (SERFOR) is leading the process of elaboration of a National Programme of Rehabilitation of Degraded Areas (NPRDA), with a multi-sectoral and articulated work to recover the goods and ecosystem services, improve the quality of life of the rural population and comply with national and international commitments.

I. Introduction

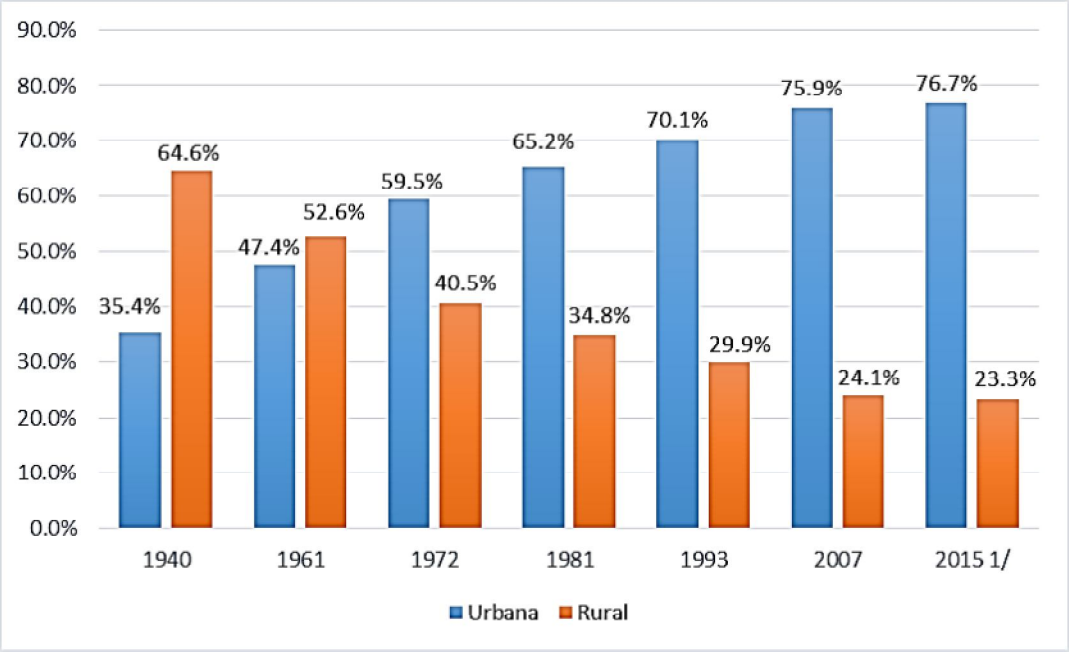
The Peru is located in the central and western area of South America, occupying 1 285 215,60 km2 of land (INEI, 2015), shows three regions: coast, mountains and jungle, which occupy the 11.7%, 28% and 60.3% of the national territory, its economy is mainly based on the exploitation of its natural resources. The main economic activities include: agriculture, mining, hydrocarbons exploitation and manufacture of products, including textiles (MRE, 2014). The population for the year 2016 is estimated at 31.5 million, of which 25% about lives in the rural area and its economic activity is related directly and indirectly to agriculture (agricultural, livestock and forestry) which has an important economic and social weight. In general, there are an estimated 2.3 million households that engage in agriculture (Zegarra and Tuesta, 2009) and generate approximately 7.6% of the national GDP. Agriculture occupies

40% of the national EAP and is estimated that 7.3 million people in rural areas, depend on the forests.

Peru is the second country worldwide with the largest expanse of forests and the fourth in tropical forests, after Brazil. Natural forests are the ecosystem of greater surface area 72 083 263 hectares, being the Amazon region with the largest forest area followed by Andean and dry forests. It is home to a great diversity of species of flora and fauna that provide benefits to the population, mainly indigenous and peasant population which is part of its ecosystems.

Grafic 01. Populatin in the rural and urban

(Percent of total population)



1/ Cifras proyectadas

Source: Instituto Nacional de Estadística – Censos Nacionales de Población y Vivienda, 1940, 1961, 1972, 1981, 1994, 2007

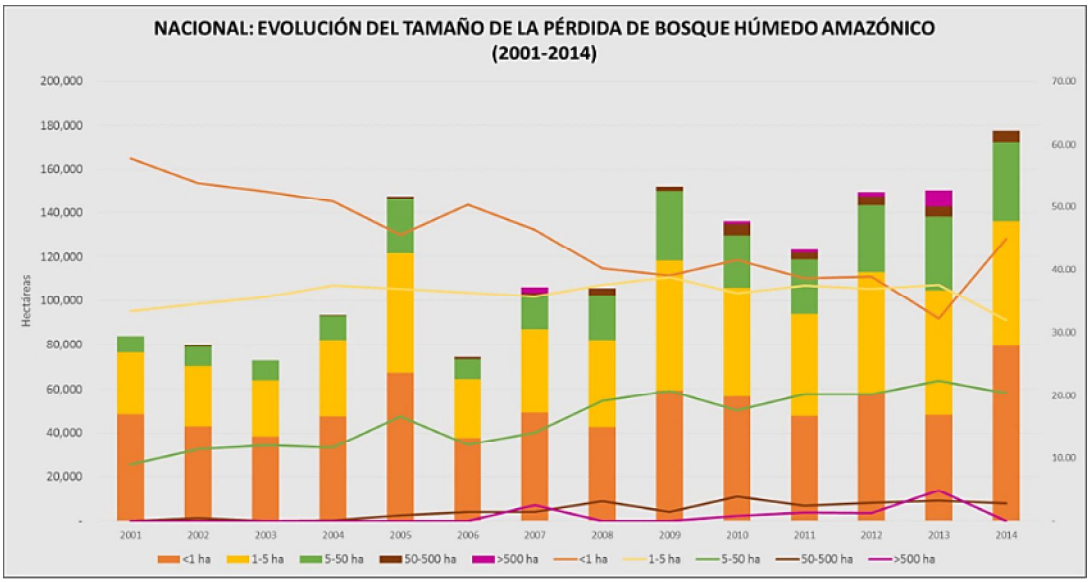
1.1. State of agricultural and forestry land degradation

Despite its importance, the forests suffer constant threats, mainly by the development of human activities such as shifting cultivation, livestock, mining and rural infrastructure, contributing to the conversion of forests and to the processes of degradation and deforestation with the consequent loss or reduction of the goods and services of ecosystems, biodiversity and even the country's food security.

77% of deforestation occurs in units smaller than 5 ha, which is explained due to the expansion of non-industrial agricultural crops, while 20% of deforestation includes areas between 5 and 50 ha.

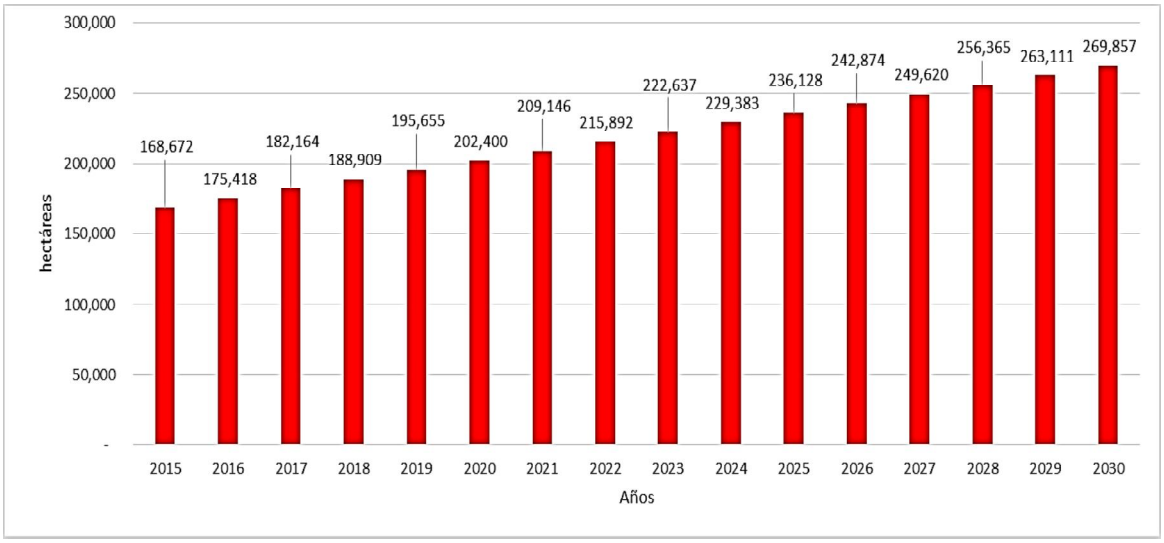
Grafic 02. Evolution of the size of the loss of the peruvian Amazon rainforest.

Period 2001-2014



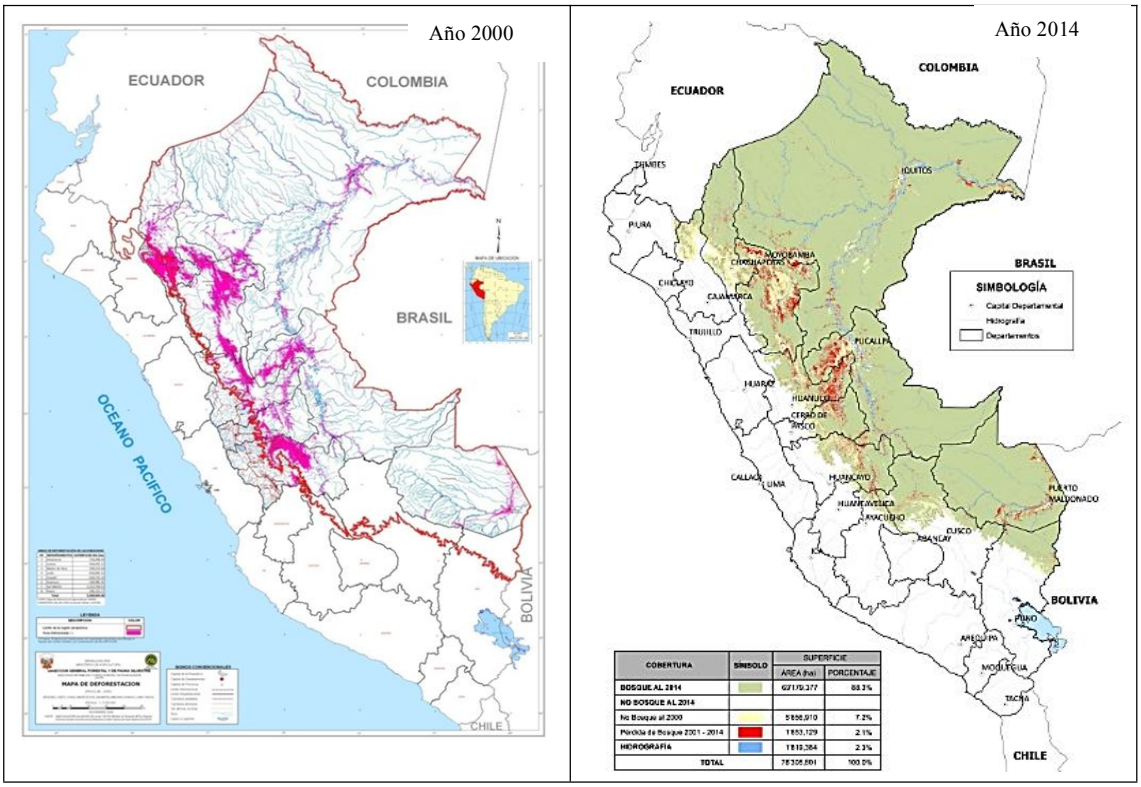
Source: Programme for the Conservation of Forests for the Mitigation of Climate Change (PNCBMCC), 2015. MINAM.

Grafic 03. Trend of deforestation: Amazon rainforests 2015-2030



Source: Source: Programme for the Conservation of Forests for the Mitigation of Climate Change (PNCBMCC), 2015. MINAM.

DEVELOPMENTS OF THE DEFORESTATION MAPS - PERÚ



Map: Developments of the Deforestation in Perú, years 2000 and 2014

Source: NaturalResourses National Instituto INRENA - MINAM

Photo N° 1: Deforestation by shifting cultivation

Photo N° 2: Deforestation by alluvial gold mining

1.2. Advances in Rehabilitation of Degraded Areas

During the last two decades in the Peru have made multiple efforts of rehabilitation of forest lands degraded in the Amazon region. The rehabilitation processes were initiated by small producers and communities with the support of public and private institutions. Research institutions and international cooperation (CIFOR, ICRAF) private organizations promoted private initiatives mainly in the low jungle, to select and evaluate forest species with potential for improvement of soil fertility, as well as assess forestry sustainable partnerships to provide better income for rural families and contribute to the protection of the forest, seeking to reverse degraded landscapes such as: fragmented secundary foresst and natural low-productivity pasture.

The year 2015, FAO-Peru, performs the systematization of 103 experiences of recovery of areas degraded in the country, carried out since 1990. These experiences considered alternatives for land use with different approaches to management and conservation of soils (with emphasis on the application of fertilizers and amendments) and the use of forestry systems, including the management of secondary forests FAO, 2015.

The rehabilitated landscapes corresponding to fragmented forests. The main initial scale of intervention was local; however, some demonstration projects up to regional and provincial scale such as alternative development projects were developed to eradicate the illicit cultivation of the "coca" and reforestation projects performed by public institutions. Most of the experiences conducted in isolation and with different objectives, from the conversion of land with illicit crops until the recovery of areas for ecological purposes end to restore the functionality of the ecosystem.

II. Key Elements

2.1. Policies, plans and projects that promote the rehabilitation of degraded areas

MINAGRI and the Ministry of the environment (MINAM), are promoting a actions for rehabilitación and restoration of degraded areas and forest ecosystems at the national level. The year 2011, the MINAGRI promulgated the Forest and Wildlife Law N° 29763 which establishes the SERFOR responsible for promoting and implementing measures for the sustainable use, conservation and protection of forest resources and wildlife by, among other actions, the recovery of forest ecosystems; Likewise, it enacted the National Forest and wildlife Policy which includes the promotion of mechanisms for rehabilitation of deforested and degraded areas with forest species, which is consistent with the National Agrarian Policy, which considers its strategic guidelines "combat, stop and reverse degradation, deforestation (...). Also has the Law of Retribution Mechanisms for Ecosystem Services (Law No. 30215) promulgated by the MINAM, which recognizes that through conservation, recovery and sustainable use can be ensured the permanence of ecosystems, as well as the economic, social and environmental benefits that people get good performance from them (f.e. carbón sequestration).

Activities include the implementation of the Programme of Reduction of Degraded Soils, which includes practices aimed to prevent or minimize the problems of degradation of land, executed by the MINAGRI. The SERFOR, in quality of national forestry authority, with the support of USAID, through the project “Forest Peru” supported by USAID and Peru Forest Sector Initiative (PFSI) promotes the Rehabilitation of Degraded Areas (RDA) and forest ecosystems, through the installation and management of forest plantations and with the support of the Bank's Development of Latin America (CAF) implements the “Sustainable Forestry Development Project Inclusive and competitive in the Peruvian Amazon”, in coordination with Regional Governments, with the aim of recovering and conserving Amazonian forests. Also, in coordination with the MINAM approved the Guidelines of Public Investment in Forestry Development Policy to 2021, which seeks to consolidate the implementation of investments that makes the Governmet in development of commercial forest plantations and protection (with emphasis on reduction of deforested areas), and is in review the national strategy for forests and climate change.

The MINAM, through the national Programme for the Conservation of Forests for the Mitigation of Climate Change (PNCBMCC) and with the collaboration of various agencies national and international such as CIFOR, ICRAF, Rainforest Alliance, CIAT and Green Commodities Program of UNDP and UNEP, has been developing projects and initiatives focused on the management of forest landscapes, in the framework of the sustainable Amazon Programme (GEF); Program of forest investment (IDB and WB) and studies on business models and opportunities to increase agricultural productivity in the Amazon at the same time reduce deforestation (UNEP and Norway).

2.2. Institutional Aspects

Several institutions in the public and private sectors, including the MINAGRI, SERFOR, MINAM, PNCBMCC, HELVETAS, GIZ, CAF, come running actions of RAD. In recent years, in public policy and management of natural resources, is strengthening the articulation and territoriality and inclusion approaches. The new Forestry and wildlife Law creates the National Forest and Wildlife System (SINAFOR), led by the SERFOR, responsible for the inter-institutional coordination of the three levels of Government and the public sector for the forest management and propose, review, evaluate and approve all plans, programmes, projects and strategies related to forest management and wildlife. The SINAFOR coordinates with regional authorities and native communities the implementation of public policies, including the National Forest and Wildlife Policy and the elaboration of the NPRDA.

2.3. Technologies Used for the RDA

For the RAD applied technologies ranging from techniques for recovery and reduced erosion of soils, good agricultural practices (reduction in the use of agrochemicals, pesticides, fungicides), until to afforestation with species native and/or introduced in agroforestry systems, based on important economic, such as coffee and cocoa crops or fruit trees and other crops in order to more efficiently utilize the land. To a lesser extent, legume forage associations are recorded as technology to rehabilitate degraded pasture areas and forest management in areas of lower level of degradation with a series of variants in terms of species and spatial arrangements.

2.4. Financing and Investment for the Rda

- There are no exclusive funding for RDA in the country; however, the State, through the Reduction of Degraded Soils Program of MINAGRI and the “Program of Forest Sustainable and Inclusive Development of the Peruvian Amazon”, funded by CAF, has allocated resources ranging from 700 thousand to $ 3 million, for the development of activities involving intervention for the RAD in the area of mountains and the Peruvian Amazon.
- On the other hand, international cooperation Helvetas, GIZ, FAO, ICRAFT, through NGOs, in coordination with the MINAM and SERFOR, come by funding local projects. Agrobanco, meanwhile, has opened a line of credit for the establishment, management and exploitation of forest plantations.
- The new legal framework related to forest management and ecosystem services includes also the payment due to the natural heritage that must be private companies or State institutions for the development of projects that require the removal of the forest cover. This amount would be devoted for conservation and rehabilitation actions. Expected also with support from IUCN-WRI, support the execution of business plans within the framework of the initiative 20 x 20.
- There is no exact amount of investment for the recovery of one hectarea of degraded land in the country; however, it is estimated between 2,000 to 5,000 dollars approximately,

depending on the conditions of the area and the level of degradation. The Rehabilitation of forest land affected by mining are that report greater investment, followed by poor agricultural practices.

2.5. Key Challenges and Efforts for RDA

Peru has assumed international commitments. In the framework of the UNFCCC is committed to reach the year 2021 a deforestation rate "zero" and in the COP20 - 2014, in Iniciative 20 x 20 to rehabilitation a total of 3.2 million of hectárea (2 million with productive plantations and 1.2 million with different systems for protection and conservation). Also at the national level in the framework of the environmental commitments and competitiveness contemplates reducing environmental pollution, degradation and improve competitiveness whereas the sustainable management of forests, conversion of land, agricultural production practices, in order to reduce the risks of loss of quality of the ecosystems and the forest cover in the country.

In this sense, the major challenges to address are:

- Strengthening of institutional capacities to implement actions for the RDA national and sub national.
- The inter-institutional coordination for joint work, in order to ensure the recovery of goods and ecosystem services.
- Raise awareness among the rural population about the risks of inadequate practices of the use of forest resources for the production.
- To strengthen the effective implementation of standards that promote the RDA for the provision of goods and services.
- Strengthen the information and surveillance and control systems in order to reduce the risk of pressure and bad practices on forest resources and ecosystems.
- Develop the NPRDA participatory and inclusive way and with approach of territory/landscape.
- Channel financing projects of RDA with the participation of the public and private sectors.

III. Lessons Learnt

- With based on the successful experiences of rehabilitation and restoration produced in the country, studies and research that have been developed, information on the current situation of degraded land must be generated in order to define strategies to boost the recovery of areas degraded in the country
- The analysis of the dimensions social, economic and environmental, establish the objective, the types of intervention and economic benefits, in order to ensure the sustainability of the project should be to develop strategies of RDA.
- An important component to define RDA strategies are related to the generation of cartographic information, therefore be should standardize systems and methodologies of mapping information to facilitate the mapping of areas intervened with

restoration/rehabilitation projects, as well as, the national map of potential areas for recovery.

- Strengthen inter-institutional coordination process. Achieving the active participation of stakeholders in the public and private sectors, in order to create synergies for the generation of information and to reduce the risk of overlap of information or execution of actions.
- Design and develop, in conjunction with stakeholders from different levels of Government, the NPRDAin order to ensure the proper implementation of the programme, its monitoring and sustainability.

3.1. Advances for the RDA in Peru

- The date has been systematizing 103 experiences of recovery of degraded areas in the country, of which 37 % were developed in the Sierra, 31% in the Amazon and equal percentage on the Coast. On the Coast, where in addition to reporting degradation by loss of forest cover and soil erosion, increase of salinity in the soil is reported by bad farming practices.
- The mapping of land degraded at the national level has been developing. The country currently has information on deforested areas, but not of degraded areas, whose surface may be higher if you include forests degraded by selective removal of forest species, caused by the illegal felling of timber.
- PNRAD-Peru is being developed. Multisectoral and inter-agency groups with participation of public and private sector have been formed. A second stage will be the presentation of information and working together with communities and organizations to complement the information and having a preliminary document.
- It has the National Forest and Wildlife System (SINAFOR), led by the SERFOR, which articulates all the institutions involved in forest management, reviews, evaluates and approves, plans, programmes, projects and strategies related to forest management and wildlife. The SINAFOR will review and approve, in the first instance, the PNRAD-Peru.
- It comes to strengthen institutional capacities (through workshops, meetings, training, etc.), at all levels of Government, in order to achieve effective participation in the process of elaboration of the PNRAD-Peru.
- There are the national program of forest plantations, which promotes the registration and establishment of 2 million of has commercial plantations and the Competitiveness Agenda that promotes the establishment of 800 thousand hectares.

IV. The Way Forward

- Strengthening the process of articulation for the elaboration of the NPRDA in the country, in order to ensure the proper implementation of the various actions.
- Strengthening institutional capacities for the generation of information (concepts, maps, methodologies, identification of typology of degraded áreas, financing, etc.), allowing to

adequately determine the strategies of intervention of the programme, its monitoring and ensuring sustainability.

- Strengthen relationships with international cooperation to achieve support for the proper implementation of agreements and international commitments undertaken by Peru in terms of RDA, conservation of biodiversity and climate change.
- Continue with the task of exploring new alternatives for financing through investors and multilateral banks, at the national and international levels, in order to support the development of initiatives for recovery of degraded lands are in portfolio.
- Continue and strengthen the process of regulation and implementation of standards involving the management for the RDA in order to ensure the success of the implementation of the measures and funding for RAD projects nationwide.

V. Summary

- In the Peru experiences in RDA with the participation of small producers have been developed. The development of these experiences were supported by public and private sector institutions, as well as international cooperation, for the purpose of research or intervention models; However, despite these initiatives, the deforestation and continued land degradation on the rise. The area deforested to the year 2015 is estimated that 9 million of ha, with a 120,000 average deforestation rate has / year.
- In recent years, with the implementation effect of the Forestry and Wildlife Law and its regulations, as well as agreements and international commitments, the RDA have emphasized relieved. Peru, in the COP20, within the framework of the UNFCCC and the Initiative 20x20 agreements, committed to restauration of 3.2 million hectares of degraded lands by the year 2020, with forest plantations and management of native forests for the protection and conservation of watersheds and the generation of environmental services. The new legal framework engages the participation of public and private sector in the promotion and execution of programs, projects, or strategies that help restore forests and ecosystems in order to restore the generation of goods and services provided.
- The MINAGRI (through the SERFOR) and the MINAM (through the PNCBMCC), are the institutions that have the greatest responsibility in the recovery of areas degraded in the country and work in a coordinated and articulated way. Both sectors have been developing programmes and projects that have components of rehabilitation/restoration of forests and landscapes, according to their duties and powers.
- Policy instruments, regulations, national plans and programmes, which support actions for the RAD in the country have been designed. Likewise, with the participation of other sectors, and the support of the SINAFOR (joint forest management space) is developing the NPRDA, involving the participation of regional and local governments and international cooperation. The development process of the program contemplates, inter alia, the diagnosis of the factors social, economic, environmental and policy, as well as

the definition of intervention strategies, guidelines, the monitoring and evaluation in order to ensure the success of your implementation.

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The Philippine National Greening Program

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Abstract: Forest cover in the Philippines decreased by 328,682 hectares i.e. from 7,168,400 ha in 2003 to 6,839,718 ha in 2010 or an annual forest cover loss of 46,954 hectares. This is despite of government effort of massive reforestation in 1986 that start with the National Forestation Program that targeted to reforest 1.4 million hectares by year 2000. This is aside from various reforestation initiatives of the government years ago. The main causes of deforestation and land degradation include intensive logging over decades, upland migration, agricultural expansion, development policy failures, and inequitable land distribution. Under National Forestation Program, traditional methods of reforestation gave way to contract reforestation by families, communities, corporations, academic institutions, NGOs and LGUs. Results have been mixed with some promising cases and others not quite so in each of the approaches, depending on the circumstances. Also in general, some approaches such as private tree farming have been more popular and rapidly adopted than others. Ensuring long-term sustainability appears to be one of the biggest challenges facing many of the initiatives. Most evaluation is based on target areas and survival rates of plantings, and often little is known about the environmental and socio-economic impacts and the aspects of good governance.

Introduction

The Philippines is an archipelago comprising of 7,100 islands. Its land area covers 29,940,400 hectares of which 15,868,412 hectares are forest land making up 53 % of the entire land area. The other 47% or 14,017, 988 cover the alienable and disposable land.

Based on 2010 National Mapping and Resource Information Authority which is an attached agency of the Department of Environment and Natural Resources that provides mapping services to the public, there are only about 6.84 million hectares of remaining forest cover in the country or 23 % of the total land area. The remaining 77% or 23.10 million hectares are considered non-forests.

Philippine forest cover decreased by 328,682 ha i.e. from 7,168,400 ha in 2003 to 6,839,718 ha in 2010 or an annual forest cover loss of 46,954 hectares. On the other hand, the total area reforested in the past 50 years (1961-2010) is only 1,939,749 hectares or an annual average of 38,795 hectares

As a forest policy, the constitution of the Philippines provides the over-all framework for the management and development of the forest resources of the country. Section 2 of article XII of the 1987 Constitution provides that the exploration, development and utilization of natural resources shall be under the full control of the State. It further provides that the State may directly undertake such activities or enter into co-production, joint venture or production sharing agreement with Filipino citizens or corporations or associations at least sixty percent of which is owned by Filipinos (Nera, 1996).

The Philippines enacted the Revised Forestry Reform Code of 1975 by virtue of Presidential Decree No. 705. It provided the policies for multiple use of forest land, land classification and survey, rational wood processing and forest protection, development and rehabilitation. Up to the present PD 705 remains the bible in forestry.

First formal rehabilitation efforts in the Philippines can be traced back to reforestation by students of the campus of the University of Philippines at Los Banos in 1910. This was followed by numerous Government-initiated projects that involved the planting of trees to reforest denuded areas. By 1973, there were 91 government reforestation projects (46 in Luzon, 31 in Visayas and 14 in Mindanao) with reforestation funds derived from timber concessions. Some private companies (such as Paper Industries Corporation of the Philippines PICOP and Provident Tree Farms) reforested via tree plantations within their concession areas.

The 1970s saw the birth of social/community forestry with programs such as Forest Occupancy Management (1971), the Family Approach to Reforestation (1971), Communal Tree Farm (1974), and the Integrated Social Forestry Program (1982). From the late 1970s-80s, there were numerous community forestry initiatives funded by agencies such as USAID, the World Bank, Ford Foundation and GTZ. There was also major NGO pioneering work on agroforestry and agriculture. In 1986, a 14-year National Forestation Program was launched with a target area of 1.4 M ha to be reforested by 2000. This program was given a boost by the ADB/OECF loan for $240 M in 1988 for what became the Forestry Sector Project. Under this project, traditional methods of reforestation gave way to contract reforestation by families, communities, corporations, academic institutions, NGOs and LGUs. It also included watershed rehabilitation and encouragement of industrial reforestation through new agreements (cifor, 2003)

The 1990s continued to see numerous community-based and integrated development projects funded by ADB, JBIC, World Bank, ITTO, FAO, KFW and others; and executed by the state, NGOs, LGUs, and people's organizations. Community based forest management through different types of tenurial instruments was adopted as the national strategy for reversing the destruction of Philippine's remaining natural forests and for rehabilitating degraded lands. Besides social and community forestry, reforestation activities have also included large-scale government and industrial plantations and private tree farming. The latter has cropped up spontaneously in response to market demand, particularly in Mindanao, Luzon, and Cebu. It has been suggested that private land reforestation in the last decades may have actually led to increased forest cover in places (cifor, 2003). However, these efforts are not enough. With an average of 38,000 hectares reforestation accomplishment per year, it would take 210 years to

reforest/rehabilitate the eight million hectares of unproductive, open, denuded or degraded areas.

Thus, in February 24, 2011 President of the Republic of the Philippines, Benigno S. Aquino signed and issued Executive Order No. 26 which saw the birth of the National Greening Program (NGP). The National Greening Program shall plant some 1.5 Billion trees covering about 1.5 Million hectares for a period of six (6) years from 2011 to 2016 or an average of 250,000 hectares per year needing 250 million seedlings per year. Its beyond reforestation with the following missions: (1) poverty reduction, (2) food security, (3)bio-diversity conservation, (4) environmental stability and (5) climate change mitigation and adaptation. Among the NGP coverage are open, degraded and open-denuded lands, protected areas and mangroves, ancestral domains, civil and military reservations, urban areas under the greening plan of local government units, inactive and abandoned mining sites.

So far NGP accomplishments are very encouraging as far as area planted is concerned. From CY 2011 until December 2015, the total area planted was 1,352,147 hectares out of the target of 1,200,000 hectares for a 113 % accomplishment. From 2011 – 2014, the program generated a total of 2,262,556 jobs and employed a total of 320,220 persons.

Accomplishments in Area Planted (ha) CY 2011 – CY 2015

2011		2012		2013		2014		2015		TOTAL	
Target	Accomp.	Target	Accomp.	Target	Accomp.	Target	Accomp	Target	Accomp.	Target	Accomp.
100,000	128,558 (129%)	200,000	221,763 (110%)	300,000	333,161 (111%)	300,000	334,302 (111%)	300,000	334,364 (111%)	1,200,000	1,352,147 (113%)

Key Elements Relating to the Case Study

With the issuance of Executive Order No. 26 by the President of the Republic of the Philippines declaring the implementation of National Greening Program, it works under a National Convergence Initiatives (NCI) composed of the Department of Environment and Natural Resources (DENR), the Department of Agriculture (DA) and the Department of Agrarian Reform (DAR) per Memorandum Circular No. 1 series 2010 in collaboration with all government agencies, local government units (LGUs), people's organizations (POs), non-government agencies (NGOs), and in partnership with the private sector and civil society.

In order to ensure the successful implementation of the NGP, partner agencies/stakeholders shall have the following responsibilities.

DA-DAR-DENR

- Nursery establishment and seedling production
- Site identification and site preparation
- Social Mobilization
- Tree planting
- Monitoring and evaluation

- Technical support and extension services
- Provision of certified seeds of agronomic crops
- Provision of access roads and trails to planting site
- Provision of post harvest and processing facilities
- Technical assistance in project development and marketing

Department of Education (DepEd)/Commission on Higher Education (CHED)

- Student mobilization
- Nursery establishment, seedling production and tree planting
- Information, Education and communication
- Provision of Extension services
- Monitoring and evaluation

Department of Social Welfare and Development (DSWD)

- Provision of Conditional cash transfer to NGP beneficiaries
- Social mobilization

Department of Budget and Management

- Allocation of funds for all activities of the NGP

Department on Interior and Local Government (DILG)

- Provision of transportation, security, and fire protection amenities
- Information, Education and Communication

Local Government Units (LGUs)

- Establishment of nurseries and production of planting materials
- Development of greening plan for urban and suburban areas
- Lead the establishment of communal tree farms for firewood and other domestic uses
- Construction of access roads and trails to the planting sites
- Provision of medical support
- Technical assistance and extension services

Department of Health (DOH)

- Provision of transportation and medical support

Department of Public Works and Highways (DPWH)

- Provision of transportation in the hauling of seedlings and volunteer planters
- Assistance in the construction of access roads and trails to the plantings sites

Department of Transportation and Communications (DOTC)

- Provision of transport to participants
- Provision of communication facilities

Department of National Defense (DND)

- Nursery establishment and seedling production
- Site preparation
- Provision of transportation support
- Provision of security

Department of Science and Technology (DOST)

- Development and transfer of appropriate technologies
- Information, Education and Communication

Department of Justice (DOJ)

- Nursery establishment and production of planting materials
- Provision of transportation

National Commission on Indigenous Peoples (NCIP)

- Mobilization of participation on Indigenous Peoples
- Identification of sites for NGP inside ancestral domains
- Supervision of forest protection activities inside ancestral domains

Technical Education and Skills Development Authority (TESDA)

- Technical assistance in products development

Philippine Amusement and Gaming Corporation (PAGCOR)

- Provision of funds for seeding production and other related activities of the NGP

The program has various strategic differences wherein available science and technology were maximized. Among these are Identifying target areas and inputs; ensuring seed & seedling quality; optimizing land use; cloning of seedlings and use of organic/microbial fertilizers (e.g., Mykovam, Mykogroe).

The introduction of quality planting materials like cloned seedlings in forest rehabilitation under NGP leads the DENR in the establishment of several clonal facilities in the country not only in its field offices but also tapped State Universities and Colleges as partner in the production of such quality planting materials. The said state universities and colleges were

given funds to build state of the art clonal facilities for them to produce cloned seedlings and planted in identified NGP sites. So far there are 21 clonal facilities established and maintained by the DENR while State Universities and Colleges have 26 facilities. To further boost the production of quality planting materials, another state of the art nursery were constructed, also in DENR field offices, the mechanized nursery. There are 13 mechanized nurseries to be established in the country. Of these, five have already been constructed and ready to be operationalized and the remaining eight are under construction.

On funding mechanisms, funds needed for the implementation of the NGP were provided by the Department of Budget and Management and succeeding funding for this program has been incorporated in the regular appropriation of participating agencies.

Forest restoration in the Philippines got a big leap from the NGP. Five years ago the average annual rehabilitation effort in terms of area planted was only 30,000 hectares. However, from 2011 which is the start of NGP to December 2015, the total area planted was 1,352,147 hectares out of the target of 1,200,000 hectares for a 113 % accomplishment or an average of 270,429 hectares per year. From 2011 – 2014, the program generated a total of 2,262,556 jobs and employed a total of 320,220 persons.

Ensuring long-term sustainability appears to be one of the biggest challenges. The NGP approaches provide a valuable opportunity to learn some important lessons for guiding future rehabilitation efforts in the Philippines. This is coupled with the issuance of Executive Order No. 193 in November 2015, expanding the coverage of National Greening Program. The Philippines has still an estimated 7.1 million unproductive, denuded and degraded forestlands which contribute to environment-related risks such as soil erosion, landslides, and flooding. In order to accelerate the rehabilitation and reforestation of these unproductive, denuded and degraded areas, the participation and investment of the private sector with a view towards enabling private companies to achieve carbon neutrality and consistent with the updated Master Plan for Forestry Development (2016 - 2028). there is a need to harmonize all forest development activities that will encourage and enhance development of forest plantations including forest parks, with greater participation of the private sector, local government units and organized upland' communities.

Lessons Learned

When the National Greening Program was launched in 2011 the success or performance indicators identified and wanted to achieve are the following:

Human Development

- Food Security (including water supply security)
- Poverty Reduction
- Economic Empowerment
- Environmental Stewardship

Economic

- Increased and sustainable supply of forest based raw materials
- Increased productivity of idle lands
- Increased Economic activity in the uplands
- Optimized utilization of upland resources

Environmental

- Productivity and Stability
- Climate Change Mitigation and Adaptation
- Biodiversity Conservation

Five years after the launching of the program, encouraging and significant result has been achieved as to poverty reduction, food security, environmental and economic empowerment although not in a large scale considering that five years is not enough to have big changes or expect impacts. However, with the 1,352,147 hectares area planted as of 2015, we could say that the program is on the right path. With the huge accomplishment in area planted, biodiversity conservation is next to come because these forests would be home for different animals and plant species and will continue to increase. Not to mention of course is that these man-made forests would mitigate the impact of climate change. Productivity and stability also follows that it is not only on major forest products but also on non-wood forest products. In terms of poverty reduction, NGP has made its role although in a short term. The program generated a total of 2,262,556 jobs and employed a total of 320,220 persons. If the program would be sustained and productive, there would be permanent jobs and employment will continue to increase then economic stability is not far behind.

The Way Forward

The DENR is inculcating to its field offices and officials to pursue the good governance. It requires its field offices such measures that will prove that rehabilitation efforts in their respected areas are truly being done and followed what are being asked from them. Below are the measures that the DENR had required its field offices to follow:

Measures for National Greening Program

- All areas for rehabilitation and management should make use of global positioning system (GPS) in conducting surveys and have these surveys produced a geographical information system (GIS) generated map. Geographic Information Systems store information using spatial indices that make it possible to identify the features located in any arbitrary region of a map. For example, a GIS can quickly identify and map all of the locations within a specified radius of a point, or all of the streets that run through a territory.
- All program sites should be geo-tagged.
- Web based access to NGP coded maps and geo-tagged photos

- Map coding of all NGP sites in accordance to Philippine Standard Geographic Code (PSGC) accessible through the NGP web site (www.ngp.denr.gov.ph)
- Submission of Certificate of Site Development
- Reports are subscribed and sworn to (under oath)
- Regular monitoring
- Partnership with People's Civil Society Organizations
- Checkless transactions (Advise to Debit Account – ADA)
- Compliant to Procurement Law

The Philippines will also adopt a landscape approach for rehabilitation and there are at least 7 prescriptive strategies that are being recommended to substantiate the Forest and Landscape Restoration (FLR) approach that is anchored on integrated management of watershed-ecosystems in the country. One of these strategies is to make the National Greening Program as the National Operational Framework of FLR (Guiang and Aragon, 2014).

The DENR National Greening Program has all the necessary components for forest and landscape restoration that target major river basins, watersheds, protected areas, ancestral domains, and coastal and mangrove areas in collaboration with several agencies and sectors. This program, however, focuses rehabilitation efforts in the degraded and denuded areas of those under the "other wooded lands" category. NGP's commodity road map targets the reforestation and rehabilitation of at least 1.5 million hectares by 2016. To meet the FLR conditions, the NGP has to:

- strengthen its focus of rehabilitation efforts with respect to priority watersheds and protected areas in each region that have the potential to increase the resiliency of ecosystems, communities, and livelihood systems;
- consider the comparative advantage of each watershed-ecosystem as basis in formulating strategies and setting targets for investments either in protecting the remaining natural forests, conserving highly diverse areas and habitats, or restoring degraded cover with the concerned LGUs and through the different land and resource managements;
- enter into more long-term maintenance and management arrangements of planted areas outside its tenure or domain with LGUs and civil society groups;
- strengthen tenure and resource use rights of communities especially for high value fast growing hardwoods;
- explore win-win joint venture arrangements with IFMA holders for the development and management of their areas with partial NGP support;
- formally enlist the NGP sites as part of the government's commitments to the implementation of REDD+ in the Philippines;

- transition into output- and outcome-based monitoring and evaluation system and link the outputs with the performance of governance-designated units with RAAs (DENR field units, LGUs, resource management units) for restoration; and
- enter into formal arrangement with NCIP for the joint restoration of degraded areas in the ancestral domains of IPs especially in priority watersheds and protected areas.

Summary

In the Philippines, strategies for forest restoration have evolved over time – with a mixture of objectives, institutional arrangements, and technical approaches (Guiang and Aragon, 2014). With the implementation of the National Greening Program that started in 2011, one important lesson that we experienced is the value of partnership among various partner implementers and stakeholders. Without their true commitment in the program, NGP would not be to achieve its goals as far as area planted and of course the jobs it created as well as employment. The program boost partnership agreement with upland stakeholders in particular, to not only rehabilitate degraded forest ecosystems, but also to provide opportunities for livelihood and community empowerment.

Another important lesson learned that have been documented are in terms of field implementation of the program despite numerous memorandum and policies issued. During the early years of the program, one issue that was identified is delays in budget release that significantly affect the implementation of project activities, most especially the right timing of planting to ensure growth of the seedlings planted. Timing is very important in forest rehabilitation projects. The ultimate goal is not just planting, but it is more of growing what is planted. The right time to plant is during the rainy season. It is therefore necessary that budget is released on time.

One lesson learned that made NGP a credible program is the policy/measures that the DENR asked its field offices to comply such as submission of Certificate of Site Development and reports should be subscribed and sworn to (under oath). The one strike policy which the DENR Undersecretary for Field Operations had issued to DENR field officers somewhat become a challenge to them to work hard and be honest in what they are doing because once the field officers caught lying, he may lose his job.

The conditions for success of a national forest landscape restoration strategy in the Philippines must consider the dominance of highly diverse watershed landscapes, highly threatened and fragmented remaining natural forests, upland poverty, increasing demand for wood and fuelwood/charcoal products, uncontrolled population growth, high vulnerability to erratic and extreme weather conditions, and complex forest governance system at the local, provincial, regional, and national levels in order to meet international commitments (Guiang and Aragon, 2014).

Forest Rehabilitation and Management – an Overview of Sri Lankan Context

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Abstract: Forest rehabilitation and management is essential to Sri Lanka since it has lost a considerable amount of forests even from the colonial era. As a biodiversity rich island conservation is critical as a country which is passing a rapid development phase after the thirty year war. According to the deforestation and forest degradation driver study completed by UN REDD+ program encroachments, development projects, agricultural ventures and illicit fillings are the main drivers of forest degradation and deforestation. Hence the effect of these drivers will enhance with the development since three of them are directly related to the modern development. Therefore as a country there will not be much chance of enhancing the forest area by converting bare lands to forested landscapes. As an island reputed of biodiversity hotspot rehabilitation and management of remaining forested landscape is the most appropriate strategy to ensure the well-being of the healthy ecosystems. Consequently the critical sites have to be identified accurately which have been already degraded and most suitable solution have to be worked out through a forest rehabilitation process in order to make the eco system up to original context. Multi Stake Holder landscape approach may use with the help of each stakeholder to rehabilitate and manage the remaining forests while Forest Department leading the way.

Introduction

Rehabilitation can be defined as "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. On the other hand Forest management is a branch of forestry concerned with overall administrative, economic, legal, and social aspects, as well as scientific and technical aspects, such as silviculture, protection, and forest regulation. Management Functions what we are dealing with conventional management, namely Planning, Organizing, Leading and Controlling are also linked and inter related with forest management. Forest Management Plan is a sight specific tool which has already been used by Sri Lanka Forest Department.

All natural forests in the country are set apart for the conservation of soil, water and biodiversity and no extraction of timber is taking place since the moratorium of logging in

natural forests imposed in 1990. All natural forests as well as forest plantations are currently managed using the Forest Management Plans prepared based on the following set of principles on Sustainable Forest Management.

Extent of forest resources

Biological diversity

Forest health and vitality

Productive functions of forest resources

Protective functions of forest resources

Socio-economic functions

Legal, policy and institutional framework

When considering the field level forest management, each declared area under the Forest Ordinance should poses a significant management plan. Management plans are prepared at the Forest Range level and a baseline is defined for above criteria in respect of each forest against which the monitoring is carried out to ensure that the forest resources are managed sustainably. In addition, the Forest Department has a manual named "Forest Department Manual" which spells out the procedures and guidelines for silvicultural management of natural forests and forest plantations. The Forest Department officers are expected to follow the guidelines provided in this manual for forest management operations.

Importance of Forest Rehabilitation and Management

Deforestation and forest degradation has now become a global issue which may result various adverse effects on world economy, climate, culture and other aspects also. According to the literature global gross annual deforestation rate is estimated as 13.5 million Ha per annum. Even though FAO has announced that the deforestation rate is estimated as 12.3 million Ha per year approximately, net forest cover increased in non-tropics is estimated as 2.9 million Ha per annum. Therefore the net annual global deforestation has estimated to 9.4 million ha per annum. The final results of above estimated deforestation rate is not be a surprised since a lot of researches and studies are already being carried out to asses and find the mitigation measures. Forest rehabilitation and management is one of the key strategies that have been identified to fight against the shrinking of forest in both quantity and quality wise.

When concentrating on Sri Lankan context the natural forest cover has been decreasing over last century continuously at a diminishing rate. The annual deforestation rate from 1999 to 2010 is 0.23%, whereas it was 0.76% from 1992 to 1999. The major causes of deforestation in Sri Lanka include, planned conversion of forest lands into non forest land uses, slash and burn agriculture, illegal encroachments, forest fires, cattle grazing etc. In addition, forest areas are being degraded by causes such as illegal felling, forest fragmentation, forests fire, cattle damage etc.

Past Experiences and Changes of Forest Cover Over the Time

According to the available data there was a 46% of estimated forest cover in 1950 which has reduced in an increasing rate up to 1980 and resulting approximately a 27% of dense forest cover. Forest administration runs even up to significantly prosperous King's Era where the special officers were assigned to carry out the forest related duties called Kele Korala in local language means Forest Officer. According to the ancient manifestos of Sri Lanka, rulers have identified the most appropriate land use pattern by considering almost all scientific criteria such as rain fall, soil type, geography, and other parameters. Well planned civilization was taken place along the fertile valleys of law lands keeping the sensitive highlands untouched. But with the invasions faced with time the capital and the civilization has shifted towards the south east area of the Island including the Central Highlands.

Even though the civilization has shifted toward sensitive areas traditional knowledge and the value systems make people responsible to live and utilize the resources sustainably. Irrigated agriculture in a "Cascade System" and well-structured home gardens make them less dependence on natural forests and sensitive forested landscapes.

The unfortunate continuous invasion started in 1505 by Portuguese, Dutch and English respectively up to 1948 kept the island as their colonial property and introduced the plantations such as Coffee, Rubber and Tea by clearing the sensitive and fragile forested landscapes including the central highlands. It has been estimated that the loss of forest cover during the colonial period as 30 – 40% of total land area.

Selective felling of trees has practiced up to about 1980s even in the sensitive and significantly important rain forest located in the south west region of the country. Traditional farming systems, irrigation systems (Cascade System) and home gardens are highly linked with Buddhist culture and social value systems which always motivate the protection and conservation of sensitive eco systems and landscapes.

Present Situation and Status of Forests in Sri Lanka

Approximately 60 percent of the forest area of the country is managed by the Forest Department while the majority of the balance area is managed by the Department of Wildlife Conservation. All forest areas belonging to the Department of Wildlife Conservation have been declared under Flora and Fauna Protection Ordinance. However, approximately 30% of the Forest Department managed forests are yet to be declared as protected areas. Forest cover at present will be estimated soon by the Sri Lanka forest department and the forest cover data that have already been published in 2010 are described in following paragraphs.

History of Forest Cover Estimation in Sri Lanka

Despite some widely quoted forest cover figures from the late 19th century, the first systematic forest cover assessment based on spatial data in Sri Lanka was carried out in 1956. The first forest cover map was prepared in 1956 by Hunting Survey Inc. of Canada which conducted an island-wide reconnaissance mapping of land use and forest cover using aerial photographs. Maps produced by this exercise were published in the early 1960s, at the scale

of 1:31,680 (two inches to one mile). The Centre for Remote Sensing (CRS) of the Survey Department produced a series of land use maps for the whole island at a scale of 1; 100,000 from the late 1970s and early 1980s based on satellite imagery. Landsat images were used as a base on to which land-use information derived from the interpretation of aerial photographs of various dates was transferred. The technical support for this project was provided by the Swiss CRS. A national forest inventory was carried out between 1983 and 1986 by the FD with the assistance of FAO. This project was based mainly on interpretation of 1983 aerial photographs. It used data from successive inventories to assess general changes in forest areas. Even though it planned for a detailed appraisal of deforestation based on aerial photographs of 1:20,000 scale, it was not conducted for the whole country due to delays in photograph flying. This effort used the forestry and land use classification in the CRS maps. The Mahaweli Authority of Sri Lanka (MASL) produced land-use maps at a scale of 1:10,000 since 1989 under the Forest/Land Use Mapping Project (FORLUMP). Unlike previous projects which covered the entire island, these maps only covered the Upper Mahaweli Catchment (UMC) area. They were based on 1987 aerial photos (1:15,000) using 1:10,000 scale topographic bases prepared by the Survey Department. Detailed and extensive field checking of the sample areas were carried out. The British Overseas Development Administration (ODA) provided funding channeled through FORLUMP and Forest Management and Plantation Project (FORMP) enabling the establishment of a remote sensing unit in the FD. The aim of this unit was to prepare new maps on forest cover using satellite remote sensing techniques, building up the national forest geographic information system (NFGIS). A generalized map of the forest cover was prepared in 1992 and it was compared with the national forest inventory (1983) supported by the FAO to assess the forest cover changes that have taken place between 1983 and 1992. It revealed that closed canopy forest cover had decreased by about 10% during this period. A majority of this loss came from dry zone, mainly due to large scale irrigation projects implemented during this period. The FD has produced subsequent forest cover assessments in 1999 and 2010. The three maps produced by the FD in 1992, 1999 and 2010 provided the basis for spatial analysis of this study. 32 3.3.2 Assessment of spatial and land use changes Assessment of spatial and land use changes associated with major drivers of deforestation helped

Forest Cover Data Published in 2010 by Forest Department Sri Lanka

Sri Lanka has a land area of 6,561,000 hectares and according to the forest cover assessment made in 2010, country has a total of 1,951,473 hectares of natural forests covering 29.7 % of land area. In addition there are about 75,000 hectares of Forest Plantations comprising of Teak, Mahogany, Eucalyptus, Pine and other local species which accounted for nearly 1% of the land area. Rubber and Coconut Plantations and other agro-forestry systems such as home gardens, which cover approximately another 20% of the land area, were not considered as forests in this assessment.

IRS satellite images (spatial resolution of 23.5 m) were used as primary source of data for this assessment and forest cover classification was done by visual image interpretation and subsequent on-screen digitizing in ArcGIS. Forest patches were further verified by ground

observations and comparison with ancillary data such as Google images and ground surveyed maps. Elevation and rainfall data were used in the classification of forests into different forest types. 92 primary forest cover maps were created in the scale of 1:50,000 covering the whole island.

Extents of Forests by Forest Cover Classes

Forest Cover Class	Extent (Ha)	Percentage (%)
Dense Forests (>40% canopy cover)	1,438,275	21.9
Open and Sparse Forests(10-40% canopy cover)	429,484	6.5
Mangrove Forests	15,670	0.2
Savannah	68,044	1.0
Total for Natural Forests	**1,951,473**	**29.7**
Marshes	3,254	0.1
Shrubs and Grasslands	342,934	5.3

Extents of Forests by Forest Types

Forest Type	Extent (Ha)	Percentage (%)
Lowland rain forests	123,302	1.9
Moist Monsoon forests	117,885	1.8
Dry Monsoon Forests	1,121,392	17.1
Montane Forests	44,758	0.7
Sub-Montane Forests	28,513	0.4
Riverine Dry Forests	2,425	0.0
Mangrove Forests	15,670	0.2
Savannah Forests	68,044	1.0
Open and Sparse Forests	429,484	6.5
Total	**1,951,473**	**29.7**

Extents of Forest Cover Classes by Districts

District	Total Area of the District* (ha)	Dense Forests (ha)	Open and Sparse Forests (ha)	Mangrove (ha)	Savannah (ha)	Total Forests (ha)	Forest Cover Percentage of the District (%)
Ampara	441,500	115,782	31,744	618	2,965	151,109	34.2
Anuradhapura	717,900	173,387	85,006	-	-	258,393	36.0
Badulla	286,100	24,522	28,086	-	16,240	68,848	24.1
Batticaloa	285,400	23,436	24,960	2,071	-	50,467	17.7
Colombo	69,900	1,736	276	-	-	2,012	2.9
Galle	165,200	19,466	1,438	406	-	21,310	12.9
Gampaha	138,700	340	1,257	634	-	2,231	1.6
Hambanthota	260,900	32,290	24,912	692	-	57,894	22.2

Jaffna	102,500	1,383	959	2,505	-	4,847	4.7
Kalutara	159,800	15,752	1,760	75	-	17,587	11.0
Kandy	194,000	28,022	9,413	-	-	37,435	19.3
Kagalle	169,300	12,872	2,576	-	-	15,448	9.1
Kilinochchi	127,900	31,292	4,883	1,885	-	38,060	29.8
Kurunegala	481,600	7,873	13,845	-	-	21,718	4.5
Mannar	199,600	106,958	17,799	1,351	-	126,108	63.2
Matale	199,300	60,711	11,797	-	-	72,508	36.4
Matara	128,300	19,259	696	39	-	19,994	15.6
Moneragala	563,900	141,329	37,828	-	45,535	224,692	39.8
Mullativu	261,700	155,403	14,978	1,041	-	171,422	65.5
Nuwara eliya	174,100	40,026	5,722	-	-	45,748	26.3
Polonnaruwa	329,300	97,491	37,310	-	-	134,801	40.9
Puttlam	307,200	58,283	23,937	1,958	-	84,178	27.4
Ratnapura	327,500	58,317	13,548	-	3,304	75,169	23.0
Trincomalee	272,700	107,960	16,319	2,395	-	126,674	46.5
Vavuniya	196,700	104,385	18,435	-	-	122,820	62.4
Total	**6,561,000**	**1,438,275**	**429,484**	**15,670**	**68,044**	**1,951,473**	**29.7**

Forest Rehabilitation and Management in Sri Lanka

As a key strategy improve the quality and the quantity of forests with respect to a particular place, location, area, state or an identification and analysis of drivers of deforestation and degradation is important. A comprehensive study did by the UN REDD+ program have identified key drivers of deforestation and forest degradation with its underlying drivers, catalysts and inhibitors. Following are the summery of those categories of identified drivers of deforestation and forest degradation.

Current Drivers Identified by the Expert Panel

Encroachments Demand for residential lands is the first driver and followings are the identified underlying drivers.

Global demand for export crops (e.g. tea), Global demand for aquaculture products (e.g. shrimp), Local demand for other field crops (e.g. maize, vegetable), Other purposes (e.g. gem mining)

Following items are identified as the catalysts of above main driver and the underlying drivers

Permissive land laws and policies, Political interference, Limitations in monitoring capacity, Poor coordination among agencies, Population growth, Commercialization of rural economies, Mechanization of agricultural technologies are directly and indirectly support the mechanism of deforestation and forest degradation.

They have also identified some inhibiting factors that discourage the land encroachment and other related underlying drivers namely, forest policies and protected area management, Internal and external migration of the rural labor force, Home gardens, Off-farm employment, Community dependence and customary rights.

Development projects have did a significant amount of deforestation during last ten years especially in the law lands of the Sri Lanka. Demand for land in projects in following areas/sectors caused the main damage to the natural forests, sensitive eco systems and forested landscapes. Irrigation development, urban development, Energy (e.g. hydropower), Resettlement, Tourism, Livelihood development, Roads and highways, Airports, harbors; High voltage transmission lines are identified as main sectors. However the mode of damage, severity and impacts are identical to each development activity. Even though hydro power projects are reputed as eco-friendly projects it has causes serious damages along the very sensitive river and stream basins resulting poor species compositions both in aquatic and shore habitats.

Population growth, Poor coordination among agencies, Political interference are identified as the main catalysts for the deforestation and forest degradation occurs as a result of development projects and its underlying drivers.

Environmental laws and regulations, Forest policies and protected area management, Public pressure and awareness, have identified as the inhibitors of the damage done due to the development projects. Public pressure and awareness are playing a major and interesting role among other inhibitors because they are challenging the project justification basically.

Private agriculture ventures are became more important driver because of the government policy of enhancing agriculture base production. International and local investors are encouraged to invest in Agricultural projects especially after completing the multi – purpose irrigation development projects.

Export and local demand for agricultural products (e.g. cashew, banana), Policy objective of reducing import costs by substituting sugar imports have identified as underlying drivers of deforestation and forest degradation. Since Sri Lanka overcome the war issue in Northern and Eastern provinces, considerable amount of lands have been cleared and open for agriculture related objectives. Indirectly some of the forested landscapes were protected due to the war which created a good buffer to protect from human interventions.

Political patronages, Poor coordination, among agencies, Population growth and Mechanization of agricultural technologies have been identified as the related catalysts of driver “Private agriculture venture”.

Environmental laws and regulations; Forest policies and protected area management; Public pressure and awareness again appears as the common inhibitors of the particular driver.

At last but not least illicit felling has been identified as a main driver of deforestation and forest degradation even though it has been controlled over the time by enforcing the law by Forest Department Sri Lanka.

Local demand for timber and wood products, Households needs and Industrial Infrastructure are the main underlying drivers related with above main driver.

Limitations of monitoring capacity, Political interference and Population growth have been identified as the catalysts while forest policies and protected area management, Home gardens, Migration, Community dependence and customary rights have been identified as inhibitors of deforestation and forest degradation as experienced above.

Strategy of Forest Rehabilitation and Management and Proposed Activities

There are large extents of degraded forest areas in the country. These lands have been subjected to forest fires, slash burn cultivation as well as tea cultivation over the years. The predominant vegetation of these lands is shrubs and grasses. Some of these shrub lands should be maintained as elephant habitats. Excluding such areas there are around 80,000 ha of degraded lands are available to be re-established into forests

The main method of re-establishment of forests in degraded and deforested forest lands is forest restoration. Forest Restoration aims to re-establish the forest which was originally present. The major strategies for the restoration include promotion of natural regeneration (Assisted Natural Regeneration), seed sawing, scattered tree planting, enrichment planting and block planting with local species. The Removal of disturbing and unwanted vegetation that hinder the growth of the immature seedlings, create favorable condition for seed germination and natural regeneration. Prevention of occurring forest fires and cattle trespassing and protection of forests from other human interventions are recommended activities for Assisted Natural Regeneration. These techniques have been practiced and proved successful in many other countries in the region.

Proposed Activities to Achieve the Set Targets of the Forest Rehabilitation and Management

Strategy 1 Conservation and sustainable, management of existing forests:								
Component	Target	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
Survey and Demarcation existing forests								
Conflict Resolution	7500 km	1500	1500	1500	1500	1500		7,500
Forest Survey and preparation of maps	7500 km	1500	1500	1500	1500	1500		7,500
Boundary Posts (No)	337,500	67,500	67,500	67,500	67,500	67,500		337,500
Forest Boundary Demarcation	7500 km	1500	1500	1500	1500	1500		7,500
Preparation of Boundary Schedules	7500 km		1500	1500	1500	1500	1500	7500
Forest Fire Control								

Identification and mapping of strategic locations	24 Maps	12	12					
Awareness programs for general public	600 Nos.	100	100	100	100	100	100	600.0
Formation and up keeping of vigilant groups	200 groups	100	100					200
Providing Fire fighting equipment	200 sets	100	100					200
Establishment and maintenance of Fire lines	1000 km	1000	1000	1000	1000	1000	1000	1000
Development of alternative livelihood for slash and burn farmers	120,000 farmers	20000	20000	20000	20000	20000	20000	120,000
Improvement of cattle management system	12000 farmers	2000	2000	2000	2000	2000	2000	12,000
Strategy 2: Expansion of Forests in to new areas								
Component	Target	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
Restoration of degraded forest	80,000 ha							
Reforestation of highly degraded areas	30,000 ha	5000	6000	6000	6000	4000	3000	30,000
Maintenance of reforested areas	27,000 ha	0	5000	11000	17000	23000	27000	27,000
Forest Restoration	50,000 ha	10000	10000	10000	10000	5000	5000	50,000
Maintenance of restored forests			10000	20000	30000	40000	45000	45,000
Establish forest plantations on private lands	11,000 ha	2000	2000	2000	2000	2000	1000	11,000
Establishment of forests on abandoned estate lands of								
Planting trees	25,000 ha	3000	4000	4000	6000	5000	3000	25,000
Maintenance of forested areas	22,000 ha		3000	7000	11000	14000	15000	22,000
Establishment of rubber plantations	40,000 ha	10000	10000	10000	10000			40,000
Strategy 3: Urban Forestry								
Establishment of urban forests	12,000 ha							
Planting trees	2000	2000	2000	2000	2000	1000	1000	10,000
Maintenance			2000	4000	6000	8000	9000	9,000

Lessons Learnt and Attempts of Forest Rehabilitation and Management in Sri Lanka

Forest Department have recorded a number of success stories of forest rehabilitation and management within the Sri Lanka under the support of government funded and as well as the other funding agent's projects. Forest Department of Sri Lanka has started a natural regeneration assisting project by identifying the degraded lands by using satellite images. The project was funded by government of Sri Lanka directly according to a proposal submitted by Forest Department. However the identification of sites was the most challenging part and had to be verified by the relevant field officers. Plant species and number of plants were decided according to the site, its location, soil type, adjacent landscape and climatic factors.

Amount of plant requirement was established in the forest department nurseries up to about 7 to 9 months. With the on set of North Eastern Monsoon rains plants had been introduced to the particular sites as planned. Field established plants are maintaining for three years with weed controlling and infill planting. Already existing plants in the field are allowed to grow and assisted the survival by allowing the space and removing the mutual competition for resources.

In addition to the above described project Forest Department have been engaged with different agencies by giving the technical assistance and the consultancy. Invasive Alien Species control projects are common all around the Island commenced by the Bio Diversity Secretariat of Sri Lanka. Forest Department has submitted field level proposals for small grants to remove the sites which are invaded with Invasive Alien Species and followed by the rehabilitation and enrichment. A plot of Hurulu International Biosphere Reserve was the best project site among the Island where the removing of Invasive Alien Species and Enrichment taken place. The site was managed by the Forest Department Field Officers who are attached to the Polonnaruwa Division.

On the other hand private sector companies are willing to do forest rehabilitation and managements projects as their Co-operate Social Responsibility projects. Cement manufacturing companies, Financing companies, Banks, Construction companies did numerous small scale forest rehabilitation and management projects during last few years. Since these agencies having their volunteer forces the plant established sites can be maintained successfully.

Maintaining of established plants during the first three years is critical and essential in order to complete a success story. Mutual competition has to manage while protecting the sites form grazers. It was quite challenging since almost all sites are adjacent or within a wild habitat or a landscape.

Summery

Forest rehabilitation and management is much needed management function in Sri Lanka since it consists with significantly sensitive ecosystems and landscapes. Multi Stake Holder landscape approach is the most appropriate and most successful approach of forest

rehabilitation. Issues and challenges cannot be generalized since the sites are significantly different. It does not require highly sophisticated technologies to implement. Monitoring and evaluation is critical as well as the selection criteria of site, plant species and etc.

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Forest Rehabilitation in Sri Lanka: Case Study in Ihala Puliyankulam Degraded Forest in Dry Zone of Sri Lanka

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Abstract: Deforestation and forest degradation are main environmental problems in Sri Lanka. Therefore, the Government of Sri Lanka has set a target to increase the forest cover up to 32% of the land area of the country from the existing 29.7%. Forest restoration and rehabilitation used as a main tool to increase the forest cover. The programme to enhance the forest cover commenced in 2014 and around 8700 ha are under rehabilitation and restoration. Ihala Puliyankulama degraded forest in Ipalogama Reserved Forest in Dry Zone of Sri Lanka is one of the restoration area among them. The area is 70 hectares and the vegetation of the land is predominantly grass with scattered trees and shrubs. Various interventions such as fire protection, removal of grass and other unwanted plants, scattered tree planting, seed sawing and protection of the land from cattle grazing are the main interventions. The land is continuously supervised and monitored. It has been observed the improvement of natural regeneration over two year period. Number of seedlings on the land has been increased remarkably compared to 2014. Suppression of grass and protection of land from fires has played a significant role in forest regeneration. It is a challenge to maintain the restoration process under national and local level external threats. Adequate measures have been taken to overcome them and to replicate this approach in other similar areas of Sri Lanka.

1. Introduction

Main land uses of Sri Lanka are Forests, Home gardens, Paddy, Tea, Rubber, Coconut and other agricultural lands. Forest occupies 29.7% of the total land area of the country according to 2010 estimates (Edrisinghe, et.al). There are three main climatic regions in Sri Lanka and they are Wet Zone, Dry Zone and Intermediate Zone. The mean annual rainfall above 2500mm is considered as Wet Zone and rain fall below 1750mm is categorized as Dry Zone. Mean annual rainfall in intermediate zone is between 1750mm to 2500mm (Survey Department of Sri Lanka). Distribution of the forest cover in Sri Lanka in main climatic regions shows in Figure 1. It shows that majority of the forests concentrated in to the dry zone of the country. In contrast home gardens and rubber plantations are concentrated in to the wet zone. Most of the paddy and other agricultural lands are located in the dry zone.

Forest degradation and deforestation are main environmental problems in Sri Lanka. Annual deforestation rate from 1999 to 2010 was estimated as 0.23% but forest degradation has not

been estimated even though it is taken place continuously at an alarming rate. The deforestation and forest degradation is higher in the dry zone than in the wet zone of Sri Lanka. Planned development activities, encroachments, shifting cultivation, illegal felling, forest fires and cattle damages are main causes of deforestation and forest degradation. As a result, Sri Lanka suffers many environmental problems such as floods, soil erosion, landslides, and siltation of reservoirs and loss of biodiversity. In addition, loss of wildlife habitats becomes a serious problem at present. Human-elephant conflicts, crop damages due to other wild animals such as wild pigs, giant squirrels, porcupines, barking deer, monkeys and peafowl are have affected rural livelihood seriously at present as a result of the habitat degradation. Deforestation and forest degradation contributes to climate change and UNFCC has estimated it contributes to 17% of the CO_2 emissions.

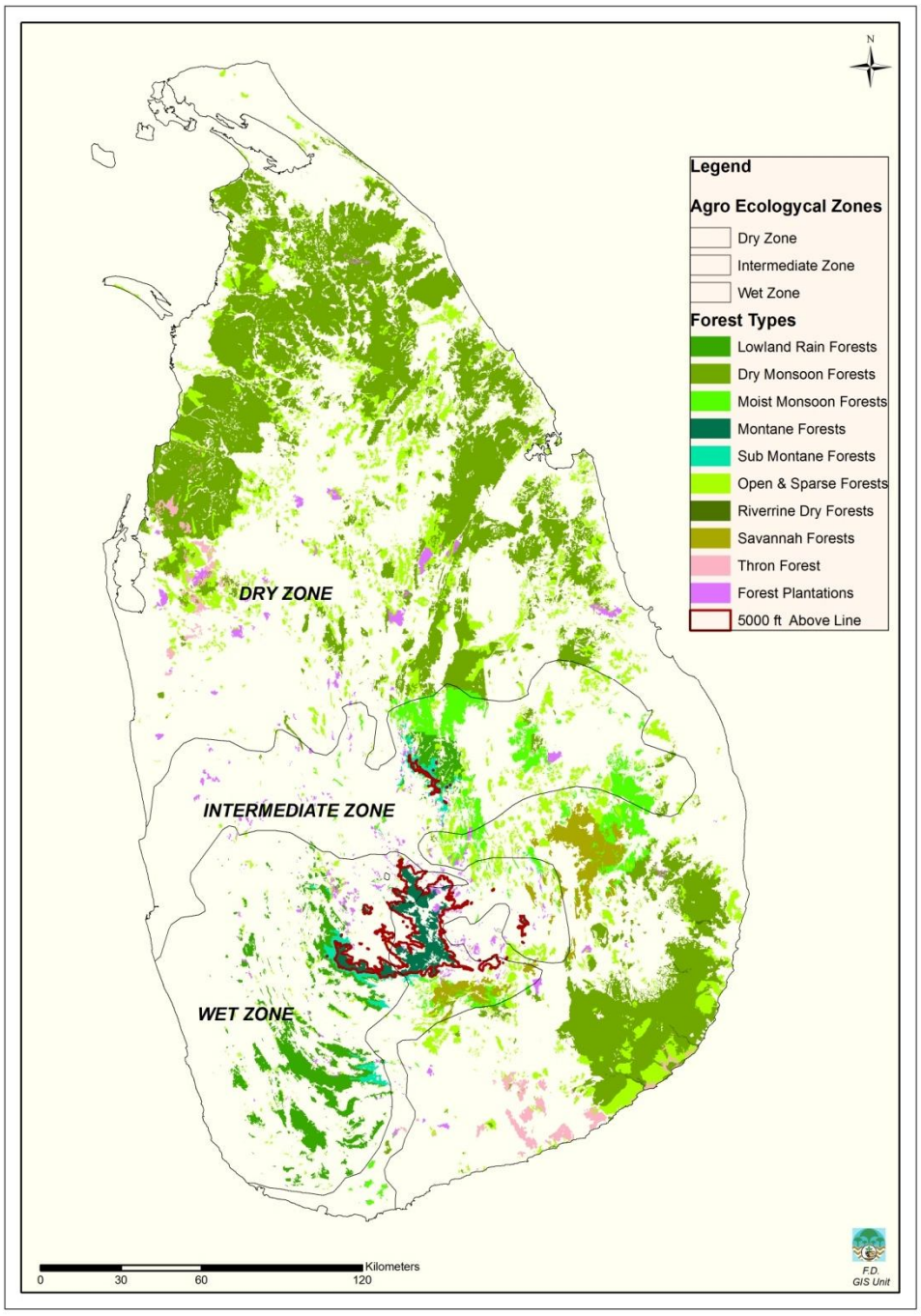

Figure 1. Forest Types of Sri Lanka and Climatic Zones

Therefore, there is a national commitment to protect the existing forest area of the country. Sri Lanka has planned beyond this target and expect to increase the forest cover up to 32% of the total land area of the country.

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 by another 60,000 ha by rehabilitating and restoring of degraded forest lands to achieve the national target of 32% forest cover. Under the forest restoration and rehabilitation programme around 8,700 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. This report describes the experience and lessons learnt in this programme in dry zone of Sri Lanka using a case study of Ihala Puliyankulama Restoration site.

Ihala Puliyankulama degraded forest area which is under restoration programme is located Ipalogama Reserved Forests in Puttalam district. Figure 2 shows the location of the Ipalogama Reserved Forest and Ihala Puliyankulama degraded forest and forest cover distribution of the district. The figure shows the majority of the reserve is degraded. This is due to encroachments and shifting cultivation. There are dense forest, open forests, scrubs and grasslands within the forest. In order to protect forest from further degradation and deforestation, Forest Department surveyed and demarcated the forest boundary in 2004. It eased the monitoring and supervision of the forest hence illegal activities within the Reserved Forests decreased. Farmers did not continue shifting cultivation within the forest after the boundary demarcation.

The area of Ihala Puliyankulama degraded forest is 70 ha and the vegetation is predominantly grass and patches of shrubs. Imperata cylindrica, Panicum maximum and Aristidia setaceae were abundant grass on the land. In addition, Haldina cordifolia and Manilkara hexandra trees were sparsely scattered. Grass species available on the land are highly combustible so that the land was prone to forest fires annually during the dry season. These fires were manmade and originated in adjoining villages due to negligence of the people. In addition, hunters set fires in the forest to trap wild animals. Due to continuous forest fires, natural regeneration was interrupted stopped subsequently grass and few fire resistant trees species were dominated on the land. There are small bushes of large trees which has the potential to grow up to 10-15 m height. Due to continuous fire damages these trees remain as small bushes. This land was selected for forest restoration programme in Puttalam district in 2014.

Ihala Puliyankulama forest land is located around 400m away from Putalam –Trincomalee main road and there are three GN divisions closer the forest. They are Aluthgama, Palugasdamana, Ihala Puliyankulama and the population is 3887 persons. The main occupation of them is farming. Main crop of the area is paddy and farmers grow vegetables and other field crops on uplands. They had practiced shifting cultivation on government lands but at present very few farmers practice it. The discussions with the villages revealed that shifting cultivators have switch over to permanent cultivation on their private lands.

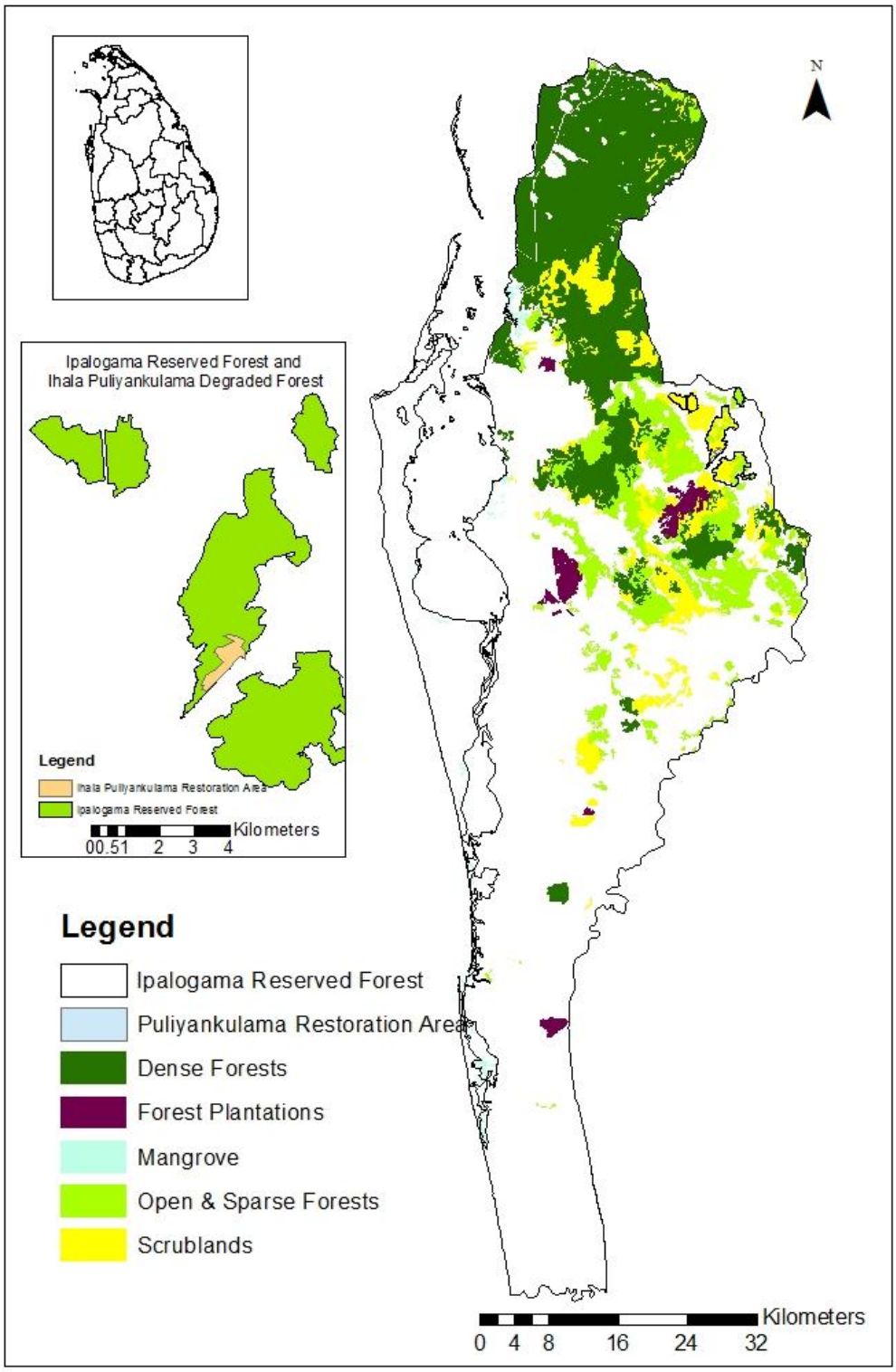

Figure 2: Location of the Ihala Puliyankulama Degraded Forest

2. Objective of The Programme

The overall objective of the national forest restoration and rehabilitation programme is to bring 60,000 ha of degraded forest lands under forest restoration process by the year 2020.

The objective of the restoration programme of Ihalapuliyankulam is to improve the bio diversity, biomass and structure of 70 ha of degraded forest area.

3. Key Elements Relating to the Case Study

3.1 Technical Aspects

The natural regeneration was not taken place on Ihala Puliyankulama degraded forest land mainly due to forest fires so combustible grass becomes prominent. Grass cover suppresses the growth of the seedlings and induces fires so this continues as a vicious cycle. There are different ways to improve this land. 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 3.

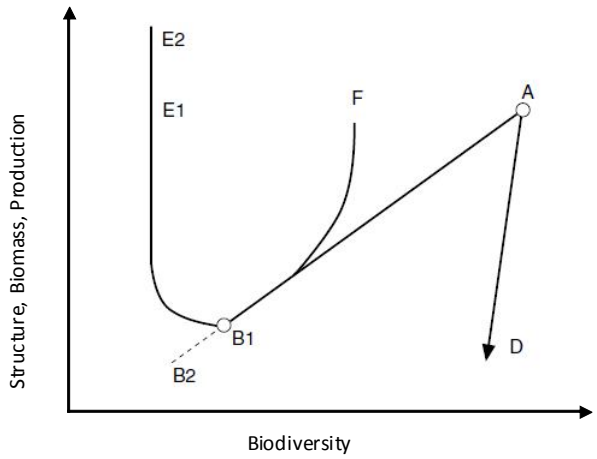

Figure 3. Ecological restoration, rehabilitation and reclamation

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 3).

The rate at which this occurs depends on the speed with which species are able to colonise 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 fertiliser 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).

3.2 Interventions Carried Out in Ihala Puliyankulama Degraded Forest

Ecological Restoration technology was used in Ihala Pulianakulama degraded area and they are describe below.

a. Fire Protection

Fire is the main cause of degradation in this land so intensive fire protection programme was implemented. Places whare 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 4). The length of the fire line is six kilometers. 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 4. 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 5) it suppresses the growth of young seedlings by limiting availability of light, moisture and nutrient to seedlings. In order to control grass we pressed and bent grass on the ground. Since it was not successful we up rooted grass and burnt them. It was successful and Figure 6 shows area where grass was uprooted.

Figure 5. Grass Cover of the land

Figure 6. Grass removed area

c. Rehabilitation of Burnt Trees

Due to seasonal fires, species which have a potential to grow as a large trees become small bushes. These bushes were managed removing unnecessary branches leaving few stumps (Figure 6).

Figure 7. Burnt saplings formed bushes

d. **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.

e. **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.

f. 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.

g. 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 seven samples were taken from Ihala Puliyankulama to establish the baseline and these samples will be revisited and study the species composition after three years from the beginning.

3.3 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. Therefore, Forest Policy of Sri Lanka supports this programme.

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, using 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.

Ihala Piliyankulama degraded forest is vulnerable for development pressure due to above mentioned reasons and its proximity to Puttalam-Trincomalee highway. However, this degraded forest is located within the Ipalogama Reserved Forest therefore the potential threat to the forest is less. In order to aware about forest restoration to general public and interested parties, Forest Department set up a sign board at the boundary of the restoration land (Figure 8).

Figure 8. Sign Board

There is a demand for grazing lands in Sri Lanka to provide food for over one million cattle population in Sri Lanka. More than 90% these cattle are free ranging and the feed on forest lands. Cattle grazing degrade forests since they damage small seedlings and compact the soil. Specially degraded forest lands are requested by cattle farmers to develop grazing lands. Cattle trespassing is an offence according to the forest law so legal action can be taken for owners who send cattle for forest areas. However, it is difficult to control cattle trespassing and enforce law since the number of cattle herd is too large to handle. Therefore, law enforcement is not a practical solution to control cattle damages in forests. According to the Animal act, cattle trespassing in forest is not illegal.

There are three cattle owners around the Ihala Puliyankulama forest area and the size of the herd is around 200. Forest Department has employed a watcher to protect this site from cattle.

3.3.1 Funding

Government of Sri Lanka funds for the forest restoration programme. The restoration programme needs continuous maintenance of the land, removing of unwanted plants and protection the land from fires. The funds available at present are not sufficient to implement the restoration programme more effectively. If more funds are available project can be expand to more lands and intensity of interventions can be increased.

4. Lessons Learnt

4.1 Baseline and Performance of the Interventions

The vegetation of the degraded land was studied using a sample survey using seven sample plots selected randomly at the beginning of the restoration programme. The sample plots were circular shape and size was 500m2 . Two years later same samples were studied again.

A change of species composition is shown in Table 1 and 2. It shows number of seedlings and shrubs have been increased with the interventions. Sample survey revealed that number of shrubs has been increased up to 294 individuals per hectare in 2016 from 63 individuals in per hectare in 2014. The result shows that number of seedlings in 2014 is 43 per hectare and after two years it is 132 per hectare. Only two new species were recorded on this land which was not present in 2014. In addition to the number of individuals, I observed the increased growth of individuals even though it is not measured. Photo monitoring also shows the improvement of the vegetation. Figure 7 Shows the enhanced growth of the seedlings.

Figure 7. Growth of the seedlings

Table 1. Shrubs on Ihala Puliyankulama before and after the intervention

Species	Common Name	Number of individuals / ha in 2014	Number of individuals / ha in 2016
Gmelina arborea	Demata	0	14
Ochna laceolata	Malkara	9	91
Blachia umbellata	Goda ratmal	0	6
Phoenix sylvestris	Indi	11	123
Carissa carandas	Karamba	6	6
Memecylon rostratum	Kuratiya	23	34
Croton lacciferrus	Kappettiya	14	20
	Total	**63**	**294**

Table 2. Tree species on Ihala Puliyankulama before and after the intervention

Species	Local Name	Number of Species			
		2014		2016	
		DBH >5 cm	DBH<5cm	DBH >5 cm	DBH<5cm
Vitex altissima	Milla	9	6	9	23
Grewia rothii	Boradaminiya	17	6	17	6
Azadirachta indica	Kohomba	6	0	6	9
Chloroxylon swietenia	Burutha	3	6	3	6
Lannae coromandelica	Bathhik	11	17	11	40
Eucalyptus camaldulensis	Camaldulensis	17	0	17	0
Tamarindus indica	Siyambala	3	0	3	9
	Panderu	3	0	3	0
Bauhinia racemosa	Maila	6	3	6	9
Syzygium cumini	Madan	0	0	0	11
Cassia fistula	Ahala	0	0	0	6
	Porawapalu	0	6	0	6
Haldina cordifolia	Kolon	6	0	6	0
Memecylon angustifolium	Korakaha	6	0	6	9
	Galseru	3	0	3	0
	Asbadda	3	0	3	0
		91	43	91	131

The main reasons for the above performance of the project are prevention of the land from forest fires, removal of grass and protection from cattle damages. During the two year period only one forest fire was occurred and it was controlled at the beginning before spreading to larger area. The area damaged due to the fire was around 10 hectares. There are no cattle grazing on this land since Forest Officers have controled it. During intervention period seed sawing was done on the land but the success of this is very low.

This restoration programme in Ihala Puliyankulama proves that the forest restoration is a useful tool to increase the forest cover while improving the bio diversity of the land. Removal

of grass is the main reason for the accelerated natural regeneration. Grass should be up rooted to effective control even though, it is an expensive practice. Therefore, we have to find low cost methods to suppress grass. It is important to improve the participation of local communities for this programme to protect the site from various threats. Forest Department can replicate the methods used in Ihala Puliyankulama to other similar degraded forest areas.

5. Way Forward

Restoration of Ihala Puliyankulama area is a part of the national restoration programme. In order to understand the performance of the programme it is proposed to conduct detailed study covering biological and socio economic aspects of the programme. This knowledge will be useful in future restoration programmes.

Uprooting grass is the best way to remove grass and promote natural regeneration but it is expensive. Therefore, it is necessary find out low cost method to suppress grass. Seed sawing is a low cost method for replanting trees but success is low. Therefore, improved seed sowing methods have to be found out. Since the funding is not sufficient to implement required restoration activities it is proposed to find additional funds.

6. Summary

The degraded forest area in Ihala Puliyankulama was restored using different interventions such as fire protection, removal of grass and other unwanted trees, scattered tree planting, seed sawing and protection from cattle. Restoration is a slow process which needs continuous care and supervision. Fire damages and cattle damages are local level threats that can be managed through supervision. The land is under restoration and number of individuals of existing species has been increased while two new species are found compared to the base year of 2014. The technology that we have used is suitable for the land. Since removal of grass is essential it is necessary find out alternative methods to suppress grass. The direct seeding methods was not successful on this land and it is necessary to develop technology for direct seeding. There are external threats from development, livestock and agricultural sectors. Threats can be managed by informing stakeholders about the programme

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Urban Biodiversity Rehabilitation in Bang Kachao Phra Pradaeng District, Samut Prakarn Province of Thailand

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Abstract: The small island calls "Bang Kachao" is covered of approximately 2,000 ha and located in Samut Prakarn Province which is approximately 10 km far from Bangkok and surrounded by 15 km length of Chao Phraya River. This feature of area causes unique ecosystem which is formulated to be one of the large richest biodiversity of the last lowland area of central plain. The area has gained reputation to the public for natural beauty and well-preserved traditional and norm of local people. Ecotourism are among the popular activities of tourists. This area was addressed by the Time Magazine as "Best Urban Oasis of Asia" in 2006.

With increasing pressure from population increase and land transforming to be residential areas, many remaining green areas have been deteriorated. Securing the long-term conservation of this area can be best achieved by developing and implementing programmes that can generate broad local support for rehabilitation and conservation. This can be accomplished by developing projects and programmes that provide direct tangible benefits derived from the conservation to stakeholders especially the local community. As a sequence, a 2-year project title "Strengthening Urban Forestry Demonstration Site of Bang Kachao (Thailand) for Biodiversity Conservation and Natural Learning Center" was formulated with financial support was made by APFNet. Awareness and sense of ownership among local communities regarding to appreciation of the value of biodiversity of natural resource in the area can be clearly seen so far after implementation of the project. This successful will be one of the measures to ensure the long-term conservation of green cover within this island.

Introduction

Since 2008, Royal Forest Department (RFD) launched an urban forestry program within a small island of approximately 2,000 ha where is called "Bang Kachao". The island is located in Samut Prakarn Province which is approximately 10 km far from city centre of Bangkok Metropolitan and surrounded by 15 km length of Chao Phraya River, a major river of central plain. This feature of area causes unique ecosystem made by the combination of fresh, salt and brackish water due to this island is just 20 km away from the Gulf of Thailand. Such ecosystem formulates the area to be one of the large richest biodiversity and accounted to be

the last lowland area of central plain that has still survived from urban expansion. Although there has more than 20,000 inhabitants living within the area for more than 500 years,

but 80% of the area has still under vegetation covered. In 1987, the government declared this area to be the green conservation area and purchased nearly 600 parcels of land or approximately 10% (200 ha) out of the total area from local inhabitants. Largest parcel of land (approximately 25 ha) is used to establish a city park called "Sri Nakhorn Khuan Khan City Park" under the managerial of RFD where headquarter of the management unit is also located there. Up to the present, the area has gained reputation to the public for natural beauty and well-preserved traditional and norm of local people. Ecotourism such as cycling through the typical fruit orchards and boat cruising for sight-seeing in daytime and flyer-fly in the nighttime, are among the popular activities of tourists. Due to the area is located close to Bangkok and road system is in very good service, large numbers of visitors are found to flush into the area during the weekend days. In 2009, more than 7,000 of local tourists plus 3,000 of international visitors from 25 countries across the world went to visit the area monthly. As a result, the area was addressed by the Time Magazine as "Best Urban Oasis of Asia" in 2006. The area has also nominated to be the major site for demonstrating the urban forestry program of the RFD to interested groups since 2008.

Although the area is now under the strictly controlled by 2007 City Planning Act and urban forestry management program under RFD, some relevant problems have been identified. The remaining green area has been clearly seen of deterioration from urbanization and population increase pressure. Many of former green areas have been transformed into residential areas and pollutions such as water, noise, air, and garbage accumulation also increase. As a result, both flora and fauna biodiversity are now under threatened. In order to mitigate the problems, maintaining and rehabilitating measure are urgently needed. To secure future conservation of Bang Kachao, this cannot be achieved by excluding local inhabitants because of no longer policy to purchase of the rest of 90% of the land area that belong to private properties. Securing the long-term conservation of this area can be best achieved by developing and implementing programmes that generate broad local support for biodiversity and green area conservation.

As a result, RFD was formulated a 2-year project title "Strengthening Urban Forestry Demonstration Site of Bang Kachao (Thailand) for Biodiversity Conservation and Natural Learning Center" was formulated and financial support was made by APFNet. The project aims to provide direct tangible benefits derived from the conservation to stakeholders especially the local community. Moreover, the project seeks directly engage all stakeholders (i.e. official from responsible agencies, people groups, academicians, professional groups, women group, youth group, tourists, interest group, and ethnic group) in the running of the site through a series of measures focusing on ecotourism that will target naturalists and culture-lovers. Under this project RFD has been implemented a number of activities including conservation of biodiversity, enrichment planting of local species into degraded areas, eco-tourism promotion, local school curriculum establishment, as well as to maintain greenish of the area through training provision in order to create awareness on the value of the area to all

stakeholders. Awareness campaigns rising have been launched among the local communities in order to boost appreciation of the value of biodiversity of natural resource in the area and the links between its continued conservation of biodiversity and the improved benefits to them. This will ensure the conservation of green cover of the rest 90% of private properties within this island.

Key Issues

With an attempt to secure the sustainable management of this green area, the overall goal of this on-going project (commencing in 2014 and suspended in 2015 due to is to instability in Thailand) aims maximizing biodiversity conservation and strengthen urban forestry program through biodiversity demonstration site and natural learning center establishment including ecotourism promotion and benefits flowing to local communities. Measurements have been set up and tested through the project funded by APFNet. Strategies regarding to degraded areas rehabilitation, people participatory, public outreach, gender involvement and urban forestry techniques have been formulated based on research and recommendation from experts and specialists within various fields. Technical recommendations from those specialists have transformed to be relevant activities, for example:

1. An Establishment of Exhibition and Interpretative Center

The exhibition and interpretative center have established at Sri Nakhon Khuan Khan Park in order to provide information about the area especially the programmes under the King's initiative projects to the visitors. On-site and on-farm implementation activities related to agroforestry and other issues have also been created.

2. Maintenance of Site Character and Value for Ecotourism

The long-term sustainability of Bang Kachao has been linked to ecotourism by improving facilities and interesting stories (i.e. culture and norms) in order to increase visitor numbers. Local culture and norm as well as local living features are encouraged to maintain as local symbols.

3. Implement a Natural Conservation and Urban Forestry Programme as Curriculum for Local School Children

This activit is targeted at local school children within the area and aiming to educate those school children on the need to conserve their natural resources as well as to raise their sense of ownership to their homeland. The program has cooperated with local schools for implementing curriculum related to sustainable area management.

4. Run Local Volunteers and Youth Group through Education Programmes

The long-term conservation of Bang Kachao will depend on the elimination threats to the area so that this will depend to a large degree on the long-term support of the local communities. It is essential that awareness and education programmes should be set up to promote the value of Bang Kachao. As a result, initially local volunteers and youth group in the local

communities have been encouraged to set up their groups with capacity building is now supported by the project.

5. Management of the Site to Maximize Biodiversity

Development of the Bang Kachao as a demonstration and learning sites for public as well as ecotourist attraction means that the area must be able to cater for substantially increased number of visitors without significant impact on the biodiversity of the area. Management plan have been formulated and amended to harmonize with a situation where biodiversity on the site can be maintained and improved. Specific attention is given to the need to create local genetic conservation sites to protect the genetic biodiversity of endemic flora and fauna species. The conservation sites are now implemented in both state lands and on-farm initiatives.

6. Marketing of the Bang Kachao Site to Potential Visitors

Up to the present, some marketing is carried out through media run by local tourist agencies where are mostly located within Bangkok while local people has found to acquire less benefits from the business. However, the intention of this activity is to attract additional tourists and to expand the site's niche. A marketing program has been developed to attract the nature and culture-lover groups to experience the area. Local professional groups are also encouraged to set up to run the business. Marketing channels have been developed such as website presentation while new materials will be created for visitors including a cycling/walking route map, flyer-fire trip leaflet, boat-cruising trip, bird-watching guide, ETC.

7. Training of Local People as Tour Guides

One of the functions of the demonstration and learning center is as a training center for capacity building activities. Local guide are trained to cover a greater area concerning history, geography, flora and fauna aspects, touring and attracting route maps as well as other interesting topics.

8. Develop Conservation Sites for Feeding Endemic Fauna

By creating local feeding sites for local animals, birds and small mammals will be attracted to the feeding sites whilst creating a tourist spectacle. This initiative has been conducted by planting fruit trees through enrichment planting activities in both degraded and private properties.

9. Management of the Site to Maximize Biodiversity

Development of the Bang Kachao as a demonstration and learning sites for public as well as eco-tourist attraction means that the area must be able to cater for substantially increased number of visitors without significant impact on the biodiversity of the area. Management plan are formulated and amended to harmonize with a situation where biodiversity on the site which can be maintained and improved. Specific attention has been given to the need to create

local genetic conservation sites to protect the genetic biodiversity of endemic flora and fauna species.

Lesson Learnt

The overall goal of this project is to maximize conservation of biodiversity and to strengthen the urban forestry program through the establishment of a demonstration site and a learning center. Benefits arising from these and from ecotourism promotion are expected to flow to local communities. Achievement and lesson learnt from project activities can be summarized as follow:

1. Establishing an Exhibition and Interpretative Center

Participants from different groups who can contribute a diversity of opinions of what they want to see the park in the future were invited to join the meetings. For example, representatives from local communities and local schools, forestry experts and lecturers from educational institutions, involved organizations from tourist and special interest groups such as Bird Conversation Society of Thailand, Thai Cycling Club and Thai Ecotourism and Adventure Travel Association, and RFD officials. Those participants were invited to identify key resources and visitor information for formulating the management planning as a whole. In particular, survey on ecology landscape, tree species, and existing facilities were also made.

2. Maintaining the Character and Value of the Project Site to Help Develop Ecotourism

The Project has developed zoning of the outdoor exhibition and planning and started primary research for content development. This would help to establish a long-term effective management planning of the area.

3. Implementing a Natural Conservation and Urban Forestry Program as Part of the Curriculum for Local School Children

The process of local curriculum development and implementation has 12 months in organizing collaborative workshops, classroom observations, and documentation. It has been working together by exchanging knowledge and experience between the management team, curriculum experts, 10 local school head teachers, volunteer teachers and students. The objective is to encourage and guide teachers to seek the proper and effective way to manage their own teaching and learning methods that fit to urban forestry and biodiversity in Bang Kachao environment. This curriculum development process was staring from November 2013-November 2014 (However the schedule has been postponed because the budget of the Year 2 has not been approved and supposed to begin from July 2016.).

In particular, the meeting of local curriculum working group was organized in order to discuss on working process and set an agreement regarding to working approach, course set-up, and schedules among management team, curriculum expert and local school representatives 3-days study trip to Kew Mae Pann Sangwanvidhaya School, Chiang Mai Province, (22nd -23rd August 2014) was also organized. The objective was to bring the local curriculum working group to learn and exchange ideas with the school where contributed the good practice of local curriculum development and implementation. After going back,

two workshops were organized to summarize lesson learnt from the trip and formulate local curriculum which will be suitable to each local school in Bang Kachao.

4. Encouraging Local Volunteers and Youth Groups to Become Involved in Education Programs

Training on education program for 20-30 local volunteers from six sub-districts was organized. In this training, the local volunteers were provided the basic knowledge of ecology system, biodiversity and tree species in Bang Kachao by the lecturers from the faculty of Forestry, Kasetsart University and practiced the technique of the biodiversity surveying and, data collecting, and how to keep plant sample before sending to laboratory by students from the faculty of science (Botany), Kasetsart University.

5. Establishment of Biodiversity Conservation Area and Development of This through Ecotourism Channels to Achieve an Increase in Visitor Numbers as Well as in the Flow of Income Benefiting Local People.

Various activities have been conducted for identifying key areas in Bang Kachao for biodiversity conservation and ecotourism development and promotion. such as learning sites selection, community network development and focus group meetings. - Canal routing in Bang Kor Bua Sub-district.

- Routing for visiting traditional mixed orchard in Bang Kasob Sub-district, Bang Kor Bua Sub-district and Bang Yor Sub-district (Promote learning and buying fruits and vegetables at site visit)

-Pa Ket Nom Klao Urban Community Forest Learning Center – Promote new learning site as the alternative uses and new approach of Nipa Palm conservation, in Song Kanong Sub-district

- Herbal plants learning site in Bang Yor Sub-district

- Bike routing network

6. Training the Local People as Tour Guides

Organized study trip to learn ecotourism product/tour program development, price setting and local touring as well as natural resource management in Krabi Province (29-31 August 2014) where best practice of eco-tourism has been relevant.

7. Maximizing the Site's Ecotourism Potential by Improving the Area's Habitat of Dependent Flora and Fauna by Developing Conservation Sites to Support Endemic Fauna

The activities have been conducted to site assessment by collecting baseline information for conservation sites for feeding endemic fauna. Ground checking of map and classified the land use on conservation land plots in 6 sub-districts which classified to be conservation land plots to conservation area, CSR plots, trespassed area, mismanagement area and public land utilization. Rehabilitation plan was drafting afterward to apply to the area as a whole.

Ecological survey was made through sample plots establishment across the area in order to investigate floral biodiversity. Surveyed vegetation was then recorded as vascular and non-vascular vegetation while locations of large trees as well as diameter at breast height were then recorded. All surveyed vegetation was identified according to botanical aspects by following plant systematical nomenclature. Potential sites to improve as habitats for dependent flora and fauna species which link to ecotourism promotion have been selected as priority to be rehabilitated. Series of planting campaigns have been implemented within those areas afterward through arbor-day campaigns form communities, volunteers and CSR activities from business companies.

8. Documenting the Project Information

Documenting database information and map, reports on biodiversity, training manuals, curriculums to make available to public have been made such as hard copy, CD-Rom, PDF files to upload on RDF website, etc. Furthermore, tourist information and map to promote Bang Kachao and demonstration and learning site visitation have al so produced such as booklets, brochures, leaflet and content to upload on RDF website, social Media such as facebook page to promote activities https://www.facebook.com/APFNetBangKachao etc. In particular, tourist guidebook and map of attractions and bicycle routes in Bang Kachao have also been published.

9. Marketing the Bang Kachao Site to Potential Visitors

To promote effective eco-tourism management, program for organizing marketing event was developed. List and making invitation of selected groups of specific interest and media such as cycling group, sketching group, and photographer group was mad. Furthermore, 2 days event in Bang Kachao (7-8 March 2015) was organized. The event was aimed to invite everyone who has a love of sketching, photography or biking come to discover and appreciate their artistic side to share the hidden treasures of the Bang Kra Chao river bend, also known as the Green Lung of Bangkok metropolitan, an area enriched with amazing biodiversity, traditional culture, and a small community lifestyle through community storytelling to be shared and remembered by all visitors for example, boat ride activity with the Love/Preserve the River and Khlongs Group to discover local community lifestyle, biking around in the Bang Krachao neighborhood, Trolley shuttle service available covering several get-on/get-off stations all over Bang Krachao.

The Way Forward

Although overall objectives of the project have been satified but there has still be some obstacles which needed to be overcome. Due to this 2-year project was started on 3 May 2013 and ecpected to be finished by 2 May 2015, However, due to the political instability in Thailand during the begining of 2014 to mid 2015 especially in Bangkok where the project site is located very closely to the protesting grounds, it was directly effected to the conduction of the activities. RFD was then submitted the suspension project requesting to APFNet Secretarait in order to ensure the activities of year one under proposed Annual Work Plan (AWP) to be completed on time and the second year of project's activities were then expected

to be commenced at the early of November 2014. The APFNet Secretariat then approved the requested on 14 July 2014.

However, this dificulties has still maintained and then made a great impact to the project's activities which some activities were needed to be adjusted to suit the situation and circumstance of the area. As a consequence, some activities under Year 1 were need to be carried out until the end of the second quarter of Year 2 while some activities under the Annual Work Plan of Year 2 has been conducted in order to keep on the project moving especialy for the preparation stage of each activities. This necessary has made the requesting of the second year installment to be delayed from the time-frame of the project. RFD wishes that after getting the second installment, the project would be run smoothly and could be completed on the expected time.

Summary

The major goal of this project is to maximizing biodiversity conservation and strengthen urban forestry program through biodiversity demonstration site and natural learning center establishment including ecotourism promotion and benefits flowing to local communities. Meanwhile, the project site has been expected to become a demonstration and learning platform of urban forestry programs to all interested person. Local communities would secure benefits from the management of the area and can ensure long-term biodiversity and green area conservation. Furthermore, ecotourism attraction as habitats of flora and fauna species can be achieved both by better management and enhance value of the site for ecotourism and nature lovers.

At the end of the project, as it is hoped, sustainable forest management would be better secured. To achieve the ultimate goal, various activities have then been implemented to ensure the achievement of the program by implementing not only biodiversity conservation but also natural rehabilitation to ensure long-term sustainable environment. For example, exhibition and interpretative center has been established in order to provide information to visitors. Curriculum for local school children and youth group has been created to enhance sense of ownership to the young generations, project information available in the public outreach, development of facilities to provide more extensive experience to visitors, creation of jobs and business for local people, planting programs to rehabilitated degraded areas, etc.

Although the project seems to be going very well, but difficulties have relevantly seen to obstruct the progress and achievement of the project as a whole. Political instability in Thailand during the begining of 2014 to mid 2015 has been greatly affected to the project implementation unavoidedly. Result of that situation has been come out with the delay of project implementation for nearly one year and a half. This dificulties has still maintained and then made a great impact to the project's activities which some activities were needed to be adjusted to suit the situation and circumstance of the area. Royal Forest Department wishes that after getting the second installment of Year 2 budget from APFNet, the project would be run smoothly and could be completed on the expected time.

The National Policy to Rehalibilitat and Develop 5 Million Hectares of Forests in Vietnam

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Abstract: Vietnam's forest cover is about 9.4 million ha (29%) down from 14.3 million ha (43%) in 1943. After decades of deforestation, Vietnam has 7-8 million unused forest land that is degraded and denuded. Forests are classified into different management categories of production, protection (watershed) and special use forests (sites of both biodiversity and historical interests). Vietnam's forests have high biodiversity value. The capacity of these forests to provide various environmental services continues to decline, despite the apparent slowing down of deforestation. Forest degradation and fragmentation are destroying valuable habitats and putting large number of vertebrate species at risk of extinction. In many areas, watershed degradation is causing environmental, human, and economic disasters as a result of floods, soil erosion, siltation, and reduced agricultural productivity. At the same time when forest land resources are being degraded and biodiversity lost, the demand for both subsistence and industrial forest products has increased due to rapid population growth and economic development. The supply of logs from domestic natural forests is declining because most of the forests have already been exploited and the remaining face smaller quotas, or have already been put under some form of protection.

The Government of Vietnam (GoV) has long recognized the need to make better use of available unused, bare land for forestry development to reduce the dependence on the remaining natural forests and provide watershed protection and other environmental services. It has initiated a number of ambitious forestry-related programs with mixed results during the last two decades. Of which, in 1998, GoV launched the 5 Million Hectare Reforestation Program (5MHRP), which aims at reforesting 5 million ha by 2010 to bring the national forest cover back to 43 percent. Broad targets comprise 2 million ha of production forests, 2 million ha of protection and special use forests, and 1 million ha of perennial tree crops.

Introduction

The Five Million Hectare Reforestation Programme (5MHRP) was approved by the National Assembly in 1997 followed by the Government Decision No. 661/QD-TTg in 1998 to guide the objectives, tasks, policy and implementation of the programme for the period from 1998 to 2010.

The goal of program includes:

- Protect effectively the existing forests with highest priority given to protection of natural forests classified as special use forests and protection forest in extremely critical and critical areas, including the protection forests established in the Programme 327, as well as rich and medium production forests. Allocation of forest and forest land to organizations, households and individuals in combination with fixed cultivation and sedentarisation programs and poverty reduction programs to support the forest protection, regeneration together with supplementary and new afforestation.
- Afforestation until 2010

+ 2 million hectares of protection and special use forests are to be planted, of which one million ha shall be regenerated and supplementary planted and one million ha planted in the combination with the fixed settlement program.

+ 3 million hectares of production forest are to be planted: around 2 hectares for planting paper materials, artificial planks, speciality trees and rare and specious timber; around 1 million ha for perennial industrial trees and fruit trees. In addition, organisations and people are encouraged to plant scattered trees in the unused land.

Up to 2005, the new planted forests were 1.309.380 ha (of which 620.567 ha of protection forest; 24.247 ha of special use forest; 664.557 ha of production forest; 763.582 ha of regeneration; the forest cover reached 37%).

In 2006, based on practical situation and availability of land and capital, the GoV adjusted targets and tasks of the five million hectares new afforestation project in the 2006-2010 period, as follows:

- To effectively protect all existing forests, especially natural forests, of which 1.5 million hectares of protection forests and special-use forests will be contractually allocated for protection every year.
- To plant new forests in 1,000,000 hectares, including 250,000 hectares of protection forests and special-use forests (an average of 50,000 hectares will be planted every year) and 750,000 hectares of production forests (an average of hectares will be planted every year).
- To zone off for regeneration 803.000 hectares of protection forests and special-use forests, including 403,000 hectares continuously regenerated and newly regenerated.
- The total estimated investment capital is VND 14,653 billion, including VND 4,515 billion of loan, VND 9,000 billion from other sources to plant production forests, and VND 1,138 billion for contingency.
- After gaining the set objectives, the targets and tasks for the 2006-2010 period have been adjusted, the Government has continued to allocate budget and steer the forest protection and development program in accordance with the national targeted programs in order to attain the objective of planting five million hectares of new

forests.

Before 5MHRP, the GoV runned the Greening the Barren Hills Program (called Program 327) from 1993 until 1998 with the objective of rehabilitating 5 million ha of forests and protecting existing forests, in order to increase forest cover to 43%. The objectives of the 327 program were gradually adjusted and eventually only focused on the forestry sector in the last years of its duration. The emphasis was put on protection forest and special use forest land and included protection, regeneration, and afforestation activities. The shifting focus of program 327 led to the formulation of the Five Million Hectare Reforestation Program (5MHRP). The 5MHRP was approved by the Parliament in 1997 and by the Prime Minister with Decision No. 661/QD – TT dated July 29 1998. The 5MHRP will be carried out from 1998 to 2010 and aims to increase nation-wide forest coverage up to 43% of the total land cover. For that reason many rehabilitation projects are referred to as Decision 661 projects.

After the completion of Program 327, the area of land that had been afforested and rehabilitated increased remarkably by the 5MHRP (1998-2010) The 5MHRP entails (1) afforesting 2 million ha of protection and special- use forests (afforest 1 million ha and regenerate 1 million ha); and (2) afforesting 3 million ha of production forests and utilizing land for dispersed tree planting. Aiming to fulfil the aforementioned tasks, the government's Decision 661 (1998) prescribed a synchronous policy system for crop structure, land, investment, credits, beneficiaries and product consumption, science and technology and international cooperation and foreign investment.

Table 1: National policies affecting forest rehabilitation in Vietnam (1991-2006)

Policy area	Major policies
Forest management	Forest Protection and Development Law 1991,2004 Decision 08/2001 /Q§-TTg - Regulates the management of special-use forests, protection forests and natural production forests
Land policies; beneficiary policies	Land Law 1993 - Land Law 1998 (revised) Land Law 2003 (revised) Decree 01/CP/1995 regarding land allocation for farming cultivation, forest production and aquaculture by state owned enterprises Decree No. 02/CP dated 15/1/1994 - Regulates forest land allocation to organizations, households and individuals for sustainable and longterm use Decree No.163/1999 dated 16/11/1999 - On forest land allocation, lease and lending to organizations, households and individuals for sustainable and long-term use Decision 178/2001/-On the beneficiary rights and obligations of households and individuals who have forests and forest land allocated, leased and lent
Tax, investment, credits	Law on Agricultural Land Use Tax, 1993 - Decree No. 129/2003/N§-CP- Regulates the enforcement of the National Assembly Resolution on reduction and exemption of agricultural land use tax. Domestic Investment Incentive Law, 1994. Investment Incentive Law (revised), 1998 Foreign Investment Law in Vietnam, 1996 Decision 264-CT (22/7/1992) - On investment incentive policies for forest development - Decision 327/CT (15/9/1992) - On policies on the use of bare land and denuded hills, coastal alluvial areas and water surfaces Decision 661/Q§-TTg (29/7/1998) - On objectives, duties, policies and implementing organizations of the 5MFIRP Resolution 03/2000 NQ-CP - On farm economy

Those policies support to achievements of 5 MHRP project.

Table 2. ***Results of the 5MHRP during 1998-2005 (Department of Forestry, MARD, 2005)***

Task	Objective to 2010	Objective to 2005	Result during 1998-2005	Compared to 2005 objective	Compared to 2010
1. Contract to forest protection	2,000,000 ha	2,000,000 ha	2,263,361 ha	113%	113%
2. Special-use & protection forest	2,000,000 ha				
2.1 Natural regeneration	1,000,000 ha	1,000,000 ha	723,450 ha	72%	72%
2.2 New planting	1,000,000 ha	610,000 ha	631,317 ha	103%	63%
3. Plantation	3,000,000 ha	2,000,000 ha	1,401,667 ha	70%	47%
3.1 Production forest	2,000,000 ha	1,390,000 ha	683,369 ha	49%	34%
3.2 Industrial crops	1,000,000 ha		86,954 ha		9%

From the above-mentioned achievements it can be seen that forest protection and management activities have obtained good results. Thus, the annual destroyed forest area could significantly be reduced, and the livelihood of local people living in or around the forests could be improved.

Because of forest rehabilitation and reforestation programmes since the beginning of the 1990s until to 2005, forest resources in Vietnam have steadily increased. The change of forest cover in Vietnam from 1943 to 2005 is presented in Table 3.

Table 3. Changes of forest areas and forest cover between 1943 and 2005 (MARD, 2004; 2005; 2006a, 2006b; Vietnam Government, 2001)

Year	Natural forest	Planted forest	Total forest area	Forest coverage %
1943	14,300	0	14,300	43
1976	11,077	92	11,169	33
1990	8,430	745	09,175	27
1995	8,252	1,050	09,305	28
1999	9,444	1,471	19,915	33.2
2000	9,865	1.919	11.785	35
2003	10,004	2,089	12,094	36.1
2004	10,088	2,218	12,306	36.7
2005	10,283	2,333	12,616	37

Note: Unit = 1000 ha

In 1943, the total forest area of Vietnam was about 14.3 million ha or 43% of the total land area, but had declined by 1990 to only 9.2 million ha or approximately 27%. By 2005, the forest area in Vietnam had recovered to 12.6 million ha, or 37%, of the total area of the country. In 1943, there were no planted forests in Vietnam but in 1995, the area of planted

forests had reached about 1 million ha and this figure increased to more than 2.3 million ha in 2005.

Key Issues

The program 5MHRP is a continuation of previous reforestation efforts and combines natural regeneration with reforestation and the establishment of new forests. The reason why this program can be implemented as the entry of all stakeholders and from many factors:

Organization

At the national level, a Steering Committee was established to assist the Government in the implementation of the program. The Committee is chaired by the Vice Prime Minister and assisted by the Minister of Agriculture and Rural Development (MARD). The committee includes representatives from the Ministry of Planning and Investment, the Ministry of Finance, the Committee of Ethnics and Mountainous Regions, the Farmers' Association and the Young Communist League. The National Project Management Board was established to support the Steering Committee in implementing the program. It is chaired by the Vice Minister of MARD and includes representatives from several departments of MARD as well as other ministries. The Permanent Project Office was established as a specialized body and located at the Department of Forestry Development. At the provincial level, a provincial Steering Committee was established to support the provincial People's Committee (PC) and chaired by the Deputy Chairman of the PC. The provincial Project Management Boards are located at the MARD or the provincial SubDepartment of Forestry Development.

At the local level, governments are organizing projects according to forest use and implementing regulations to facilitate planning. The program has been implemented in 57 of 61 provinces. Planning contributes to communication between levels of government and local communities.

Selection of Project Managers

All organizations and individuals in Vietnam having an approved project and an area of allocated, contracted or hired land can be selected as project managers for production forests. Special use and protection forests are managed by the state. A project manager at local level has the responsibility for managing and supervising the project. Households participating in the project have planting costs reimbursed and they share benefits according to regulations. Households may benefit in a number of ways; develop fixed agriculture programs in protection and special use forests, earn wages in protection forests, and harvest firewood, thinning, and non-timber forest products in protection forests.

Species Composition

The selection of species and composition to be planted are based on the functional objectives of the forests. In special use forests, the objective is ecosystem restoration, therefore, native species are selected. In protected forests, the objective is to realize multiple use potentials, therefore, fruit trees, species providing special products and industrial use trees are selected. In production forests, the selection of species is based on soil, climate, accessibility,

processing requirements and market demand for products

Policies

Land Use Policy

An inventory of agriculture and forest land was conducted to establish a land use plan for the three forest types. This forms the basis for the establishment of new projects and the evaluation of on-going projects. This facilitates the issuance of land use right certificates to organizations, households and individuals.

Investment and Credit Policy

The following types of investments come from the national budget:

- 2 million VND (US $140)/ha for planting precious and rare species in production forests;
- 2.5 million VND (US $175)/ha for planting and maintenance for three years in protection forests;
- 50 000 VND (US $4)/ha/yr for a maximum of five years for silvicultural measures in protection forests; and
- 1 million VND (US $ 70)/ha over six years (maximum) for enhancement of natural regeneration.

Infrastructure investments are limited to creating facilities for silviculture such as fire control, pest eradication and nurseries at a rate not more than 5% of the total annual investment for the program. Project management costs are estimated at 8% of the total investment. Credit is available for investment in production forests and less critical protected forests. Loans with favorable conditions are available up to a maximum of 70% of the total investment in the project. Investors may also benefit through a reduction of land use tax of 50% to 100% depending on the areas' accessibility. Investors use the land use certificates as a guarantee for loans.

Tax Policy

Organizations and individuals who plant trees or perennial crops on barren land or invest in processing industries can benefit from a favored tax policy under the laws on domestic investment. Products harvested from production forests are exempt from the resource tax. Products legally collected from planted forests and non-timber products from natural forests are exempt from the batch trading tax.

Science and Technology Policy

Institutions are encouraged to develop plant breeding and seed certification protocols. Additionally, they are to undertake research on intensive reforestation and advanced techniques for protection against pests and fire.

Foreign Investment

Foreign investors are encouraged to establish reforestation and wood processing joint ventures with national organizations. Favorable conditions for foreign investments are available under the Law on Foreign Investment, Decree No. 10/ND-CP.

Challenges

The program faces a number of investment and institutional challenges. A clear land use plan is not yet established and this may be affecting investments in reforestation. Wood processing facilities are small, dispersed, and their needs to be a better understanding about market conditions and project profitability. Staff capacities and infrastructure (fire control, pest eradication) for local projects, especially in remote areas, need to be upgraded, as do offices and equipment. There is a need for continued efforts to attract foreign and domestic investments through tax and interest rate adjustments. Public awareness appears low. Some of these challenges can be overcome through technical and financial support as well as assistance in land use planning.

Lesson Learnt

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

- Implementation of the project with involvement of all relevant stakeholders from National Assembly- the highest powerful agency to provincial levels.
- 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.
- The procedure of project appraisal, management and monitoring of project operation is essential to ensure the success of the projects.
- At present, because of inadequate appraisal, the number of projects that focus on protection and special-use forest have exceeded 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.
- Clear and detailed benefits for households and articulated participation will vasdy 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.
- The implementation of forest rehabilitation projects should be integrated with other projects that aim to improve the socio-economic conditions of local

populations.

- Forest rehabilitation projects should be combined with other supporting activities to ensure that the major goals of the projects are met.

The Way Forward

The program 5MHRP were formed in the context of Vietnam reduced too much forest within a short time from 14.3% in 1943 to 8.2% in 1995. This program was funded by the state budget and donnor. A major part of the 5MHRP activities concentrated international cooperation in forestry. Some 21 donors committed themselves with MARD to support the plantation of five million ha of forests. In recent years, 45 projects from PAM,[2] UNDP, FAO programs and from the Government of Sweden, Germany, Japan, Holland, Finland and non government organizations such as WWF, CARE, and OXFAM were and are being implemented. Loans from the World Bank, Asian Development Bank, and Japan Bank for International Development Cooperation are being assigned to projects under the 5MHRP program.

After the program ended, the GoV identified forestation is one of the important objectives of the economy. Policy of land allocation to local people for planting is continuously implemented. People across the country promoting the cultivation of many crops depending on the different geographical areas to look for suitable plants. Some common species such as acacia (Acacia), eucalyptus (Eucalyptus sp) ... is widely grown. But these plants are short harvest cycle tree. Most of them were harvested for industries materials such as construction , paper material production .... etc. Thus, this solution should not really bring high economic efficiency for farmers.

Learning from the 5MHRP program and other programs, adapting with the current situation, the GoV is on the way restructuring of the forestry sector, of which shifting from plantation of short term harvest cycle tree for timber materials for the construction industry, paper production ... to plantation of long term harvest cycle tree for applying payment for forest environmental services. Policy on land allocation shall be implemented continuously. Trees for planting have harvest cycle around 20 – 30 years. This plant restructuring is also in line with the international trend that are leading by countries like the United State and Australia

Summary

The 5MHRP program is a significant project which was implemented all over the provinces and with key beneficiaries are people living in rural, remote, mountainous areas and ethnic minorities.

The objectives of rehabilitating and protecting of Vietnam’s forests aimed for under the 5MHRP, especially through natural regeneration, have been advanced well. The forest coverage has increased from 33.2% in 1999 to 35.8% in 2003. Targets of establishing forest plantation have also progressed according to annual plans. However, after six years 1,196,594 ha of protection and special use forests were planted, an area that equaled only 49.7% of the area planned for that period. During the same period, 516,629 ha of production forest was

planted. This included 443,833 ha of industrial plantation, or 22.2% of the planned area.

The program has been successful in promoting activities such as planting 5 million hectares of forests as mentioned above, built a model reforestation, attract people to participate in afforestation activities, improve people's livelihood people, alleviation and poverty...etc. Besides that, there are somelimitations when considering the effectiveness of the program compared to the financial resources and manpower. Linkage between economic value with forest plantation is not strong enough impact to quality of plantation forests. Some areas of plantation forests are degraded due to lack of care of planters.

From those limitations, the GoV is on process of restructuring forestry sector, of which

plant restructuring shall be implemented to increase forest cover and improve the quality of planted forests supporting to application of the policy on payment forest environmental services successfully.