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Bangladesh: Participatory Forest Management in Degraded Forests: Perspective REED+ In Bangladesh

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Institute of Forestry and Environmental Sciences, University of Chittagong

1. Abstract

British colonial approach is still in the core of resource management of Bangladesh, however, recent policies of management of forest incorporating social aspects and considering diverse dimensions of human in the forestry sector with various driving factors like climate change, afforestation /reforestation programs, REDD+ etc, lead the forest management of Bangladesh a huge shift on policies from earlier one. This study critically reviewed, with a case study at Teknaf forest region (south-east region), the management practices of forest where participated management approach is practiced and have potential for REDD+ activities in future. This study also focused newly adopted management strategies to uphold the forest from the “specialized shop” to “emporium of diverse functions and services”. Major shift lies on enforcing laws with punishment are now converted to accentuate on the awareness of the people of the society about the resource, sharing the resource and considering livelihood of the local people. The results revealed that people of the study area are concious about the forest products and services and involved in law implementation and guarding the forest resources from illicit felling where earlier this indiscriminate cutting of the trees were responsible for degrading the forest. However, this case study put forward a sketch how participatory management approach may help forest to reconstruct from its deforested and degraded nature and hence, may be a better option to pave the way in implementation of REDD+ plan for Bangladesh.

2. Introduction

Land uses of Bangladesh mainly with agriculture (64.2%), and forestry (17.8%) (Map 1). Homestead forests and government owned forests are the key sources of fuel and timber. However, a rapid population growth with high demand for fuel wood and timber and 0.97 million hectares of denuded land as a result of shifting cultivation, illicit felling, accelerated soil erosion and uncontrolled fire hazard, compelled the nation to choose environmentally, ecologically and economically viable tree species propagules (indigenous and/or exotic) with intensive (day to day) management systems. On the other hand, a country, which is regularly affecting natural calamities like flood, cyclone etc with limited wealth and resources, is crucial to consider the
3. Methodology

Description of the study area

Cox’s Bazar South Forest Division is situated in the extreme south-eastern Region of Bangladesh. It lies between 20° 50’ and 21° 51’ N latitude and 92° 0’ and 92° 15’ E longitude. Teknaf is a upazilla of Cox’s Bazar, the southeast district in Bangladesh, situated by the border of Myanmar. About 48 kilometer border lies between Teknaf, Upazilla and Myanmar, divided by Naf River and hills. There are medium high hills and Naf River to the eastern side and the Bay of Bengal to the west side of the Teknaf. A glimpse of the study area is described in Appendix 1 with photographs.
Table 1: Range Wise Forest Land and Manpower

<table>
<thead>
<tr>
<th>Range</th>
<th>Beat</th>
<th>Staff</th>
<th>Reserved Forest (ha)</th>
<th>Protected Forest (ha)</th>
<th>Total area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teknaf</td>
<td>4</td>
<td>15</td>
<td>6011.13</td>
<td>613.20</td>
<td>6624.33</td>
</tr>
<tr>
<td>Hoaikong</td>
<td>4</td>
<td>14</td>
<td>5186.29</td>
<td>10.87</td>
<td>5197.16</td>
</tr>
<tr>
<td>Silkhali</td>
<td>3</td>
<td>12</td>
<td>2956.27</td>
<td>22.21</td>
<td>2978.48</td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
<td>41</td>
<td>14153.69</td>
<td>646.28</td>
<td>14799.97</td>
</tr>
</tbody>
</table>

Ref: Teknaf Range Office, Cox’s Bazar South Forest Division.

Map 2. Teknaf region of Bangladesh, the case study area

**Methods of sampling and data collection**

**Resource survey**

Resource survey was conducted in three beat areas of Teknaf forest region namely Teknaf, Hoaikong and Silkhali ranges. Simple random sampling was followed to collect the resource data for with a predetermined sample size. Sample plots with 20 meter by 20 meter size were taken in the forest for collecting diameter at breast height (dbh) and height with the instruments such as diameter tape and Spiegel relascope. Moreover, if the plantation is big enough then the sample size was 50 meter by 50 meter. However, regeneration survey was conducted on the forest floor with 5 meter by 5 meter plot. In both plots all the trees were measured. Later volume
were calculated per hectare basis. The collected data were analyzed to constructed local volume table for the species.

**Socioeconomic survey**

The homestead survey was conducted in different villages of Teknaf, Shilkhali and Hoaikong forest range of Cox’s bazaar South Forest Division to assess people’s dependency on forest and economic status of households. The survey was conducted from 10th April to 21th April 2014 with a pre-structured questionnaire in the area. A total of households were surveyed randomly from Teknaf, Hoaikong and Shilkhali ranges. The head of each selected household was interviewed to collect required information. In the absence of the head of the family the female head or any adult member of the family was interviewed. The collected survey data were analyzed and presented in the result section.

4. Results

**Natural Forests**

Cox’s Bazar South Forest Division holds a very small area of productive natural forests. It is situated at Shilk hali Range. Dominated species is *Dipterocarpus alatus* (Dhuli Garjan). The forest is about 150 years old. The number of total individual of Garjan is 5717. *Hopea odorata* (Telsur) prevail there as co-dominated species. Regeneration of that forest is good. On an average the forest holds 340.89 m$^3$/ha (Table 2).

<table>
<thead>
<tr>
<th>Location</th>
<th>Dominant Species</th>
<th>Volume (m$^3$/ha.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silkhali</td>
<td>Dhuli Garjan: <em>Dipterocarpus alatus</em></td>
<td>340.89</td>
</tr>
</tbody>
</table>

**Plantation Forests**

Most of the areas of study area are mostly of plantation forests. It is un-even aged, multi-storied forest with a canopy from 25-35 m in height. Evergreen species are frequent in the upper storey. The commonest species in the main canopy are as follows:

<table>
<thead>
<tr>
<th><em>Dipterocarpus turbinatus</em></th>
<th><em>Chcikrassia tabularis</em></th>
<th><em>Gmelina arborea</em></th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Dipterocarpus alatus</em></td>
<td><em>Syzygium grande</em></td>
<td><em>Acacia auriculiformis</em></td>
</tr>
<tr>
<td><em>Termanila arjuna</em></td>
<td><em>Tectona grandis</em></td>
<td><em>Casuarina equisatifolia</em></td>
</tr>
</tbody>
</table>
Among the plantation forests *Acacia auriculiformis* (Akashmoni) plantations are found in Kerontoli, Domdomia and Nature Park of Teknaf Range which hold 93.9 m$^3$/ha, 81.31 m$^3$/ha and 214.64 m$^3$/ha of timber respectively. Local co management people preserved this species, as this species is less vulnerable to grazing and very gregarious in nature also need little care except protection. However, this is an invasive nature of tree which usually supress the native seedlings but can withstand any adverse soil. Other plantation forests found in TWS are Agar plantation at Teknaf Sadar, Teak plantation at Kerontoli, Sal plantation at Boroitoli and Jhau plantation at Shilkhali which hold 89.09 m$^3$/ha, 7.1 m$^3$/ha, 30 m$^3$/ha and 104.9 m$^3$/ha of timber respectively (Table 3). Volume equations drawn in this study for different species were described in Appendix 2.

<table>
<thead>
<tr>
<th>Location</th>
<th>Planted Species</th>
<th>Volume (m$^3$/ha.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teknaf Sadar</td>
<td>Agar (<em>Acquillaria agallocha</em>)</td>
<td>89.09</td>
</tr>
<tr>
<td>Kerontoli</td>
<td>Akashmoni (<em>Acacia auriculiformis</em>)</td>
<td>93.90</td>
</tr>
<tr>
<td>Kerontoli</td>
<td>Teak (<em>Tectona grandis</em>)</td>
<td>7.10</td>
</tr>
<tr>
<td>Domdomia</td>
<td>Akashmoni (<em>Acacia auriculiformis</em>)</td>
<td>81.31</td>
</tr>
<tr>
<td>Boroitoli</td>
<td>Sal (<em>Shorea robusta</em>)</td>
<td>30.00</td>
</tr>
<tr>
<td>Silkhali</td>
<td>Jhau (<em>Casuarina equisetifolia</em>)</td>
<td>104.90</td>
</tr>
<tr>
<td>Nature Park</td>
<td>Akashmoni (<em>Acacia auriculiformis</em>)</td>
<td>214.64</td>
</tr>
<tr>
<td>Shaplapur</td>
<td>Jhau (<em>Casuarina equisetifolia</em>)</td>
<td>229.9</td>
</tr>
<tr>
<td>Silkhali</td>
<td>Jhau (<em>Casuarina equisetifolia</em>)</td>
<td>209.3</td>
</tr>
</tbody>
</table>

Unique plantation Jhau (*Casuarina equisetifolia*) is available in the coastal areas of Shaplapur and Silkhali. Some vacant places are present in the plantation area due to grazing, biotic interference. At Shaplapur Jhau plantation, where mean dbh of 15.7cm. Number of trees average 1903/ha and standing volume is 222.9 m$^3$/ha. Maximum number of trees are of 18-19 cm diameter class. Constituting of total trees, maximum height and diameter of the trees 18.9 m and 21.1 cm respectively while their corresponding minimum diameter 6.2 cm and height 5 m. At Silkhali Jhau plantation, number of trees 1763/ha with a mean dbh of 14.2 cm. Number of trees average from 408/ ha and standing volume is 209.3m$^3$/ha. Maximum numbers of trees are of 16-17 cm diameter class. However, highest height and diameter of the
trees 23 m and 26 cm respectively while lowest diameter was 4.7 cm and height was 3.5 m found.

**Bamboo Resources**

Bamboo plantation found in Teknaf Sadar Beat under Teknaf Range holds 791 culm/ha of Bamboo (Table 4). Several species of bamboo are also found in these forests. The common bamboo species are as follows:

- Muli - *Melocanna baccifera*
- Mitinga - *Bambusa tulda*
- Dolu - *Neohouzeaua dulloa*
- Ora - *Dendrocalamus longispathus-Dendrocalamus hamiltonii* etc.

<table>
<thead>
<tr>
<th>Range</th>
<th>Beat</th>
<th>Yield (culm/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teknaf</td>
<td>Teknaf Sadar</td>
<td>791</td>
</tr>
</tbody>
</table>

**Cane Resources**

Cane is planted as an experimental plantation under some areas of Teknaf and Hoiakong range. Total 70ha Cane plantation established in Hoiakong range and 40ha in Teknaf sadar Beat. Cane is found as the associate species along with *Chcikrassia tabularis* (Chickrashi) at Teknaf Sadar Beat under Teknaf Range which holds 381 clump/ha (Table 5). Cane species occurs in association with Chickrassi, Teak, and Koroi etc. The common cane species are as follows:

- Golla bet - *Daemonorops jenkinsianus*
- Kadam bet - *Calamus erectus*
- Sundi bet - *Calamus guruba*
- Udum bet - *Calamus longisetus*
- Kora bet - *Calamus latifolius*

<table>
<thead>
<tr>
<th>Range</th>
<th>Beat</th>
<th>Yield (clump/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teknaf Sadar</td>
<td>Teknaf Sadar</td>
<td>381</td>
</tr>
</tbody>
</table>
**Socio-economic status**

Educational status of the respondent show that 60% of them are illiterate and 40% are literate. Among the literate on an average 55% have primary education, 8.75% have secondary education. Family status of the respondents shows that average family size in the study area is 6.25% of which 2.5% average male members and rest 3.75% average female member. On average each family has 2.25 earning members of which 2.25 is male average and 0 is female average. Analysis of the family income by the respondents households show that average family income in the study area is 13,000 Tk/month (US$167) and 52000-55000 Tk/yr (US$667-705) of which maximum amount of income 47.5% coming from fishing, 17.5% from field supervisor, 7% from agriculture and beetle leaf worker, 28% are fisherman. Table 6, 7, 8 and 9 illustrating the results of socio-economic survey of the study area.

<table>
<thead>
<tr>
<th>Location/village name</th>
<th>Illiterate (%)</th>
<th>Literate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Pri</td>
</tr>
<tr>
<td>Shilkhali</td>
<td>40</td>
<td>45</td>
</tr>
<tr>
<td>Teknaf</td>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>Shaplapur</td>
<td>80</td>
<td>15</td>
</tr>
<tr>
<td>Jailer dip</td>
<td>90</td>
<td>10</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>60</strong></td>
<td><strong>55</strong></td>
</tr>
</tbody>
</table>

**Table 6: Educational status**

<table>
<thead>
<tr>
<th>Location/village name</th>
<th>Average Family member</th>
<th>Earning member</th>
<th>Male no. average</th>
<th>Female No. Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average</td>
<td>male</td>
<td>female</td>
<td></td>
</tr>
<tr>
<td>Shilkhali</td>
<td>7</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Teknaf</td>
<td>8</td>
<td>3</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Shaplapur</td>
<td>5</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Jailer dip</td>
<td>5</td>
<td>2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>6.25</strong></td>
<td><strong>2.25</strong></td>
<td><strong>0</strong></td>
<td><strong>2.5</strong></td>
</tr>
</tbody>
</table>

**Table 7: Family Status**

**Table 8: Monthly Average Income Status of IFMP Estate**

<table>
<thead>
<tr>
<th>Location</th>
<th>Income/ month(tk) average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shilkhali</td>
<td>5950 (US$ 77)</td>
</tr>
<tr>
<td>Teknaf</td>
<td>6650 (US$ 84)</td>
</tr>
<tr>
<td>Shaplapur</td>
<td>8700 (US$ 111)</td>
</tr>
</tbody>
</table>
5. Discussion

The natural forests of the study area are now under serious threat of exploitation. Once upon a time the total study area was with natural forest. Later, some of the areas were converted into plantations. However, now natural forest stands with only 749.80 ha are remaining with 5717 trees. This may be act as a symbol of earlier forest composition. Now, they are remaining with the government forest department with conventional management system more particularly just protecting the trees from illicit felling and the land from encroachments. If these area also under participated system this forest may have potential to sequester carbon and pave a way to REDD+ implementation. On the other hand, other plantations (in Table 3 with bold marks) of the study area under participated approach with a benefit sharing system (from selling the forest products from thinning and final felling), where forest department will get 45%, Local beneficiary will 45% and 10% for future tree program of sell proceed. The plantations (Table 3: Agar 89.09 cum/ha; Akasmoni: 93.9, 81.31 and 214 cum/ha; Jhau 229.9 and and 209.3 cum/ha) under participated management have showed clear and identical more volume production then the conventional forest management practices (Teak 7.10 cum/ha, Sal : 30.00 cum/ha in table 3). In conventional management practices protection of forest is a major hindrance. As Government of Bangladesh has been made a ban on cutting of trees of government owned forest since 1989 but had a provision was made to cut the trees under participatory management program (social forestry) and now government planned to fell 505 ha of forest land under participated forest management system at Teknaf (Appendix 3). This provision made enthusiasm to the local people to be attached in the management of the forest. The people associated as beneficiary of the forest now protecting and caring their forest resources with the forest department, earlier it was

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Table 9: Dependency on Forest

<table>
<thead>
<tr>
<th>Area</th>
<th>Fuelwood</th>
<th>Timber Extraction</th>
<th>Fuelwood + Timber Extraction</th>
<th>Seedling Cutting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shilkhal</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shaplapur</td>
<td>32</td>
<td>1</td>
<td>47</td>
<td></td>
</tr>
<tr>
<td>Holbunia</td>
<td></td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dohakmapara</td>
<td>29</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jahajpura</td>
<td></td>
<td>5</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Madargunia</td>
<td></td>
<td>17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shilcharipara</td>
<td>23</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>104</td>
<td>43</td>
<td>48</td>
<td>15</td>
</tr>
<tr>
<td>Percentage (%)</td>
<td>50</td>
<td>20</td>
<td>23</td>
<td>7</td>
</tr>
</tbody>
</table>

---

8
a not possible as in the reserve forest ‘everything is prohibited unless permitted’. The socio-economic study revealed that the people of the study area are not highly educated and the illiteracy rate is very high which lead the people more dependent on the adjacent forest for their regular livelihood. Participatory forest management approach with a blend of the road map of REDD+ may not only conserve the forest as a sink of carbon but also may be an option to uplift the socio-economic condition of this area.

6. Conclusion

Bangladesh is a highly populated country where land is one of the most scarce resource. People for their regular livelihood need forest products and services and hence it is under serious depletion. This case study put forward a scene how participatory mangement approach may help forest to reconstruct from its deforested and degraded nature and hence, act as a better option to pave the way in implementation of REDD+ plan in Bangladesh.

7. Acknowledgements

This paper is highly indebted to the students of 8th semester (2008-2009 session), Prof. G.U. Ahmed and Mr. T.K. Bal Assistant professor of IFESCU for field work and data collection.
8. References


2) Appendix 1. Photographs illustrated glimpse of forest environment at Teknaf forest areas.
3) Appendix 2. Individual Volume equation drawn for each species

- Volume equation for Akashmoni (*Acacia auriculiformis*):
  \[ \text{Volume} = 0.02635 + 4.1016 \times 10^{-10} \, (h_t \times d_b^2) \quad [r = 0.999126879] \]

- Volume equation for Teak (*Tectona grandis*):
  \[ \text{Volume} = 0.01719 + 1.22048 \times 10^{-4} (h_t \times d_b^2) \quad [r = 0.87610] \]

- Volume equation for Agar (*Acquillaria agallocha*):
  \[ \text{Volume} = 0.02252 + 1.01387 \times 10^{-4} (h_t \times d_b^2) \quad [r = 0.93456] \]

- Volume equation for Dhaki Jam (*Syzygium grandis*):
  \[ \text{Volume} = 0.09980 + 0.00009 \times 10^{-4} (h_t \times d_b^2) \quad [R = 0.93644] \]

- Volume equation for Arjun (*Termanila arjuna*):
  \[ \text{Volume} = 0.04969 + 1.23939 \times 10^{-4} (h_t \times d_b^2) \quad [r = 0.82007] \]

- Volume equation for Chickrassi (*Chcikrassia tabularis*):
  \[ \text{Volume} = 0.04969 + 1.14172 \times 10^{-4} (h_t \times d_b^2) \quad [r = 0.84219] \]

- Volume equation for Garjan (*Dipterocarpus alatus*):
  \[ \text{Volume} = 0.25559 + 1.00558 \times 10^{-4} (h_t \times d_b^2) \quad [r = 0.85448] \]

- Volume equation for Jhau (*Casua*):
  \[ 702 + 5.01648 \times 10^{-6} (h_t \times d_b^2) \quad [r = 0.73367] \]
4) Appendix 3: Felling areas for next 5 years under participated forest management approaches for Cox’s Bazar Forest division.

### Financial Year 2013-2014

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Range</th>
<th>Area (ha.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dhoapalong</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>Teknaf</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>Cox’s Bazar</td>
<td>30</td>
</tr>
<tr>
<td>4</td>
<td>Panerchara</td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>Ukhia</td>
<td>05</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>95</strong></td>
</tr>
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</table>

### Financial Year 2014-2015

<table>
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<th>Area (ha.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ukhia</td>
<td>80</td>
</tr>
<tr>
<td>2</td>
<td>Inani</td>
<td>47</td>
</tr>
<tr>
<td>3</td>
<td>Rajarkul</td>
<td>60</td>
</tr>
<tr>
<td>4</td>
<td>Shilkhali</td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>Dhoapalong</td>
<td>130</td>
</tr>
<tr>
<td>6</td>
<td>Teknaf</td>
<td>190</td>
</tr>
<tr>
<td>7</td>
<td>Cox’s Bazar</td>
<td>60</td>
</tr>
<tr>
<td>8</td>
<td>Panerchara</td>
<td>40</td>
</tr>
<tr>
<td>9</td>
<td>Hoaikong</td>
<td>120</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>747</strong></td>
</tr>
</tbody>
</table>

### Financial Year 2015-2016

<table>
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<th>Range</th>
<th>Area (ha.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rajarkul</td>
<td>140</td>
</tr>
<tr>
<td>2</td>
<td>Inani</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>Ukhia</td>
<td>75</td>
</tr>
<tr>
<td>4</td>
<td>Silkhal</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>Dhoapalong</td>
<td>110</td>
</tr>
<tr>
<td>6</td>
<td>Hoaikong</td>
<td>40</td>
</tr>
<tr>
<td>7</td>
<td>Panerchara</td>
<td>50</td>
</tr>
<tr>
<td>8</td>
<td>Teknaf</td>
<td>120</td>
</tr>
<tr>
<td>9</td>
<td>Cox’s Bazar</td>
<td>30</td>
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<tr>
<td><strong>Total</strong></td>
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</tr>
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### Financial Year 2016-2017

<table>
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<tr>
<td>2</td>
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</tr>
<tr>
<td>3</td>
<td>Ukhia</td>
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</tr>
<tr>
<td>4</td>
<td>Silkhal</td>
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</tr>
<tr>
<td>5</td>
<td>Dhoapalong</td>
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</tr>
<tr>
<td>6</td>
<td>Hoaikong</td>
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</tr>
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<td>7</td>
<td>Panerchara</td>
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<td>8</td>
<td>Teknaf</td>
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<td>9</td>
<td>Cox’s Bazar</td>
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<td><strong>Total</strong></td>
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<td><strong>625</strong></td>
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### Summary

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<th>Financial Year</th>
<th>Total Area (ha.)</th>
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<td>2014-2015</td>
<td>747</td>
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<tr>
<td>2015-2016</td>
<td>585</td>
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<tr>
<td>2016-2017</td>
<td>625</td>
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<tr>
<td>2017-2018</td>
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Bangladesh: Social Forestry: An Appropriate Approach for Rehabilitation of Degraded Forest and Sustainable Forest Management---A case study in Mymensingh Forest Division, Bangladesh

Mr. Mohammad Moyeenuddin Khan
Mymensingh Forest Division, Forest Department, Bangladesh

1. Abstract

Mymensingh Forest Division in Bangladesh covers an area of 71,287.21 acres of Government Forest Land under the administrative jurisdiction of Mymensingh, Sherpur, Jamalpur and Netrokona District. Since Bangladesh is the most densely populated country in the world, the Forest land of this country is under great threat of encroachment. Forest resources were also at threat to meet the local demand. In such a reality, Forest Department introduced the participatory Social Forestry approach like woodlot plantation, agro-forestry plantation, strip plantation on the sides of roads, railways and embankments etc.

In social forestry approaches, local people (Community members) are selected as the participants, they plan, raise protect and the plantations in association with forest department. Harvesting after 10 years rotation, the participants and other stake-holders gets their share as per agreement. When the Participants started to get the share, they become more inspired in the social forestry practices. Due to local pressure, the forest was thinned and squeezed day by day and it was nearly to be degraded. At that stage the Government took the programme of Social Forestry. Under this programme, the Participants are feeling ownership of the plantation. So they try to protect the trees of the plantation. The forest lands getting its wilderness get-up day by day. Now a-days, the Participants are too much inspired and encouraged that they want to be a participant in Social Forestry Programs by any means.

2. Introduction:

In Bangladesh, Social forestry was introduced, in 1981, with an objective for restoration/rehabilitation of the forest lands with the involvement of local people. Reduction of the local pressure on the forest resources as well as environmental improvement was the main target. Since the local people were the participants (beneficiaries) of the Social Forestry programme, they saved forest resources in association with forest department. Before Social Forestry Programme, the local
people surrounding the forest areas were involved in poaching of trees, many of them lived on illicit felling and trafficking of trees. They mostly lived on growing agriculture crops on the margins of forest lands.

Social Forestry Programs have been initiated with a view to meet the forest product requirements of local population and to reverse the process of ecological and climatic degradation through soil and water conservation and to improve the socio economic condition of the rural people.

Objectives of Social Forestry:

- To meet the needs for fuel wood, small timber, bamboo, fodder and other minor forest produces on sustained basis.
- To provide employment opportunities to the rural population.
- To develop cottage industries in rural areas.
- To utilize the available land to the best advantage according to its production capacity.
- To provide efficient soil and water conservation.
- To improve aesthetic value of the area and to meet the recreational needs of the population.

From last two decades there has been a gradual shift in the forest management approach adopted by Forest Department i.e from its traditional custodian role to a more participatory approach. Accordingly the provision of people’s participation in protecting the natural forest and afforesting the degraded and encroached forest land with benefit sharing mechanism has been developed and people’s participation has been ensured.

Social Forestry Achievements:

| Table: Summary of Harvested Social Forestry Plantation (1999-00 to 2012-13) |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| **Area Felled** | **Timber Quantity** | **Fuelwood Quantity** | **Poles** | **Total sale Proceed** | **Participan t Involved** | **Participan t Share** | **Tree Farmin g Fund** | **GOB Reven ue** |
| **km/h a**      | (Thousand Cubic m.) | (Thousand Cubic m.) | (Thousand Nos) | (Crore Tk) | (Thousand Nos) | (Crore Tk) | (Crore Tk) | (Crore Tk) |
| 23.253 ha & 10.729 km | 4,46,580 | 4,95,110 | 4542.16 | 461.91 | 105.92 | 208.34 | 45.19 | 190.46 |
3. Key element relating to the case study:

The Forest policy of Bangladesh, 1994 has given importance to the social Forestry Programme, and it illustrates the guidelines to restoration/rehabilitation of the forest lands through Social Forestry activities. It imparts importance on the proper management of the hydrology and geology as well as the forest resources and bio-diversity conservation through tree planting. The forest policy also given emphasis on the social forestry activities in the marginal lands and in the fallow lands.

In the light of forest policy, 1994, the forest Act, 1927 has been amended in 2000 for successful implementation and sustainable management of the Social Forestry Programme. Social Forestry rules have been promulgated in 2004 and were amended to make it time be-fitting and more effective in 2010. It illustrates the complete guidelines for Social Forestry system.

Different aspects of social forestry rules, 2004 (amended in 2010):

**Term of agreement and renewal**

The period of agreement under this rule shall be as follows:

a. in case of sal forest, 20 years, renewable twice up to rotation period:

b. in case of natural forest, 20 years, renewable once up to rotation period:

c. in case of woodlot, agroforestry, strip plantation, foreshore, barendra tracts and other sites fruit trees, the period for which such a tree shall bear fruits normally.

d. In case of woodlot, agroforestry, charland plantation, strip plantation, plantation in Barind Tracts and other sites, minimum 10 years and maximum 20 years, renewable twice or thrice up to rotation period for maximum 40 years.

**Selection of beneficiary:**

The beneficiaries shall be selected by the Forest Department in consultation with the local Government organization of that area and the non-Government organization associated with social forestry of that area. Generally, the beneficiaries shall be selected from amongst the local inhabitants living within one kilometer of the respective plantation site of Social Forestry and shall preferably be from amongst the following persons.
(a) landless persons:
(b) owners or occupants of less than 50 decimals of land;
(c) destitute women:
(d) unprivileged community:
(e) poor ethnic minority:
(f) poor forest villagers and
(g) insolvent freedom fighters or insolvent successor of freedom fighters.

In the event of insufficient number of beneficiaries from within one kilometer of the plantation site, such beneficiaries residing in the nearest areas may be selected.

The selected beneficiaries must be willing to associate themselves with social forestry activities.

**Duties and functions of Forest Department in social Forestry**-

The forest department shall have the following duties and functions in implementing social forestry programs-

(a) Selection of beneficiaries:

(b) Making work plan for plantations, to provide assistance in preparing work plans for social forestry programs initiated by local community and to approve such work plans.

(c) providing technical advice to the beneficiaries in respect of raising social forestry and its management and where necessary, accepting co-operation of any Government or non government organization in the respect:

(d) making agreement with land owning person or agencies, beneficiaries And non-Government organizations and others;

(e) monitoring of social forestry activities and reviewing of Tree Farming Fund.

(f) to impart training;

(g) marketing of final harvest and distribution of its income among all parties
(h) where the beneficiaries are unable to produce quality seeds or seedlings, assisting them in getting such seeds or seedlings;

(i) cutting the branches of trees creating obstacles to the vehicular traffic or any other obstacles;

(j) to cancel agreement with beneficiaries in case of failure to perform duties

(k) to develop necessary guidelines to beneficiaries in extraction and utilization of forest produces of social forestry programs initiated by local community in accordance with approved work plans.

Duties and functions of beneficiaries under agreement-

The beneficiaries under agreement shall have the following duties and functions-

(a) To participate in the development or social forestry management plan:

(b) To prepare work plans jointly with the forest department, to prepare work plans for social forestry programs initiated by local community with the assistance form the forest department and implement the such approved work plans:

(c) Raising seedlings for plantation:

(d) Planting trees and taking care of planted trees, maintenance and protection of trees planted:

(e) Thinning and pruning of trees as per approved plan:

(f) Attending meetings related to social forestry being invited:

(g) Any other activity as per approved plan:

(h) To arrange required investment in social forestry programs initiated by local community with the consent of the forest department: and

(i) Sending representative to concerned forest Division in marketing crops.
Distribution of income derived from social forestry:

(1) The branches derived from pruning and trees felled during first thinning and the fruits of fruit bearing trees and agricultural crops grown, shall be receivable in full by the beneficiaries.

(2) The income derived from trees felled at anytime after the first thinning and after completion of rotation shall be distributed as follows, namely:

(a) In the case of woodlot, latex and fruits produced from rubber plantation and a Agro-forestry in the forest under the control of the forest department.

<table>
<thead>
<tr>
<th>Parties</th>
<th>Receivable rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Forest Department</td>
<td>45%</td>
</tr>
<tr>
<td>(ii) Beneficiaries</td>
<td>45%</td>
</tr>
<tr>
<td>(iii) Tree Farming Fund</td>
<td>10%</td>
</tr>
</tbody>
</table>

(b) in the case of protection and development of sal forest-

<table>
<thead>
<tr>
<th>Parties</th>
<th>Receivable rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Forest Department</td>
<td>65%</td>
</tr>
<tr>
<td>(ii) Beneficiaries</td>
<td>25%</td>
</tr>
<tr>
<td>(iii) Tree Farming Fund</td>
<td>10%</td>
</tr>
</tbody>
</table>

(c) in the case of strip plantation raised on lands owned or occupied by a person or public or statutory body other than the forest department-

<table>
<thead>
<tr>
<th>Parties</th>
<th>Receivable rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Forest Department</td>
<td>10%</td>
</tr>
<tr>
<td>(ii) the person or body owning or occupying the land</td>
<td>20%</td>
</tr>
<tr>
<td>(iii) Beneficiaries</td>
<td>55%</td>
</tr>
<tr>
<td>(iv) Local union parishad</td>
<td>5%</td>
</tr>
<tr>
<td>(iv) Tree Farming Fund</td>
<td>10%</td>
</tr>
</tbody>
</table>
d) in the case of plantation in charland and foreshore-

<table>
<thead>
<tr>
<th>Parties</th>
<th>Receivable rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Forest Department</td>
<td>25%</td>
</tr>
<tr>
<td>(ii) Beneficiaries</td>
<td>45%</td>
</tr>
<tr>
<td>(iii) the land owner or person occupying the land</td>
<td>20%</td>
</tr>
<tr>
<td>(iv) Tree Farming Fund</td>
<td>10%</td>
</tr>
</tbody>
</table>

(e) in case of gully and pond bank rehabilitation and Plantation in Barind tracts-

<table>
<thead>
<tr>
<th>Parties</th>
<th>Receivable rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Forest Department</td>
<td>25%</td>
</tr>
<tr>
<td>(ii) Beneficiaries</td>
<td>45%</td>
</tr>
<tr>
<td>(iii) the land owner or person occupying the land</td>
<td>20%</td>
</tr>
<tr>
<td>(iv) Tree Farming Fund</td>
<td>10%</td>
</tr>
</tbody>
</table>

(f) in case of existing plantation and natural forest, except sal forests-

<table>
<thead>
<tr>
<th>Parties</th>
<th>Receivable rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Forest Department</td>
<td>50%</td>
</tr>
<tr>
<td>(ii) Beneficiaries</td>
<td>40%</td>
</tr>
<tr>
<td>(iii) Tree Farming Fund</td>
<td>10%</td>
</tr>
</tbody>
</table>

(g) in case of social forestry initiated by social community in land under the Forest Department of after mangrove a forestation; controlled production of honey, fishes, hogla and grass in the said plantation-

<table>
<thead>
<tr>
<th>Parties</th>
<th>Receivable rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Forest Department</td>
<td>25%</td>
</tr>
<tr>
<td>(ii) Beneficiaries</td>
<td>75%</td>
</tr>
</tbody>
</table>

(h) in case of social forestry initiated by local community in land either semi-Government or autonomous body-

<table>
<thead>
<tr>
<th>Parties</th>
<th>Receivable rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Forest Department</td>
<td>10%</td>
</tr>
<tr>
<td>(ii) Beneficiaries</td>
<td>75%</td>
</tr>
<tr>
<td>(iii) the land owning agency</td>
<td>15%</td>
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Sustainability of Social Forestry Programmes

The Social Forestry Rules

The Forest Act, 1927 has been amended in 2000 to support and encourage Social Forestry/ participatory forestry activities in the country. Social Forestry Rules, 2004 have been promulgated and has been amended in 2010 to make it more effective and time be-fitting. Forest Act and Social Forestry Rules will provide legal support to participatory forestry and will also ensure sustainability to social forestry programmes.

The Tree Farming Fund (TFF)

Participatory plantations are being raised from development budget using both government and loan money. Participatory Forestry cannot be made sustainable using government fund only. Tree Farming Fund (TFF) has been developed using 10% money from the final harvest to reduce dependency on Government and donor fund. The Ministry of Finance has approved TFF. The participants will operate the TFF. TFF will provide 50% of the replanting cost. The remaining 50% cost will be provided by the project. If TFF doesn't cover 50% of the replanting cost, the participant will contribute voluntary labour to cover the gap. TFF and participatory labour contribution will make participatory forestry sustainable.

Major Social Forestry Activities:

Social Forestry was initiated by Bangladesh Government with Communality Forestry Project with the financial help from Asian Development Bank (ADB) in 1981-82 (Duration 1981-82 to 1986-87). Under this project 4892.0 hac. woodlot 121.0 hac agro-forestry and 4288.0 km. strip plantation was raised besides, 22158 no. of participants/village leaders/ NGO workers were trained up in social forestry under this project.

The Thana Afforestation and Nursery Development Project was implemented from 1989-90 to 1994-95. under this project 19,562.00 hac of woodlot plantation, 5,180.0 hac. of agro-forestry plantation, and 18,800.00 km of strip plantation was raised. Besides 90,900.00 hac. of participants/village leaders/ NGO workers were trained up in Social Forestry by this project.

In 1995-96 and 1996-97 fiscal year under Extended Social Forestry Project 582.00 hac. woodlot plantation, 967.00 hac agro-forestry plantation and 3658.00 km strip plantation was raised. Besides, 5,000 participants/village leaders/ NGO workers were trained up in social forestry.
From 1995-96 to 2001-02, under Coastal Green Belt Project 8,934.00 km strip plantation and 665.00 hac foreshore plantation was raised. Besides, 48,561 nos. of participants/village leader/ NGO workers were trained up in Social Forestry.

Then from 1997-98 to 2005-06 under Forestry Sector Project 12,375.00 hac. woodlot, 3,708.00 hac agro-forestry, 1,035.00 hac block plantation, 1,850.00 hac charland forestation, 14,353.00 km strip plantation, 1,050.00 hac. enrichment plantation and 6,187.00 hac assisted natural regeneration (ANR) in degraded sal Forest was raised. Besides, 1,39,801 participants/village leaders/ NGO workers were trained up in Social Forestry.

Under Poverty Alleviation through social forestry project (March,2010 to December, 2013) 300.0 hac charland afforestation (new), 50.00 hac. charland afforestation (2nd rotation), strip plantation (new) along the roads, railways, embankments etc. 7,100.00 km, strip plantation (2nd rotation) along the roads, railways, embankments 10,563.00 km, was raised. Besides, 70,530.00 participants/village leaders/ NGO workers were trained up in Social Forestry.

Besides these, Co-ordinated Reedland afforestation project (duration 2005-2010), Social Forestry for Forest Resource Development and Management Project (duration 2006-08), Agar Plantation Project (duration 2007-2012), Poverty Alleviation through Participatory Forestry (duration 2006-08) Projects were implemented with the concept of Social Forestry to restore and rehabilitate the degraded Forests of Bangladesh.

4. Lessons learnt:

Social Forestry activities in Mymensingh Forest Division:

The Forest lands under the jurisdiction of Mymensingh forest Division was dominated with sal trees (Shorea Robusta) in association with other associate species. But due to tremendous socio-anomic and political pressure and due to evolvement of industrialization this forest is in danger and under great threat of degradation.

In Mymensingh Forest Division approximately 20.0 crore taka has been distributed as dividends among 10,000 nos. of social forestry participants (beneficiaries). The Social Forestry activities done under Mymensingh Forest Division. are as Follows (from 2000-2001 to 2012-2013) :
<table>
<thead>
<tr>
<th>SL No.</th>
<th>Year</th>
<th>Woodlot and agro-forestry block plantation (Hac)</th>
<th>Strip plantation (Km)</th>
<th>Woodlot and agro-forestry block plantation (Hac)</th>
<th>Strip plantation (Km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>2000-2001</td>
<td>1182.46</td>
<td>206.0</td>
<td>614.07</td>
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<td>2.</td>
<td>2001-2002</td>
<td>1274.53</td>
<td>288.0</td>
<td>849.55</td>
<td>108.00</td>
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<td>3.</td>
<td>2002-2003</td>
<td>1135.80</td>
<td>145.0</td>
<td>785.38</td>
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<td>4.</td>
<td>2003-2004</td>
<td>2500.0</td>
<td>200.0</td>
<td>1325.0</td>
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<td>5.</td>
<td>2004-2005</td>
<td>1656.95</td>
<td>155.0</td>
<td>745.0</td>
<td>65.0</td>
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<td>6.</td>
<td>2005-2006</td>
<td>1567.60</td>
<td>165.0</td>
<td>178.0</td>
<td>65.0</td>
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<td>7.</td>
<td>2006-2007</td>
<td>400.0</td>
<td>10.0</td>
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<td>8.</td>
<td>2007-2008</td>
<td>625.0</td>
<td>10.0</td>
<td>0.0</td>
<td>10.0</td>
</tr>
<tr>
<td>9.</td>
<td>2008-2009</td>
<td>130.0</td>
<td>3.40</td>
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<tr>
<td>10.</td>
<td>2009-2010</td>
<td>150.0</td>
<td>29.0</td>
<td>0.0</td>
<td>29.0</td>
</tr>
<tr>
<td>11.</td>
<td>2010-2011</td>
<td>83.10</td>
<td>110.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>12.</td>
<td>2011-2012</td>
<td>100.97</td>
<td>136.0</td>
<td>54.45</td>
<td>46.0</td>
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<tr>
<td>13.</td>
<td>2012-2013</td>
<td>719.36</td>
<td>77.00</td>
<td>669.36</td>
<td>47.00</td>
</tr>
<tr>
<td></td>
<td><strong>Total:</strong></td>
<td><strong>11526.79</strong></td>
<td><strong>1534.40</strong></td>
<td><strong>5220.81</strong></td>
<td><strong>495.00</strong></td>
</tr>
</tbody>
</table>
Cambodia: Forest Restoration and Plantation in Cambodia

Mr. Piseth Ken
Department Forest Plantation and Private Forest Development in Forestry Administration

1. Background

Forest resources have been benefiting our national society to great extent. Forest is not only beneficial economically, it contains such indispensable characteristics as maintaining natural environment, improving climate, making the air fresh, maintaining regularity of water source, protecting slopes and biodiversity, contributing to the reduction of greenhouse gas emission into the atmosphere and helping support the livelihood of millions of people who rely on forest products and non-timber forest products.

Nonetheless, Cambodia has succeeded in maintaining varied and extensive forest covering more than 10.8 million hectares, including plantation and bamboo. They contain biologically unique landscape and are of significant culture heritage, and are potentially highly productive. Furthermore, Cambodian forests are of intimately linked to agriculture and in-land fisheries, and to maintaining the sustainability and productive of both these sectors.

The majority of our rural population is subsistence farmers, 75% of these, as well as landless families; depend on access to natural resource for essential products, energy and food, particularly in times of hardships. Forests also provide household opportunities for diversification, supplementary income, and employment created by forest product-based enterprise.

2. Deforestation in Cambodia

During the 1980s, the triple-party Government used the forests for cover, and its resources to finance their activities. After the survival from the Pol Pot regime the resources were used to finance restoration work.
Based on assessment data in 1965 documented the forest cover remaining as 73.04% of the total land area. The 1990s gave rise to numerous large-scale concession creating a system that, due to circumstance at the time, gave leeway to illegal and unsustainable logging so in 1993 the forest cover had declined to 59.82% and it continued to decline, reaching 58.60% of the total land area by 1997 and otherwise in 2002 the forest area was assessed as 61.15% of the total land area, decreasing to 59.09% in 2006 and 57.07% in 2010.

3. National Forest Programme 2010-2029

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 centre of sustainable forest management.

The National Forest Programme will be guided, among others, by the Cambodia Millennium Development Goals for poverty reduction, environmental sustainable and attainment of 60% forest cover by 2015.

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:

**Programme I: Forest Demarcation, Classification and Registration**
- Forest Demarcation, forest classification and Registration
- National Function-based Forest Classification

**Programme II: Conservation and Development of Forest Resource and biodiversity**
- Forest Management Plan
- Development and management of Production Forest
- Monitoring, Assessment and Reporting for SFM
- Biodiversity and Wildlife Conservation
- Conservation and Development of Genetic Resource and seed source
- Tree plantation and Development of Forest Plantation
- Development of Forest Products and Market promotion
- Wood Technology Development and Forest Product Processing
- Forest Certification

**Programme III: Forest Law Enforcement and Governance**
- Legal and Administrative Reform
- Law enforcement and Forest Crime Monitoring and Reporting
- Rapid Response on Forest Crime Information
- Conflict Management System
- Monitoring, Reporting and Learning System

**Programme IV: Community Forestry Programme**
- Community Forest Identification and formalisation
- Community, Institutional and Livelihoods Development
- Community Forestry Development Support

**Programme V: Capacity and Research Development**
- Institutional and Human Resource Development
- Extension and Public Awareness
- Research Capacity Building Development

**Programme VI: Sustainable Forest Financing**
- Government Financing
- Income from Forest Sector
- Income from the Private Sector and Community forestry
- Financing via Donors
- Innovation Financing from Payments of Environment services and Carbon Credit

**Figure 1: The National Forest Programme Framework**
3.1 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 efficiency and benefits from forest services
- To support wood processing technology development, and enhance quality forest products and market promotion.

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.

Sub Programme 2.6 Tree plantation and Development of Forest Plantation

National development programme in Cambodia recognize the importance of forest resource to rural livelihood, and peoples’ to those resource. The Forestry Administration’s efforts to create an enabling environment for multipurpose tree
planted and to develop plantation forestry will focus on multi-purpose tree plantation, which have a potential to supply domestic timber needs, increase income of local community and improve the environment through watershed protection and erosion control. It is important that such as plantation are developed wisely and consider various species for multi-purpose planting for long-term and short-term rotation; for example, Dipterocarpus alatus Hopea adorata Azadirachta, rubber trees, Eucalptus spp., and Sesbania grandiflora. It is important that plantations are developed in line with market needs or possible future demands. In this case, it is also important to consider species that are known and already utilized by local communities. Familiarity with a topic will lessen the possible adverse attitude local villages may have toward the programme, and encourage these to participate on a larger scale. This may even promote private initiatives, where communities plant tree on their own on open land.

4. Forest Plantation Statistics of Cambodia

Forestry Administration, especially department of forest plantation and private forest development, was interesting with the forest restoration and plantation through under cooperation with relevant stakeholders such as government, sub-national level, society civil and private sector in order to achieve 60% forest cover by 2015 in the National Forest Programme. Since 1985 till 2011, FA has been achieved with forest plantation and restoration on 18726 ha, including with ground level of FA.

Department of forest plantation and private forest development has 16 forest restoration and plantation stations, 25 nurseries and 6 agro-forestry pilots test in order to achieve of NFPs’ expect result as below:

- To forest plantation supply in domestic international market and source of income
- To participate the environment protection, soil quality improvement, protection of soil erosion and natural disasters.
• A major species conservation, breeding and testing in order to wood species utilization of economic effectiveness

• To growth a major species for sharing to citizens in order to forest plantation mobilization at garden, porn band, a long street in village, commune, publish, school and pagoda by cooperation with commune council in order to converting rural area to a green forest cover and avoid on natural forest utilization and poverty alleviation participation with the Royal Government of Cambodia.

• To conduct a research and breed through species plantation establishment and plot sample of species plantation.

Beside of ground-level of forest administration, the forest restoration and plantation station also was pushing on forest plantation of domestic species, which supported fund by the Royal Government of Cambodia. Totally, these stations restored the forestland reached to 12945 ha with a domestic species such as Cassisa Siamea Lam, Dipterocarpus alatus Roxb, Eucalyptus, Hopea odorata Roxb, Peltophorum dosyrrhachis Kurz, Tectona grandis L.t, Dalbergia cochinchinensis Pierre.

**Arbor Day**

Forest administration always annually celebrated the Arbor Day in 9 July by His Majesty the King Norodom Sihamoni plants young tree and offers saplings to a local resident in order to dissemination on forest beneficial and this event was attended by senior officials of government and representatives of relevant non-governmental organizations as well as thousands of local residents and students.
Beside the Arbor Day in national, the ground level of FA also conducted this event for encourage and disseminate to local resident on forest plantation because it is importance our life and country.

Nurseries

In year to year nurseries which under managed department of forest plantation and private forest development, have always distributed some tree to local residents in order to plant a long village street, pagodas, schools and high-ranking of government officer, especially Samdech Akka Moha Sena Padei Techo Hun Sen always distributed some seedling to residents.
● There are still destroying forest plantation in some forest restoration and plantation stations in order to land encroachment for private owner.
● Lack of support and cooperate from partners and NGOs on forest restoration and plantation.
● Forest fire and disaster on new seedling in some forest restoration and plantation stations.

6. Conclusion

The Forestry Administration do hope that forest plantation will create an enabling environment for multipurpose tree plantation and to develop plantation forestry that focus on multi-purpose tree plantation, which have a potential to supply domestic timber needs, increase income of local community and improve the environment through watershed protection and erosion control and especially increase forest cover to 60% as stipulated in the Millennium Development Goal.

Otherwise, the National Forest Program has also raise a strongly expected with forest restoration and plantation for fit the III rectangular strategy of the Royal Government and Cambodia on improve agricultural productivity and diversification through land reform, fishery and forestry reforms. As below:

● An enabling environment for local investments in multi-purpose tree plantation is established through ongoing reforms to secure local people’s rights to benefit from all aspects of plantation activities.
● Rural people’s involvement in multi-purpose plantation increase steadily, and as a result local incomes and livelihoods in participating communities are improved.
● Watershed protection and reduced soil erosion in participating area.
● Improved sustainable supply of timber and poles through production of wood products at local and national level.
Lao PDR: Sustainable Forest Management and Rural Development in Lao PDR

Mr. Airyai Vongxay

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1. **Background:**

Lao PDR is a land lock country surrounded by 5 countries: China, Myanmar, Vietnam, Thailand and Cambodia. The total land area is 23,680,000 ha with forest land cover's 41%. The total population is around 6 million people mostly living in rural areas (60%). The forest is divided into three types: conservation, protection and production forest. which area about 3.8 million ha respectively. Unless there is a plantation forest and village forest that the area of about 0.4 ha million and 0.8 ha respective.

According to the mandate the MAF/DOF has responsibility managing the PDF, Village forest and Plantation forest. While conservation forest, protection forest responsible by DFRM under the MONRE

At the moment, the sustainable forest management has been parallelly conducting with the rural development by focusing to the forest rehabilitation of all three forest types mentioned.

2. **The production forest management activities and steps:**

1. Provision and delineation of the production forest management areas
2. Propose and approve the production forest management area by the Government
3. Forest management inventory: divided into Sub-production forest managements areas, compartments, based lines and survey lines.
4. Data entering, analysis and provide into the Annual Logging Areas by rotations
5. Pre-logging survey and doing cutting regime
6. Tree marking survey
7. Monitoring and evaluation by the Sustainable Forest Management Committee for conducted logging operation.

8. Rehabilitation planning: natural reforestation in production forest areas, enrichment planting on degraded forest areas and planting on opened forest areas.


11. Forest protection and seedling maintenance: weeding, replanting and/or watering.

3. Degraded forest land and forest rehabilitation:

3.1 Natural forest rehabilitation:

The total areas of the natural degraded forest is 6.13 million hectares that can be rehabilitated.

For five year planning 2006-2010, the Forestry Sector could be conducted the forest rehabilitation in the natural forest 613.816 ha of 2.550.000 ha.

3.2 Plantation and seed sources:

There were 100 seed sources in the whole country undertaken by the Government with 6.665 trees, 28 species in the areas of 9.188 ha. During the year of 2007-2008, 227.7 tones of seed are collected from the 100 seed sources, sown and transplanted of 113.260.000 seedlings of which can be planted in 40.050 ha.

3.3 Main problems of forest rehabilitation:

- Not clearly understanding for local organization: Province and District levels and small scale/process.
- Limited of the Government investment fund for the forest rehabilitation and planting.
- Few of plantation maintenance especially the plantation owned/funded by the Government.
- Not completed land delineation for the planting investment of industry tree species.
The Government land approving to the investment portions and contractors (internal and external) are very complex and not clear between the Investment Sector, the Provincial land Management Office, the Environment Sector and Forestry Sector.

Many Organization Levels: Central, Province and District can approve the land for business men or contractors.

The investment for 2+3 model will be a main gap for business sector and less benefit to the government and farmers participated.

Delay of approving the plan and the use of the Forest Development Fund for forest rehabilitation and tree planting.

4. The participated village development activities:

4.1. Capacity building of village organizations and staffs.

Objective:

To ensure the village organization works effectively and comfortably with the District and the Project(s).

Main tasks:

- Develop skills and the ability to undertake their allocated tasks
- Develop facilities and the physical capacity for the village organization

4.2. Forest and Land use zoning and planning

Objective:

To delineate and organize land for production for villagers to manage, expand and use in a productive and sustainable manner,

To identify the types, and delineate the areas of forests for villagers to manage and use in a productive and sustainable manner,

To provide the framework for, and to facilitate the step by step reduction of forest slashing for upland cropping, eventually leading to the complete cessation of shifting cultivation.

Main tasks/prcesses:

- Preparation and orientation of staffs and villagers.
• Establish the Village and Group Village Development Committee of Land Use Zoning planning.

• Review of Village boundary delineation

• Understanding indigenous land management and historical change in land use.

• Current forest type, land use and land cover mapping by villagers themselves. This can be facilitated by use of satellite images interpretation, followed by detailed villager participatory mapping and field checking.

• Socio-economic analysis and estimation of future production land requirement for cropping, livestock, houses, infrastructure and forest for the whole village population based on a 20 years horizon.

• Forest and Land Zoning: Focuses on conservation of medium and good quality Forest (for PFA or village forest), while identifying areas with potential for current or future use for villagers livelihoods. Areas which are being progressively degraded or developed and either (a) decided to be regenerated as production forest or designated for potential future development as cropland, plantation land or community use.

• Village Forest and Agricultural Land Management Agreements.

• Installation of markers on the boundary of keys zones, in key locations.

4.3. Village Development Planning:

Objectives:

• To set up an appropriate village development plan and a target of poverty reduction.

• To provide a guide to the implementation of development activities which are effective in meeting the local needs

• To improve and develop the capacity of the village organization in their mandated role of responsibility for village development planning and management.
To improve the village forest situation in order to sustainably manage and use of forest.

**Process steps:**

- Basic socio-economic data collection
- Identification and then analysis of village problems and opportunities
- Developing and drafting of the Village Development Planning including the Joint Village Agreement making, logging and forest rehabilitation agreement and others.
- District review and approval of the Village Development Planning.
- Carrying out on Village Development including forestry development activities: forest surveys, tree marking, logging, logging area maintenance, forest rehabilitation: site preparation; nursery works; seedling preparation and transportation, planting, seedling maintenance.

**4.4. Village Development Grants:**

The SUFORD Project, participant villages are provided with a Village Development Grants (VDG), of USD 8.000 and 4.000 per village in the 1st and 2nd phase village respectively.

**Objectives:**

- To promote alternative means of income-generation resulting from village investments may reduce direct pressure on surrounding forests.
- The Village Development Grants are provided as an expression of goodwill or appreciation from the GoL to those villagers for their participation and management of the production forests.
- To give villages experience in administering revenues from forest management.

**Main tasks:**

- Village Development Grants Policies
- Types of activities eligible for support by Village Development Grants (VDG)
- Types of activities prohibited to be supported by VDGs.
- Villager decisions on how to use the Village Development Grants
- Villager decisions about implementation and procurement
- Selection of participant households
- Developing VDG activities proposal document.
- Use of returned VDG loans.

4.5. Support to Village Finances Management

**Fund mobilization:**

- Flow of VDG Funds: how the funds flow from the central office to the villages, how the disbursement process function, how the village access the funds and the required accounting, bookkeeping and auditing procedure.

- Fund management of villagers: village meeting for selection of Village Development Committee of Financial Management Unit to be responsible for initial disbursements and procurement, contracting and payment to contractors (infrastructure) and to the households loaned the funds and monitoring the payment of loans.

- Village Bank Accountings and Cash Box: village bank accounting opening and preparing for the use of the fund.

- Accounting and record keeping in relation to disbursement of VDG: The District staff may be helped and able to:
  - Advice villagers on determining the most efficient and effective method for construction and procurement;
  - Assisting villagers to manage construction and to supervise works undertaken by a contractor;
  - Reporting on project technical progress and problems, and certification of completed works.
5. **Provisions of training and other technical assistance are conducted by the Central portion as Project Staffs and advice requested by villagers:**

- Suggesting or explaining to villages that some of the VDG could be used to make loan to producer groups or individuals to establish small scale enterprise.
- Assisting (training, explaining) in conducting cost benefit analysis, activity models and gross margin budgets, business planning and accounting
- Providing technical training and skills development and technical planning capacity:
- Conducting study tours to other similar ventures; and
- Developing linkage to markets, and/or developing an understanding of markets, market quality and design requirements.

6. **Monitoring and Evaluation:**

The monitoring and reporting of financial and physical progress of VDG activities will be conducted by the Village Development Committee (VDC):

- Monitor and record the progress of each household, both physical and financial (payment progress; and
- Report to the District at the end of each quarter:
  - Report 1. the financial progress of each household or individual,
  - Report 2. for livestock activities, a summary of the physical progress for the whole group or village (not for the household),
  - For other activities (rice, fish weaving) they will submit a combined ledger and report format at household level.

7. **Local stakeholders including:**

- The District Governor Office;
- The Planning Office including the Statistic Office;
• The Grassroots Construction and Rural Development Offices;
• The Education and the Health Offices;
• The Lao Women Union;
• The Lao National Front for Construction
• The Agriculture and Forestry Office.

1. The Government Forestry Development Projects focusing on forest conservation and rehabilitation for the three forest types in the whole country supported by the Forest Development Fund of the Lao PDR Government.


8. Support and Funds:

The Sustainable Forest Management and Rural Development Project (SUFORD) supported and funded by the World Bank and the Government of Finland, has implemented the project plan for the first phase from the year 2005-2008 and the Project will be continued and extended for the second phase from 2009-2011 in 5 provinces, 16 districts, 8 Production Forest Management Areas (PMA) in the whole country. The main objectives of the Sustainable Forest Management and Rural Development Project (SUFORD) are to put priority natural production forests under sustainable forest management, and to link such management with improvement villager livelihoods. Thus, at the village level, the SUFORD project has two main components (1) production forest management and (2) village development. In the first phase from 2005-2008, the SUFORD Project has finished implementing the sustainable forest management plan in 4 provinces, 18 districts, 412 villages participated, 8 Production Forest Management Areas with 713.327 ha. For the second phase from 2009-2011, the Project planned to continue and extend the project activities in the production forest management areas in 5 provinces, 16 districts, 714 villages participated, 8 Production Forest Management Areas (PMA) with 603.549 ha.

9. Referenced:
• The Forestry Law, dated on December 24, 2007
• The Land Law,
- The Prime Minister's Decree No. 59, dated on May 22, 1993 dealing with the Sustainable Production Forest Management.

- The Prime Minister's Decree No 17, dated on November 22, 2008 dealing with the additional forest management improvement and coordination.

- The Forestry Strategy Plan to the year 2020

- The Ministry of Agriculture and Forestry Regulation No. 0204, dated on October 3, 2003 dealing with the production forest establishment and sustainable management.

- The Ministry of Agriculture and Forestry Agreement No 0051, dated on 20/4/2009 dealing with the Forest Rehabilitation.

- The Ministry of Agriculture and Forestry Guideline No 105, dated on 12/3/2009 regarding the implementation along with the Prime Minister’s Decree No 17.

- Others Official Document concerned with the forest land and forest management.
Malaysia: 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.

Keywords: 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 twelve (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 gazetted them as Permanent Reserved Forests (PRFs) 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 5.79 million hectares or 43.9% of its total land area (Anon., 2010). These forests consist of unique and complex ecosystems which are home to the country’s rich flora and fauna. In Peninsular Malaysia, the major forest types consist of 4.4 million hectares dry inland forest which is the main forest cover, 0.24 million hectares peat swamp forest and 0.09 mangrove forests. Of the total forested area in Peninsular Malaysia, 4.89 million hectares are Permanent Reserved Forests (PRFs), 0.30 million hectares are State/Alienated Land Forests and 0.59 million hectares are National Park/ Wildlife and Bird Sanctuary. In the year of 2012, approximately 0.09 million hectares of the PRFs are designated as production forests managed under sustainable forest management and the remaining are preserved and being protection 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 Permanent Reserved Forests (PRFs) 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 2014, it was recorded in Malaysia that approximately 0.50 million hectares of forested land has been fire in just only 2 months (January-February 2014).
The other factor of forest fire is shifting cultivation done by local community for their secondary source of food and income. In 2013, approximately 0.30 million hectares from forested land in Peninsular Malaysia is identified as a poor and degraded forest. According to Asian Development Bank in a year of 1990, it was confirm that about 0.05 million hectares of forested land in Peninsular Malaysia was degraded due to the shifting cultivation practices. Degraded Forest distribution in Peninsular Malaysia is as Figure 1.

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 Permanent Reserve Forest (PFRs). 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. This development plan will cover up to 0.06 million hectares degraded forest in Peninsular Malaysia for the year of 2011 to 2024.

**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 1978 (Revised 1992) which emphasizes that the Permanent Reserve Forest (PFR) 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 National Forestry Policy 1978 (Revised 1992) 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, Indicators, Activities and Management (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 Permanent Reserve Forest based on the inherent capability of the forest, its optimal use and on comprehensive forest land use
through forest regeneration and rehabilitation. FDPM 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

Recognising 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 Logging Under the Selective Management System (SMS)**

FDPM has been practising SMS in dry inland forests, peat swamp forests and mangrove forests of PRF since 1978. It was implemented in Peninsular Malaysia due to the change in forest harvesting mainly to the hill Dipterocarp forest where conditions such as steeper terrain and lower species richness do not favour a drastic opening of forest in one cut. 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 20-50 years for mangrove forest.

The SMS involves three key stages, namely inventory before logging (pre-felling), logging (felling) and inventory after logging (post-felling). Selective logging 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 – 12 matured trees are felled in every hectare and 32 residual trees are left to form the nest 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 types of planting approaches are practiced which are line planting and group planting. To date, a total 35,896 hectares of PRFs 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 -2012

<table>
<thead>
<tr>
<th>State</th>
<th>1970-2000 (ha)</th>
<th>2001-2005 (ha)</th>
<th>2006-2010 (ha)</th>
<th>2011-2012 (ha)</th>
<th>Total Planted (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Johor</td>
<td>1,804</td>
<td>648</td>
<td>44</td>
<td>168</td>
<td>2,664</td>
</tr>
<tr>
<td>Kedah</td>
<td>1,051</td>
<td>25</td>
<td>426</td>
<td>204</td>
<td>1,706</td>
</tr>
<tr>
<td>Kelantan</td>
<td>3,695</td>
<td>400</td>
<td>275</td>
<td>-</td>
<td>4,370</td>
</tr>
<tr>
<td>Melaka</td>
<td>399</td>
<td>-</td>
<td>76</td>
<td>-</td>
<td>475</td>
</tr>
<tr>
<td>N. Sembilan</td>
<td>958</td>
<td>210</td>
<td>199</td>
<td>66</td>
<td>1,433</td>
</tr>
<tr>
<td>Pahang</td>
<td>4,963</td>
<td>2,503</td>
<td>2,692</td>
<td>1,017</td>
<td>11,175</td>
</tr>
<tr>
<td>Perak</td>
<td>5,350</td>
<td>142</td>
<td>858</td>
<td>871</td>
<td>7,221</td>
</tr>
<tr>
<td>Perlis</td>
<td>150</td>
<td>-</td>
<td>10</td>
<td>100</td>
<td>260</td>
</tr>
<tr>
<td>Pulau Pinang</td>
<td>10</td>
<td>1</td>
<td>-</td>
<td>10</td>
<td>21</td>
</tr>
<tr>
<td>Selangor</td>
<td>3,661</td>
<td>336</td>
<td>280</td>
<td>203</td>
<td>4,480</td>
</tr>
<tr>
<td>Terengganu</td>
<td>1,779</td>
<td>60</td>
<td>-</td>
<td>252</td>
<td>2,091</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>23,820</strong></td>
<td><strong>4,325</strong></td>
<td><strong>4,860</strong></td>
<td><strong>2,891</strong></td>
<td><strong>35,896</strong></td>
</tr>
</tbody>
</table>

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. Realising 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

(A) Under-Story Species

<table>
<thead>
<tr>
<th>No</th>
<th>Scientific Name</th>
<th>Local Name</th>
<th>Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Aglaia sp.</em></td>
<td>Bekak Fruit</td>
<td>Fruit (Primates &amp; Birds)</td>
</tr>
<tr>
<td>2</td>
<td><em>Archidendron bubalirum</em></td>
<td>Kerdas Fruit</td>
<td>Fruit (Primates, Birds &amp; Squirrels)</td>
</tr>
<tr>
<td>3</td>
<td><em>Archidendron jiringa</em></td>
<td>Jering Fruit</td>
<td>Fruit (Primates, Birds &amp; Squirrels)</td>
</tr>
<tr>
<td>4</td>
<td><em>Ardisia sp.</em></td>
<td>Mata Pelanduk</td>
<td>Fruit (Primates, Birds)</td>
</tr>
<tr>
<td>5</td>
<td><em>Artocarpus heterophyllus</em></td>
<td>Nangka Fruit</td>
<td>Fruit (Primates, Birds &amp; Squirrels)</td>
</tr>
<tr>
<td>6</td>
<td><em>Artocarpus integer</em></td>
<td>Cempedak Fruit</td>
<td>Fruit (Primates, Birds &amp; Squirrels)</td>
</tr>
<tr>
<td>7</td>
<td><em>Artocarpus rigidus</em></td>
<td>Temponek Fruit</td>
<td>Fruit (Primates, Birds &amp; Squirrels)</td>
</tr>
<tr>
<td>8</td>
<td><em>Baccaurea maingayi</em></td>
<td>Tampoi Fruit</td>
<td>Fruit (Primates &amp; Birds)</td>
</tr>
<tr>
<td>9</td>
<td><em>Baccaurea sumatrana</em></td>
<td>Tampoi Fruit</td>
<td>Fruit (Primates &amp; Birds)</td>
</tr>
<tr>
<td>10</td>
<td><em>Barringtonia sp.</em></td>
<td>Putat Fruit</td>
<td>Fruit (Birds)</td>
</tr>
<tr>
<td>11</td>
<td><em>Boubea macrophylla</em></td>
<td>Kundang Hutan</td>
<td>Fruit (Primates &amp; Squirrels)</td>
</tr>
<tr>
<td>12</td>
<td><em>Durio sp.</em></td>
<td>Durian Fruit</td>
<td>Fruit (Primates, Birds &amp; Squirrels)</td>
</tr>
<tr>
<td>13</td>
<td><em>Dyssoxylum sp.</em></td>
<td>Mersindok Fruit (Langsat Hutan)</td>
<td>Fruit (Primates &amp; Birds)</td>
</tr>
<tr>
<td>14</td>
<td><em>Eugenia (Syzygium) sp.</em></td>
<td>Kelat Jambu Laut</td>
<td>Fruit (Primates &amp; Birds)</td>
</tr>
<tr>
<td>15</td>
<td><em>Garcinia artoviridis</em></td>
<td>Asam Gelugor</td>
<td>Fruit (Primates &amp; Birds)</td>
</tr>
<tr>
<td>16</td>
<td><em>Mangifera indica</em></td>
<td>Mangga Fruit</td>
<td>Fruit (Primates, Birds &amp; Squirrels)</td>
</tr>
<tr>
<td>17</td>
<td><em>Nephelium lappaceum</em></td>
<td>Rambutan Hutan</td>
<td>Fruit (Primates &amp; Birds)</td>
</tr>
<tr>
<td>18</td>
<td><em>Sandoricum koetjape</em></td>
<td>Sentul Fruit</td>
<td>Fruit (Primates &amp; Birds)</td>
</tr>
</tbody>
</table>

(B) Over-Story Species

<table>
<thead>
<tr>
<th>No</th>
<th>Scientific Name</th>
<th>Local Name</th>
<th>Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td><em>Castanopsis spp.</em></td>
<td>Berangan Fruit</td>
<td>Fruit (Primates &amp; Squirrels)</td>
</tr>
<tr>
<td>20</td>
<td><em>Dialium sp.</em></td>
<td>Keranji Fruit</td>
<td>Fruit (Primates, Birds &amp; Squirrels)</td>
</tr>
<tr>
<td>21</td>
<td><em>Ficus spp.</em></td>
<td>Ara Fruit</td>
<td>Fruit (Primates, Birds &amp; Squirrels)</td>
</tr>
<tr>
<td>22</td>
<td><em>Irvingia malayana</em></td>
<td>Pauh Fruit</td>
<td>Fruit (Primates &amp; Squirrels)</td>
</tr>
<tr>
<td>23</td>
<td><em>Knema sp.</em></td>
<td>Basong Fruit</td>
<td>Fruit (Primates &amp; Birds)</td>
</tr>
<tr>
<td>24</td>
<td><em>Koompasia excelsa</em></td>
<td>Tualang Depository of wild honey (Seed for squirrels)</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td><em>Lithocarpus cyclophorus</em></td>
<td>Mempening Gajah</td>
<td>Fruit (Primates)</td>
</tr>
<tr>
<td>26</td>
<td><em>Mangifera longipetiola</em></td>
<td>Machang Fruit</td>
<td>Fruit (Primates &amp; Birds)</td>
</tr>
</tbody>
</table>
iv. Coastal rehabilitation and conservation programme

The tsunami tragedy in 2004 which involved 18 countries had highlighted the importance of mangrove forests in stabilising the coastal environment especially as a mitigation to natural disaster. It is also had created the awareness to public. On 26 January 2005, Honourable 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.

In 2005, FDPM had identified 8,416 hectares of mangrove forest with different categories of risk which need different silviculture treatments in Malaysia. Under the 9th Malaysia Plan, FDPM in collaboration with various government agencies and NGOs had succeeded in planting and rehabilitating 2,088 hectares of mangrove forest through the funding of Federal Government. In the 10th Malaysia Plan, FDPM plans to rehabilitate 1,520 hectares of mangrove forests which fall under the ‘high risk’ category.

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

To conserve natural coastline which served as natural protection to minimize the damage caused by natural disaster and soil erosion;

- To create buffer zones to withstand the high waves and strong wind as well as prevent environmental pollution;
- To restore coastal habitat that serve as the corridors and enrich the biodiversity; and
- 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
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:

**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. As of Mei 2014, a total of 20,916,168 trees had been planted over 22,241.22 hectares. Various agencies are involved in this tree planting campaign and FDPM is responsible for monitoring the progress of planting under this campaign.

**The International Day of Forest**

The International Day of Forest is celebrated around the world on 21 March to commemorate the contribution and value of forests and forestry to the community. Besides, it is also to raise awareness to all local, national and international people about the importance of all types of forests. FDPM usually include tree planting as one of the activities in this programme and approximately 934 trees have been planted during its first launch in the year of 2012. The theme for the International Day of Forest 2014 is “Forests for Community Livelihood”.

**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”. In Malaysia, the IYF 2011 was jointly launched by the honourable Chief Minister of Johor State and the Minister of Natural Resources and Environment Malaysia in conjunction with the...
national level World Forestry Day celebration held in Nusajaya, Johor on 21 March 2011. A total of 1,000 trees were planted.

**The Malaysia Book of Records- Largest Paya Bakau Tree Planting Event 2014**

In conjunction with Ship for South-East Asian Youth Programme (SSEAYP) annual assembly, Institut of Foresters Malaysia (IRIM) with collaboration from FDPM and other agencies including NGOs has was organizing Largest Paya Bakau Tree Planting Event which was was held on May 2014 in Langkawi Island. Officiated by former Prime Minister of Malaysia, Tun Abdullah Ahmad Badawi and his wife Tun Jeanne Abdullah, 20,200 mangrove trees were planted successfully from two mangrove species within a time frame of two hours during this event which is Rhizophora Apiculata (bakau minyak) and Rhizophora Mucnorata (bakau kurap). The objective of this programme was aimed to helping and create a natural barrier and be a natural nursery for small fish and aquatic live. This programme broke previous record of planting 11,111 mangrove seedlings in 2011.

**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 silviculture 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 silvicultural 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. For example, the land usage of oil palm plantation industries in Malaysia was increased about 688.6 thousand hectares (16.5%) for the year of 2006 (4,165.2 thousand hectares to 2010 (4,853 thousand hectares).

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 Sate 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**

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Myanmar: Degraded Forest Rehabilitation and Sustainable Forest Management in Myanmar

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Forest Research Institute, Myanmar

1. INTRODUCTION

Myanmar is a country situated in continental Southeast Asia, between 10° and 29° N latitude and 92° and 101° E longitude. Myanmar, with an area of 676,577 km², extends 936 km from the east to west and 2,051 km from north to south. Boundaries share with China in the north, with Laos and Thailand in the east, and with Bangladesh and India in the west. The Andaman Sea and the Bay of Bengal edge the Myanmar coast in the south and the west. Topographically, Myanmar can be roughly divided into three parts: the western hills region, the central valley region, and the eastern hills region. The general profile of the country rises from the sea level along the southern coasts to the snow-capped mountains towering with a highest elevation of around 6,000 m in the northern tip of the country near the China border.

The country can generally be described as hilly and mountainous because most parts of the country are situated on high lands. Myanmar is drained by many river systems and most are flowing from the north to the south. The main rivers are Ayeyawaddy, Thanlwin, Chindwin and Sittaung. Myanmar typically features a tropical monsoon climate. The climate in some parts of the country, however, is locally modified by topography. In most parts of Myanmar, there are three well defined seasons: the rainy season (mid-May to October), the cold season (November to January) and the hot season (February to mid-May). Nonetheless, the rainfall patterns and temperature distributions are quite diverse throughout the country. The coastal regions receive more than 5,000 mm of annual rainfall whereas the central part of Myanmar has an annual rainfall of less than 1,000 mm. In addition, the average highest temperature in the central region during the hot 2 season of March and April rises to above 43.3°C while in the northern mountainous parts of the country, it is about 36°C and on the eastern Shan plateau, it is between 29.4°C and 35°C.

As a result of the great variations in rainfall, temperature and topography, there are many forest types in Myanmar. Tropical evergreen forests occur in many places of the highest rainfall zone especially in the southern part of the country. Hill and moist forests are found in the eastern, northern and western where the elevation exceeds 900 m. The forest type changes into deciduous, then into dry forests towards the middle of the country as a result of low rainfall. Mangrove forests are characteristics of the coastal areas.
2. FOREST RESOURCES IN MYANMAR

2.1 Major Forest Types

The forests are highly variable from scrubby and thorny growths of central Myanmar to the candlestick like stands of clean bole evergreen dipterocarps forests. The deltaic and coastal mangroves are the important breeding grounds for aquatic species and standing along the sites of Bay of Bengal. The most prominent and major forest type which covers almost 37% of the total forest area is deciduous forest. About 60% are the forest types bearing valuable timber. Major forest types in Myanmar are shown in table 1.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Type of Forest</th>
<th>Area (, 000 ha)</th>
<th>% of Total Forest Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Tidal Forest, Beach and Dune Forest and Swamp Forest</td>
<td>1,375</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td>Tropical Evergreen Forest</td>
<td>5,5000</td>
<td>16</td>
</tr>
<tr>
<td>3.</td>
<td>Mixed Deciduous Forest</td>
<td>13,407</td>
<td>37</td>
</tr>
<tr>
<td>4.</td>
<td>Dry Forest</td>
<td>3,483</td>
<td>10</td>
</tr>
<tr>
<td>5.</td>
<td>Deciduous Dipterocarpus Forest</td>
<td>1,719</td>
<td>5</td>
</tr>
<tr>
<td>6.</td>
<td>Hill and Temperate Evergreen Forest</td>
<td>8,939</td>
<td>25</td>
</tr>
<tr>
<td>7.</td>
<td>Scrub Land</td>
<td>998</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>Total Forest Area</strong></td>
<td><strong>35,375</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Source: FRA, 2011

2.2 FOREST RESOURCES

Myanmar is rich in forest resources. It is known to have about 7,000 plant species, of which 1,071 are endemic. Recorded vegetative species are shown in Table 4. Out of the 2,088 big and small tree species, 85 species have been recognized and accepted as producing multiple-use timber of premium quality. Studies on the properties and utilization of the lesser-used timber species (LUS) are being carried out, and their utility extensively promoted. The objective is to increase commercial production and reduce the pressure on the premium quality timber.
Table 2: Recorded Vegetative Species

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Flora Species</th>
<th>Number of Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Big Tree</td>
<td>1,347</td>
</tr>
<tr>
<td>2.</td>
<td>Small Tree</td>
<td>741</td>
</tr>
<tr>
<td>3.</td>
<td>Bamboo</td>
<td>96</td>
</tr>
<tr>
<td>4.</td>
<td>Shrub</td>
<td>1,696</td>
</tr>
<tr>
<td>5.</td>
<td>Rattan</td>
<td>36</td>
</tr>
<tr>
<td>6.</td>
<td>Orchid</td>
<td>841</td>
</tr>
</tbody>
</table>

Source: Forestry in Myanmar, 2011

3. FOREST RESOURCES MANAGEMENT

3.1 Forest Management Plans (Forest Management Unit)

Working plans had been developed and implemented to manage forests for each forest division in the country since 1856 when systematic and scientific management of forests has started in Myanmar. There existed 33 plans and most of them became outdated for some inexplicable reasons although great importance has always been attached to them. In 1996, FD launched special operation to update and reformulate the working plans by incorporating modern sustainable forest management (SFM) concepts.

The working plans were renamed as Forest Management Plans, and the new plans place emphasis not only on timber production for economic development but also production of Non Wood Forest Products, biodiversity conservation, well-beings of local people and forest-dependent communities, all of which are integral aspects of SFM. By the end of 1998, Forest Management Plans for 62 districts covering the whole country have been completed as final drafts.

3.2 Myanmar Selection System

Myanmar is endowed with natural resources such as forests, fertile lands, abundant fresh water and rich minerals. Forest resources play a vital role in supporting the socio-economic life of the people. About 37 million or 70% of people live in rural areas and still depend up on the forest resources for livelihood. Myanmar is the world prime supplier of the natural teak and more than half of the country is still covered by forests. Forest management has begun since kings dynasty and forests were protected. Teak could be harvested or cut by the citizen and which is designated as “royal teak”.

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Scientific management of forest has started in 1856 by Dr. Brandis. He has known that the teak tree girth is increased 1 feet within 30 years. From this scientific work, the productive forests are set 30 coupes and the trees are extracted with the certain girth limit in one coupe. Those trees which attained 1 ft under the certain girth limit are due to be harvested after 30 years according to Brandis’s proposition. Thus, this practice is applied not only on teak stand but also on the hard wood stand. Since the trees which reached a predefined girth limit are selected and marked for felling. The felling operation is followed after selective marking of teak and/or other hardwood necessarily after the rainy season.

This system, *Exploitation-cum-cultural* system, known as the Myanmar Selection System (MSS) has been the principal silvicultural system practised in the management of Myanmar’s natural forests. The MSS involves adoption of a felling cycle of 30 years, prescription of exploitable sizes of trees, girdling of teak as well as green teak felling, selective marking of other hardwoods, felling of less valuable trees interfering with the growth of teak, thinning of congested teak stands, enumeration of future yield trees down to fixed sizes, and fixing of annual allowable cuts (AACs) for teak and other hardwood.

MSS give the natural forests undamaged and sustained till the AAC is the rule to be harvested. The problem following after selective marking of exploitable trees and enumeration of future harvest trees are prone to illegal cutting during the next harvesting period. The losses of these future yields highly affect the sustainability of the natural forests.

National Forest Inventory (NFI) has been yearly conducting with the aid of remote sensing and geographic information system by using available update Landsat imageries in each and every State and Division alternatively. NFI data could generate the adjustment of future yield gained by previous selective marking data.

### 3.3 Permanent Forest Estate in Myanmar

Forest land is owned by the State and is legally classified as reserved forests, protected areas and public protected or unclassified forests. So far more than 20 million ha of the forest area (approximately 31% of the total country’s land) have been corresponded to Permanent Forest Estate (PFE), which comprises of conservation reserves (i.e., protected areas), production forests (i.e., forest reserves), and protected public forests

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Legal Classification</th>
<th>Area (km²)</th>
<th>% of total land area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Permanent Forest Estate</td>
<td>197,899.36</td>
<td>30.73</td>
</tr>
<tr>
<td>2.</td>
<td>Reserve Forests</td>
<td>121,842.91</td>
<td>18.00</td>
</tr>
<tr>
<td>3.</td>
<td>Protected Public Forest</td>
<td>40,949.60</td>
<td>6.05</td>
</tr>
<tr>
<td>3.</td>
<td>Protected Areas system</td>
<td>35,106.85</td>
<td>5.67</td>
</tr>
</tbody>
</table>

Source: Planning and Statistic Division, Forest Department, 2011
4. Policy, Legislation and Institutional Arrangement

4.1 Forest Policy

In view of the importance of the Myanmar Forestry Sector in enhancing national socio-economic development, and ensuring ecological balance and environmental stability, the Myanmar Forest Policy has been formulated in a holistic and balanced manner within the overall context of the environment and sustainable development taking full cognizance of the forestry principles adopted at the United Nations Conference on Environment and Development, 1992.

4.2 Six Imperatives

The policy has identified six imperatives which the Government must give the highest priority in order to achieve broader national goals and objectives. These are:

A. **PROTECTION** of soil, water, wildlife, biodiversity and environment;

B. **SUSTAINABILITY** of forest resources to ensure perpetual supply of both tangible and intangible benefits accrued from the forests for the present and future generations;

C. **BASIC NEEDS** of the people for fuel, shelter, food and recreation;

D. **EFFICIENCY** to harness, in the socio-environmentally friendly manner, the full economic potential of the forest resources;

E. **PARTICIPATION** of the people in the conservation and utilization of the forests; and

F. **PUBLIC AWARENESS** about the vital role of the forests in the well being and socio-economic development of the nation.
4.3 National environmental policy

The National Commission for Environmental Affairs (NCEA) was formed in 1990 to coordinate environmental matters across ministries, to develop National Environmental Policy and to liaise with foreign countries and non-government organizations regarding environmental matters (Bryant 1996).

Myanmar’s National Environmental Policy developed in 1994 for integration of environmental consideration into social and economic development. The MOECAF is the most responsible agency for implementing the national policy on nature and biodiversity conservation in Myanmar but other Ministries such as the MOAI, MOLF, etc., share the common responsibility and accountability for biodiversity conservation. The institutions that are keys to environmental management and biodiversity conservation are discussed in the following section.

4.4 Legal framework

NCEA published the National Environmental Policy in 1994. Myanmar imposed laws, rules and regulations as legal backbones for effective conservation. Protection of Wildlife, Wild Plants and Conservation of Natural Area Law (1994) mandates protection of wild flora and fauna and their habitats and representative ecosystems. List of Protected Species (1996) affords various degree of protecting wild plants and animals according to their designation: (1) completely protected species may not be hunted except for scientific purposes under special license; (2) protected species may be hunted but only with special permission; and (3) seasonally protected species are subjected to traditional subsistence hunting by rural communities only during the open (i.e., non breeding) season (Annex III). In addition, Forest Law (1992) protects forest resources and gives priority to link forest management to social and environmental considerations. Environmental Law has been enacted on 30th March of 2012. This Environmental Law (2012) will be the tool to implement the National Environmental Policy of Myanmar and to enforce the development activities to be minimum impact on environment.

4.5 Myanmar agenda 21

In compliance with Myanmar’s National Environmental Policy, Myanmar Agenda 21 was developed in 1997 and it was a collaborative effort made by various government agencies in order to strive for the sustainable development of the country. The formulation of Myanmar Agenda 21 is an important step in the process of achieving sustainable development in the country. It is intended to serve as a framework for integrating environmental consideration in the national development plans as well as the sector and regional development programs in the future. This document is the expression of the political commitment of the Government to sustainable development. Myanmar Agenda 21 stresses nature and biodiversity
conservation in a separate chapter. It stated that two aspects: PAs planning and management, and biodiversity conservation.

4.6 Thirty-year National Forest Master Plan (NFMP)

Forest resources have played an important role not only in socio-economic development but also in ecosystem management and biodiversity conservation in Myanmar. Therefore, Ministry of Environmental Conservation and Forestry has formulated a National Forest Master Plan (NFMP) covering a time span of 30 years from 2001-02 to 2030-31. The NFMP was worked out comprehensively into two volumes and the strategic areas consists of a) management of natural resources, b) establishment of forest plantations, c) establishment of community forests, d) growing trees in homestead and non-forested areas, and e) promotion of wood-based industry value-added forest products. At the end of the planned period (2030-31), the PFE will be 40% of the country's total area.

4.7 Dry Zone Greening Action Plan

With the aim to conserve and promote the rehabilitation of dry land ecosystems of the central Dry Zone, a comprehensive 30-year dry zone greening action plan comprised of five-year intermediate ones has been formulated, and activities are being implemented accordingly. Forest plantations have been establishing in degraded forest areas using appropriate native and exotic tree species. In addition, the degraded natural forests and the remnants are conserving through the natural regeneration and enrichment planting.

4.8 National bio-safety framework

From May 2004 to November 2006, a project of “Development of National Biosafety Framework Project, Myanmar” was conducted with the technical and financial assistance from United Nations Environment Program (UNEP)/Global Environment Facility (GEF). The objective of the project is to support biotechnology development while guarding the national biodiversity in sustainable way as well as ensuring human health. At the completion of the project, a draft on “National Biosafety Framework” and a draft on “Law on Biosafety” had been prepared in both Myanmar and English versions, and those drafts have been submitted to higher authority.

4.9 National Biodiversity Strategy and Action Plan

In cooperation with UNEP/GEF, Forest Department has formulated National Biodiversity Strategy and Action Plan (NBSAP). The NBSAP has been adopted by the Government Meeting No. 16/2012 on 3rd May of 2012. The primary goal of Myanmar NBSAP is to provide a strategic planning framework for the effective and efficient conservation and management of biodiversity. The specific objectives of NBSAP are i) to set the priority for conservation investment in biodiversity management, and ii) to develop the range of options for addressing the issue of
biodiversity conservation. The development of NBSAP will facilitate the framework for sustainable use of biological resources and Myanmar’s obligations to the Convention on Biological Diversity. It is trusted that the NBSAP provides a comprehensive framework for planning biodiversity conservation, management and utilization in a sustainable manner, as well as to ensure the long term survival of Myanmar’s rich biodiversity.

4.10 National environmental conservation committee

To give environmental matters a priority, the National Environmental Conservation Committee (NECC) has been formed in Myanmar since November 2004 with the objective of promoting environmental conservation and sustainable development of the country. Creation of the NECC is an attempt to consolidate the environmental conservation activities at local and national levels. It is chaired by the Union Minister of the MOECAF. In April 2011, NECC was reformed by including 21 members from 19 ministries. Sub-committees were formed eco-region wise under NECC, and their main functions are:

- to address the environmental problems due to unsustainable land use,
- to address the environmental problems in rivers and wetland areas,
- to implement environmental conservation activities in industrial zones and civil areas,
- to develop policies, principles, rules and regulations for environmental matters, and
- to strengthen the awareness of environmental matters.

NECC has been monitoring the implementation of environment conservation activities by its members in the country and is giving necessary advices to achieve the objectives.

4.11 Institutional Arrangement

Six institutions under the Ministry of Environmental Conservation and Forestry are performing their specific duties and responsibilities mainly related to forestry and environment.
5. Major Drivers of Forest Degradation

Forest degradation is experienced in all developing countries and the major drivers of forest degradation in Myanmar are as follows:-

1. Overexploitation;
2. Illegal logging;
3. Shifting cultivation;
4. Expansion of agricultural land;
5. Fuelwood collection;
6. Urbanization

6. Rehabilitation and Reforestation Activities

The Rehabilitation and Reforestation program in Myanmar commenced in the early 1960s and large-scale plantation forestry in the 1980s. FD mainly establishes four types of plantations: Commercial plantations, industrial plantations, watershed plantations for rehabilitation of degraded watershed areas and local supply plantations especially aiming to supply wood-fuel demand of local communities.

6.1 Combating Desertification in the Central Dry Zone

The DZGD was formed in 1997 with the special tasks of mitigating harsh environment by preventing desertification in the Dry Zone of the Central Myanmar. Since then, the four major tasks assigned to the DZGD in order to fulfill the objectives are: (i) Establishment of forest plantations for local supply and greening purpose, (ii) Protection and conservation of remnant natural forests, (iii) Promotion of wood-fuel substitution, and (iv) Development of water resources. Some international organizations and companies are also contributing to the environmental restoration in the Dry Zone by the establishment of forest plantations.

6.2 Greening Activities of the Bago Yoma Range

In the Bago Yoma range, teak (Tectona grandis Linn. f) forests dominate and deforestation and degradation takes place due to easier accessibility compared to other parts of the country. The FD has therefore been carrying out the Bago Yomas Greening Project which covers six districts with a total area of 50,700.23 km² with the special intention to restore and rehabilitate. During the project, the major activities such as conservation and protection of natural forests, enrichment planting, natural regeneration and establishment of plantations are being implemented. Furthermore, all possible means and activities for the establishment of community forests, extension services, water supply, establishments of seed production area and research activities are also carried out to restore the Bago Yoma areas.
6.3 Conserving Coastal and Mangrove Forests

Due to extensive use of the mangrove for making charcoal and timber as well as encroachment for cultivation purposes, the 386,000 ha of total mangrove forests in Myanmar have decreased to almost half between the early 1990s and 2002. Most of the remaining mangroves suffer from various levels of degradation, rendering the rehabilitation of these forests a crucial issue. As part of its regular schedule, FD is implementing rehabilitation tasks such as regeneration improvement felling in remaining mangrove forests, plantation establishment in depleted areas and abandoned paddy fields, and community forestry. In cooperation with international organizations, conservation and rehabilitation projects have been also carried out.

6.4 Forestry Development in Border Areas:

Border areas of Myanmar are mostly rugged and mountainous, particularly in the northwest, north and the east. The Development for the Progress of Border Areas and National Races Department (DPBANRD) in collaboration with other related governmental and non-governmental bodies has been undertaking social, economic and environmental development tasks.

6.5 Establishing a Protected Area System and Biodiversity Conservation

Myanmar has been a member country of the International Center for Integrated Mountain Development (ICIMOD) and signatory of the Convention on Biodiversity Conservation (CBD) since the early 1990s. Up to now, 32 wildlife sanctuaries and 2 national parks, constituting about 7.3 percent (49,456.46 km²) have been formed and managed. The FD, MOECaf has planned to increase Protected Area (PAs) coverage up to 10 percent of its total land area in the long run.

6.6 Practicing Criteria and Indicators (C&I) for SFM

Identification of Myanmar’s C&I for SFM at both national and Forest Management Unit (FMU) levels was completed in 1999, and is based on International Tropical Timber Organization (ITTO)’s C&I of 1998. It contains 7 criteria each at both national and FMU levels. There are 78 indicators and 257 required activities at the national level, and 73 indicators and 217 activities at the FMU level, together with standards of performance for each activity. The FD has been testing the adequacy and application of Myanmar’s C&I at FMU level for further improvement. The MOECaf and Forest Resources and Environment Development Association (FREDA), a forestry-related Non Government Organizations (NGOs) in Myanmar, took this initiative with the financial and technical support from Japan Overseas Forestry Consultants Association (JOFCA).
6.7 Demonstrating Model Forests

The FD has established two model forests in the *Bago Yomas* Region. The Japan International Forestry Promotion and Cooperation Center (JIFPRO) and Japan Overseas Forestry Consultants Association (JOFCA), the NGOs from Japan, have been cooperating with the FD in developing these model forests to demonstrate forest certification.

6.8 Developing Timber Certification

The Timber Certification Committee (TCC) was formed in August 1998 by the MOECAF, and since then, it has been establishing links with other timber certification bodies on a bilateral basis. Myanmar TCC has links with the National Timber Certification Council (NTCC) of Malaysia and the Eco-labeling Institute of Indonesia (LEI). Myanmar TCC is now heading for the development of a timber certification scheme reflecting Myanmar’s forest management system. Myanmar’s C&I is the basis for developing a timber certification checklist at the FMU level. Nowadays, MOECAF with the assistance from European Union has been processing an agreement for certifying the legal timber.

6.9 Practicing Code of Forest Harvesting

MOECAF developed the National Code of Forest Harvesting Practices in Myanmar in 1999 with FAO’s financial and technical assistance. A number of training courses have been provided to the staff of the Extraction Department (MTE) for thorough understanding and immediate implementation in the field.

6.10 Nation-wide Tree Planting Campaign

Realizing the direct and indirect benefits of trees to mitigate climate change, the Forest Department has launched the Nation-wide Tree Planting Program since 1997-78 with the objective of raising public awareness and greening the non-forest area in order to enhance environmental services. Some of those services fulfill basic needs of local people.

6.11 Managing Watershed Areas:

Restoration of watershed areas and of important dams started early. Excessive removal of vegetative cover, practice of slash and burn system and their shortened fallow period, and overgrazing in those areas are major factors causing watershed degradation. FD started establishing watershed protection plantations, and in addition, a UNDP/FAO contributed Pilot Watershed Management Project for the *Kinda* Dam, Inlay Lake (Shan State) and *Phu-gyi* Dam Watershed, and FD is maintaining those activities after the completion of the projects.
6.12 Stabilizing Shifting Cultivation:

It is evident that shifting cultivation is one of the major causes of forest depletion and degradation. To address this issue, a national level multi-sectoral program of highlands reclamations has been developed and actions are underway. The program clearly encourages the upkeep of traditional land use systems, customary rights and cultural values. In cooperation with other sectors, FD has been implementing activities such as (i) Community forestry based on agroforestry systems, (ii) Provision of improved technologies, complementing traditional forest-related local knowledge, (iii) Recruiting shifting cultivators into routine forestry operations such as plantation establishment, (iv) Enhancing income-generating opportunities; and (v) Provision of awareness raising campaigns and extension services.

6.13 Controlling Illegal Logging

Illegal logging today is being intensified and is threatening forest management in most developing countries. The following measures are being undertaken to reduce illegal logging at the initial stage and to eliminate it eventually by (i) Strict enforcement of the existing forest law, rules and regulations, (ii) Setting up checkpoints along the main shipping routes across the country, (iii) Inspection of logging operations to ensure that they are carried out in accordance with the procedures and prescribed rules and regulations, (iv) Adoption of an incentive scheme for the staff and those who are actively engaged in protecting illegal logging, (v) Forming a partnership with the institutions concerned and local communities in combating illegal logging, and (vi) Cooperation and coordination with the neighboring countries in fighting the illegal logging along the borders.

6.14 Community Forestry

FD has issued Community Forestry Instructions (CFI) in 1995 so as to develop community participation in forest management in Myanmar. CFI allows local communities to be involved in developing management plans, protection, conservation and restoration of forests, and encourages the utilization of forest products and NTFPs particularly in the vicinities of their settlements. The CFI allows for a 30-year land use, ownership rights and disposal of products from community forest under the guidance of FD.

6.15 Education, Training and Researches in Forestry

The University of Forestry is only giving academic background relating to forestry and environmental sciences, and three training centers are addressing relevant issues to staff of the forestry sector as well as private individuals and communities with the aim of extending forestry education. Another three training centers under MTE are conducting courses on timber extraction and downstream processing annually. Site-level restoration researches have focused on assessment of stand characteristics and existing natural regeneration, and enrichment planting. Research programs and
activities of the Forest Research Institute are merely formulated in line with forest policy at the national level in addition to regional and global concerns. To adopt more appropriate training and research program, it is still required to improve human resource and capacity management.

6.16 Promoting Forestry Extension Services

In order to promote forestry and environmental service, the Extension Division was formed under the FD with aims of (i) Publishing and disseminating forestry related articles in government newspaper, (ii) Publishing the Myanmar Forestry Journal, (iii) Broadcasting videos, and films relating to conservation of natural resources and environment on television, (iv) Organizing exhibition shows at national events and (v) Enhancing public awareness and participation.
Myanmar: Sustainable Forest Rehabilitation and Management for the Conservation of Trans-boundary Ecological Security in Montane Mainland Southeast Asia-Pilot Demonstration Project in Myanmar

Dr. Chaw Chaw Sein
Forest Research Institute Myanmar

1. Introduction

In accordance with participatory land use plan of the target village located near the Nyuak-Htauk reserved forest, there are residence area, private farm lands, shifting cultivation lands in reserved forest and unclassed forest, spiritual forests, spring water forests and forests where villagers collect fuelwood for home consumption. Different forest rehabilitation strategies were designed for each land use systems that are required forest rehabilitation based on the base line assessment. During this reporting period, sustainable forest rehabilitation plan for home garden, shifting cultivation lands, spiritual forests and spring water resources were formulated through participatory process involving local communities, authorities and scientists. The following sections will elaborate management plan for forest rehabilitation.

2. Forest rehabilitation in community based forest management

Forest rehabilitation plan was prepared based on scientific literature on best practices, field survey, local perceptions and concerns, involvement of local officials and local FD staff.

2.1 Establishment of community forest in shifting cultivation areas

The pilot demonstration site is located in the reserved forest where local communities have being practicing shifting cultivation significantly since after 1988. Total area is 24.3 ha, of which, 8.41 ha is affected by shifting cultivation while other 15.89 ha is degraded secondary forest areas covered with Teak (*Tectona grandis*) and some hardwoods species such as Thit-ya (*Shorea obtusa*) and In-gyin (*Shorea siamensis*). Along with increased population and industrialization of agriculture, swidden Taungya is likely to change into sedentary agriculture. Nowadays, the commons crops planted in the Taung-ya include maize, groundnut, sesame and paddy as illustrated in figure (1). Maize becomes commercial crop for the local community because of ensure market access and simple processes compared to other crops. The industrialization of agriculture with intensive use of inputs has
increased productivity and farmers’ income, on the other hand, it may lead to reduce agro-ecosystems to prevent erosion and mitigate climate change. To demonstrate good practices for forest rehabilitation in such area, community forestry model was introduced to address real needs of communities as well as to rehabilitate the degraded natural forest.

![Figure (1) maize and groundnut cultivation in Taungya](image)

### 2.1.1 Management plan for community forestry with agro-forestry

Community forest user group was organized with nine households who are doing Taungya in 8.41 ha of cultivated land. According to the present vegetation and land use, two management strategies were designed under community forestry i.e. agro-forestry and conservation of existing natural forests. Individual member, thus, will manage agro-forestry plot as well as natural forests plot. Management plan to manage agro-forestry and natural forest was prepared by collaboration among user group members, authorities, elder people and scientists.

To accomplish preparing management plan to meet the objectives of the project, the following activities were conducted.

1. Gathering community information and identify village needs through village meeting and informal interview by scientists.
2. Presenting concept of community forestry and agro-forestry in the village meeting
3. Sharing economic outcomes of agro-forestry using example from other user group
4. Facilitating local communities to develop preferable agro-forestry design including preferable species to be planted
5. Confirming developed agro-forestry design in the meeting
6. Discuss about conservation of existing natural forest
7. Make a consensus meeting among user members for conservation of natural forest by the help of scientists

8. Site visit to Wundwin township community forest to study the present rehabilitation practices of agroforestry

9. Nursery and preparation of planting materials

10. Demonstrate tree management practices to user group members such as planting trees and improvement felling by local FD staff and scientists

11. Identification of tree vegetation in community forest area and home garden to measure the success of forest rehabilitation

Aside from above mention extension activities to raise awareness of user group members in sustainable forest rehabilitation, compost making training was also provided to local communities with the aim of raising awareness about soil management practices.

In this thematic report, items of afforestation by means of agro-forestry and natural forest conservation were illustrated more detail. The layout design for agro-forestry varies among members based on their species preference, availability of the land, traditional knowledge and scientific knowledge on agroforestry practices. For intercropping, 12 feet x 12 feet wide interrow spacing is used for the members who have above 10 acres of shifting cultivation area as shown in figure (2). In the case of user group members who have limited shifting cultivation area, 12 feet x 24 feet spacing or 36 feet x 36 feet spacing will be used as illustrated in figure (3).
At the planting season of last year, six members have planted about 2550 seedlings of Shaw Phyu (*Sterculia versicolor*) in some parts of their individual farm land at a spacing of 12 feet x 12 feet as main plant as shown in figure (4) and (5). Shaw-phyu trees are efficient enough in providing higher economic return within short rotation period so local people prefer to plant it. In the next year, Mango trees (*Mangifera indica*), Jackfruit (modified seedlings which can produce fruit within three years after planting), Lemon and Danyin will be planted in the remaining unused land for growing trees this year. These fruit trees are planted to provide subsistence needs as well as to generate additional income from farm land. In accordance with their traditional knowledge, Dog fruit are good for soil decomposition and it has smaller canopy size.

Different intercrops grown by user group members in interspaces are maize, groundnut or rice. Even though fellow system was almost disappeared now-a-days, some farmers still practise traditional knowledge on rotational cropping system to reduce soil degradation. For the first year, they plant groundnut or rice (mostly groundnut) and maize are then planted for three consecutive years. After that, they plant again groundnut. Figure (4) shows that local communities plant groundnut, rice and corn by dividing cultivated land into three plots.

Along the farm boundary, about 1000 seedlings of Mezali (*Cassia siamea*) and about 1000 seedlings of Yamane (*Gmelina arborea*) were planted with the purpose of producing fuelwood, pole, post and manure. The planted tree around the farm boundary is 15 feet x 15 feet. As per lay out design indicated in figure (4), some user group members will plant forest trees by mixing fruit trees such as Jack...
fruit and Mango along the farm boundary. Operational activities for intercropping will be carried out as their farm schedule (Table 1).

<table>
<thead>
<tr>
<th>No</th>
<th>Activities</th>
<th>Operational season (month)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Soil preparation</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Seedling collection</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Fertilizer gathering</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Planting fruit &amp; forest trees</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Crop planting</td>
<td></td>
</tr>
<tr>
<td></td>
<td>i. paddy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ii. groundnut</td>
<td></td>
</tr>
<tr>
<td></td>
<td>iii. corn</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Harvesting</td>
<td></td>
</tr>
<tr>
<td></td>
<td>i. paddy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ii. groundnut</td>
<td></td>
</tr>
<tr>
<td></td>
<td>iii. corn</td>
<td></td>
</tr>
</tbody>
</table>

2.1.2 Community forestry with conservation of existing natural forest

15.89 ha of natural forest area will be managed individually under the group. According to the field inventory of natural resources, there are about 31 tree species in natural forest area. To conserve that existing natural forest, proper silvicultural treatments such as improvement felling, enrichment planting, weeding, pruning, thinning and fire protection have being carrying out. Table (2) shows seasonal plan for each activity, workload sharing system and how to implement activities decided by integrating their traditional knowledge and scientific point of view through participatory decision making process. For the gap planting, preferable species by user group members are Teak (*Tectona grandis*), Bamboo (e.g. Wani *Dendrocalmus latiflorus*) and Yamane (*Melina arborea*) which will plant in 2014.

<table>
<thead>
<tr>
<th>Activities</th>
<th>Operation season</th>
<th>Implementation activities</th>
<th>Work sharing system</th>
<th>Remark</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.Land allocation for CF management in the reserved forest</td>
<td>August-September</td>
<td>Natural forests are divided individually through users’ consensus</td>
<td>Collective decisions</td>
<td>Nil</td>
<td></td>
</tr>
<tr>
<td>2.Improvement felling</td>
<td>September-October-November (will be conducted every year)</td>
<td>Cutting inferior trees for developing healthy and sound trees; climber cutting and coppicing will be carried out</td>
<td>Individually</td>
<td>For these operations, Staff from Forest Research Institute provided practical training by working together with user group</td>
<td></td>
</tr>
<tr>
<td>Activity</td>
<td>Time Period</td>
<td>Details</td>
<td>Responsibility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-------------------</td>
<td>-------------------------------------------------------------------------</td>
<td>----------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Fire protection</td>
<td>February-March</td>
<td>Outer fire line is 6 feet wide while inner line is 3 feet</td>
<td>Collective action</td>
<td>Fire protection will be conducted every year</td>
<td></td>
</tr>
<tr>
<td>4. Planting trees (enrichment planting)</td>
<td>May-June-July</td>
<td>Rare, endangered and locally preferably species will be planted.</td>
<td>Individually</td>
<td>About 250 tree seedlings will be planted in 2014.</td>
<td></td>
</tr>
<tr>
<td>5. Weeding</td>
<td></td>
<td>3 times of weeding will be carried out.</td>
<td>Individually</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Rotation for harvesting</td>
<td>7- years for fuelwood 25-years for pole 30-years for post</td>
<td>Selected trees will be harvested using coppice selection system.</td>
<td>Individually</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2.2 Home Garden

Majority of villagers are Danu who used to plant home garden inside their residence traditionally as shown in figure (6). This practice consists of a house surrounded by cultivation of annuals and perennials. Commons annual crops planted in home garden are: egg plant, pumpkin, lemon, various kinds of beans, chili, ladies’ finger, bitter guard, mustard and tomato. Perennials crops and fruit trees include banana, papaya, mango, coconut and coffee. Aside from edible crops and fruit trees, they also plant ornamental plants such as rose, jasmine, kiss me quick, temple tree (Plumeria acutifolia) and ywet hla (Musaenda luteola).

In order to do experiment for enhancement of home garden, 55 households (one fourth of total households) were randomly selected and their preferable crops, fruit trees and forest trees were identified through face to face interview by home visit. Interview results indicated that home garden products partly contribute for subsistence consumption and small amount of income as well. Common preferable species to be planted by local communities are modified Jackfruit, Papaya, Mango (Mangifera indica), Sandal wood (Sandal album), Aga wood (Aquilaria malaccensis) and coconut. This year, about 500 Mango (Mangifera indica) seedlings have been distributed to local communities. In coming planting season, remaining desirable seedlings will be supported by the project.

Figure (6) home garden
3. Conclusions

As indicated in base line assessment of socio-economic conditions of the target village, Taungya has been a chronic practice to generate subsistence food and income of local communities since the village was established. On the other hand, it is also a culturally deep-rooted practice so that it will not be easy to eliminate among local communities. In addition to this, forest provides fuelwood not only for home consumption but also for income sources in off-farm season, which lead to deforestation. As mentioned above, therefore, participatory planning processes are necessary for achieving sustainable forest rehabilitation. In the next year, forest rehabilitation plan will be preceded based on participatory land use plan involving local communities, private sector, local officials, elder people and scientists. Meanwhile, training and extension activities will be conducted to raise awareness on forest resource management, sustainable agricultural practices and income generating activities.


- **Upland nurseries for preparing seedlings and planting materials of rare and endangered native tree species.**
  - Field experimentation of site requirements and techniques to prepare and transplant seedlings and planting materials of locally preferred, rare and endangered native tree species
  - Field demonstration of site requirements and techniques to prepare seedlings and planting materials of locally preferred, rare and endangered native tree species
  - Completion of the database of locally preferred, rare and endangered native tree species (list of species, site requirements and propagation techniques, based on results of Year I and Year II in this regard)

- **Techniques for soil improvement in degraded areas for tree planting**
  - Soil improvement and rehabilitation of degraded forestland
  - Field experimentation of techniques to improve soil conditions of degraded areas for tree planting
  - Field demonstration of techniques to improve soil conditions of degraded areas for tree planting

- **Agroforestry systems, including understory cultivation**
  - Upland agro-forestry based models, including understory cultivation.
  - Field experimentation of agroforestry models in line with the participatory planning of forest rehabilitation
  - Field and on-farm demonstration of agroforestry models, including indigenous practices,
Nepal: Potential and Prospect of Community Forest Management in Nepal, a Case Study of Panchase Community Forest, Nepal

Mr. Rom Raj Lamichhane
Gazzeted II Class, Ministry of Forest and Soil Conservation

Introduction

Spread over 147,490 km² (14,749,000 ha) (LRMP, 1986), Nepal lies between the arid Tibetan highland and Indian. It is located between 26° 22’ and 30° 27’ North latitude and 80° 04’ and 88° 12’ East longitude. It is about 800 km long (East-West) and 160 km wide (North-South) (CBS 2013). The study area is Panchase is bounded with nine Village Development Committees of Kaski, Parbat and Syangja districts of Western development region. The region has great biological, cultural, and religious diversities and natural beauty as well. It represents an important Middle Mountain’s ecological zone which is less addressed amongst the country’s protected area system and is only one corridor linkage of Lowland (Chitwan–Nawalparasi) and of Annapurna Himalaya range. Panchase Protected Forest is gazette in 2012 with an area of 57.76 sq kilometer. The forest has characterized by sub-tropical and temperate vegetation. Altitudes vary from 1450 meter to 2517 meter. A famous historical lake 'Panchase' is situated at the altitude of 2,250 meter of the area. is situated in middle mountain landscape of Nepal. Having the highest percentage of forests in year 1986 and second highest population percentage as per national census (2012), middle mountain landscape of Nepal has faced decrease in forest cover at an annual rate of 2.3 percent between 1978/79 and 1990/91 (HMGN/MFSC, 2002, MoFSC 2008). Due to potentiality of rich cultural and biodiversity values, the forest of Panchase area has been recently declared as protected forest by government of Nepal under national Forest Act 1993.
So far, about 1.2 million hectare of forest land has been handed over to more than 23,000 CFUGs. Thirty five percent of the total population has benefited from this program. The community forestry program has been successful in improving the natural regeneration and productivity of the forest.

Community forestry is an extensively studied field in Nepal and the impacts of community forestry on bio-physical aspects are satisfactory. However, the research has indicated mixed outcomes on social and economic transformation after community forestry. Barren and waste lands have turned into green forests. Users have secured rights - access, use, and control- on forest resources. Besides, fulfilling basic needs, many CFUGs have collected a big sum of money by selling surplus forest products that have significant contribution in community development and in additional income opportunity. This program has been received as one of the successful participatory forest management models in Nepal and elsewhere.

**Vegetation**

The Panchase region is very rich in plants diversity. There are five major forest types; Alder Forest, Chir Pine Broad Leaved Forest, East Himalayan Oak-Laurel Forest, Lower Temperate Oak Forest, and Schima-Castanopsis Forest. Kharsu (*Quereus semecarpefolia*), Phalat (*Quercus species*) and Lali Gurans (*Rhododendron arboretum*) are major species at the upper part of the area whereas Chilaune (*Schima walichii*), Katus (*Castanopsis indica*), Rakchan (*Daphniphyllum himalayense*) and Sal (*Shoerea robusta*) found at the lower belt.

There are more than 589 flowering plant species recorded in Panchase Forest. 107 species of medicinal plants, 8 species of fiber yielding plants, 23 species of natural dye yielding plants; 18 wild species potential for floriculture (except Orchids ), 56 species of wild Mushroom, and 98 species of ferns are found in the area. This region is commonly known as Kingdom of wild Orchids. Among the 412 species of orchid reported in Nepal, 113 species of orchid have been found in the Panchase region including two endemic species (*Panisea Panchasenensis* and *Eria Pokharensia*) and 35 species with high commercial value.

Wild animals found in the forest area are Asian Black Bear (*Selenarcto thibetanus*), Barking Deer (*Muntiacus muntjak*), Leopard (*Panthera pardus*), Jungle Cat (*Felis chaus*), Fox (*Vulpus vulpus*), Jackal (*Canis aerus*), Wolf (*Cania lupua*), Monkey (*Macaca mulata*), Rabbit, Mongoose etc. 8 species of Bat are recorded in this region.

Similarly, Nepali Kalij, Wild Cock, Koel, Red Whiskered Bulbul, Crow, Hawk, Owl, Sparrow are the most common birds found in the area. Demoiselle Crane (*Anthropoides virgo*) and Parrot (*Psittacula himalayana*) are important migratory birds also found in the area. The lower belt of Panchase hill forest nearby the settlement is being managed by local people as community forest and upper land forest in the
Panchase hill is kept as protected. Forest ecosystem plays an important role in the global carbon cycle as it influences the climate and climate change processes; and is globally emphasized for improving the nutritional and economic life of the rural people (FRA/FAO, 2010, Chukwumaucheya, 2012 & Singh et al., 2012). “Sustainable Management of biodiversity, cultural and watershed areas as well as Livelihood promotion of local community”.

Panchase Uncontrolled grazing, landslide, infrastructure development (rural road) and anthropogenic pressure for forest products are some crucial problems that lead degradation of the Panchase forest area (DoF, 2013).

The protection activities in upland area have considerably reduced soil erosion, sedimentation, and flooding in the downstream. As upland communities rarely receive the benefits of the environmental services they provide, now it is realized how environmental service- transfer- payments can best be implemented to improve environment condition and the livelihoods of upland communities in the area.

- The extensive use of forest for various proposes has led the forest towards degradation.
- Thousands of livestock, mainly buffaloes freely graze round the year under the open grazing systems.
- *Michelia champaca*, *Prunus* and *Texus* of the core forest area are on the verge of extinction and the numbers of *Orchid* species are also declining from the forest.
- Threat to wildlife population due to an increasing poaching in the forest.
- Soil eroding and sedimentation towards the Phewa Lake is also one of the major problems of the area.

The main aim of the forest conservation is “Sustainable management of biodiversity, water resources and ecotourism through participatory management approach ensuring environmental stability and livelihood promotion of local people”. The program’s objectives are:

- community based sustainable management of flora, fauna, habitat and micro ecosystem; wise use of forest products and conservation of natural beauty of the vicinity,
- community based ecotourism and creation of environment friendly jobs in order to improve livelihood of local people.
- participatory watershed management within Protected Forest, ensuring mutual relationship between up-stream and down-stream by establishing payment for environmental system.
Programs

To meet the goal and objectives following programs have been given priority.

- Sustainable Community Forest Management
- Biodiversity Conservation
- Soil and Watershed Conservation
- Local livelihood Enhancement

Organizational structure

- District level council
- Local level council

Benefit sharing system

- Equal benefit sharing opportunity
- Benefitted to the pro-poor by leasing the marginal land

Monitoring system

- Participatory monitory system
- Participation of all user
- Mutual understanding
- Lesson learned
- Self monitoring
- Monitoring by district forest office
- Regional directorate department of forest
- Monitoring by expert group

Besides above mentioned progress achievement panchase user groups have got so many remarkable progresses towards conservation of the natural resources and the local people have benefitted themselves locally.
The implementation of the programs will not always be easy to get a positive result. As per the conservation of Panchase watershed area, there are various encountering problems and their solutions are mentioned below:

### Problem, Solution and Future way forward

The implementation of the programs will not always be easy to get a positive result. As per the conservation of Panchase watershed area, there are various encountering problems and their solutions are mentioned below:

<table>
<thead>
<tr>
<th>S.No</th>
<th>Problems and Issues</th>
<th>Solutions and Future way forward</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lack of budget will hinderance to achieve goals and progress.</td>
<td>Manage the budget by DoF as yearly regular budget and cooperate with other helping institutions.</td>
</tr>
<tr>
<td>2</td>
<td>Free grazing and traditional rotational grazing will Deteriorate biodiversity.</td>
<td>Manage other income generation option.</td>
</tr>
<tr>
<td></td>
<td>Lack of legal authority to punish poacher and herbs smugglers.</td>
<td>DoF and regional directorate will prepare the rules and regulations and provide authority to local forest council.</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>4.</td>
<td>Elimination of water source, waterfalls and siltation of Fewa lake.</td>
<td>Principal of climate change will be adopted and provision of payment of ecosystem services should be implemented.</td>
</tr>
<tr>
<td>5.</td>
<td>Do not take conservation ownership by community and unable to conserve by government side.</td>
<td>Mobilize local council and establish more employees from department of forest.</td>
</tr>
<tr>
<td>6.</td>
<td>Problem from Forest fire and Ruler infrastructure leads to soil erosion.</td>
<td>Provide fire control training to local people and provide proper equipment to them. Green roads provision should be implemented.</td>
</tr>
<tr>
<td>7.</td>
<td>Lack of integrated ecotourism system.</td>
<td>Integrated ecotourism should be developed.</td>
</tr>
</tbody>
</table>

### Feature of Panchase Forest

1. Lake without springs’ of Panchase Protected Forest Area. The pond is named upon its feature being managed without any springs for the source of water. The pond on the saddle of hilly Nepal with historical importance and its amenity reflects the best technique of water management.

### Assisting organization

Machhapuchhre Development Organization (MDO) has been implemented Panchase Bio-diversity Management Project under the support of UNDP/Global Environment Facility – Small Grants Programme (UNDP/GEF-SGP). The main goal of this PBMP is to manage bio-diversity of Panchase forest ecosystem as an integrated community-based approach thereby diversifying and strengthening local livelihoods in sustainable manner. Capacity Building and linkage development, alternative energy promotion, biodiversity conservation and livelihood enhancement activities are the major programmes carried under the PBMP.

### Project Area

The project covers Panchase lekh and it's adjoining three VDCs of three districts (Arther Dandakharka-Parbat, Bangsing-Syangja and Bhadure Tamangi-Kaski). After the completion of first phase of PBMP and effectiveness of the project second phase of the project being implemented from January 2008 to July 2010. Two VDCs of Parbat district namely Ramja Deurali and Chitre are extended.

### Project Goal

To manage the Panchase Forest Ecosystem as an integrated, community-based, 'biodiversity-landscape management project', such that its geographic integrity, biodiversity richness, ecological processes and hydrological
functions are maintained, while also ensuring that the requisite natural resources, or their alternatives, are provided to, and equitably distributed within, neighboring communities, and concomitantly diversifying and strengthening local livelihoods in a sustainable manner, thereby alleviating poverty and improving the quality of life for a broad array of local people in the participating communities.

**Project Objectives**

- To develop and strengthen local organizational and institutional capacities for good governance and improved service delivery.
- To increase awareness and adoption of alternative energy sources and other 'green' technologies'.
- To improve community-based biodiversity management.
- To develop diversified income generating activities.

**Study of the Panchase about the Model of Conservation Area.**

Protected areas are essential for bio-diversity Conservation. They are the cornerstones of virtually all national and international conservation strategies, set aside to maintain functioning natural ecosystem, to act as refuges for species and to maintain ecological processes that cannot survive in most intensely managed landscape and seascapes. Taking following objectives, NTNC formulate the Panchase Study team. The team members are Dr. Ridish Pokhrel (Associate Professor of IOF, Pokhara.

- To critically survey the Panchase area and identity most suitable community based management modality in consultation with local communities and other stakeholders
- To clearly define a governance structure for the management of the area.
- To define necessary preconditions for successful declaration of Panchase as protected area.
- To formulate a comprehensive and high standard management document to effectively manage the Panchase area.
- To provide all the available literatures for developing the document.

The final report of the study was submitted in the National Trust for Nature Conservation-NTNC and Interaction Workshop for the sharing of the study being completed in NTNC. The model for the conservation of Panchase focused for Community Based Conservation-CBC.
Impacts of the Program

a) Effects on biodiversity

The vegetation of Panchase Forest has been better in comparison to the past. This was achieved by the massive plantation activities by the technical and financial support of project and actively participation of local community and CBOs members. Likewise, Panchase area is the main watershed area of Phewa Lake. In the last few years decomposition of soil in Fewa Lake is increasing day by day. So, the project helps to control soil erosion in the watershed area. The open grazing was controlled and encroachment was also prevented. Local People planted fodder and forest trees along their open land, homeland and other unutilized places, thus reducing the barren land. The Panchase area has now changed into greenery area.

b) Effects on climatic change

In many areas of the project, in order to reduce the pressure on local forest and to improve health of the community people, the improved cooking stoves constructed. Improved Cooking Stoves was alternative energy which reduced the CO2 emission. This reduced Carbon dioxide gas emission in the environment. The demand for ICS is still increasing. Solar Tuki also reduced the use of Kerosene which helps to reduce the carbon emission.

c) Sustainable Livelihoods

The project has carried out activities for the sustainable livelihood. It has carried out training to develop skilled human resources who can manage NTFP at the local level. Farmers have started seasonal and off season vegetables farming, Bee keeping, Coffee farming. These activities have generated additional income for the people. Saving and credit program through group formation are the sustainable means of income of the community. The proper management and effective implementation of the program has increased the funds of the group. Locally available resources natural, human and financial have been well mobilized and utilized. The forest conservation and well management has eased their lives in collecting fodders and fuel wood. The program has also provided them resources for developing micro enterprises.
Philippines: Degraded Forest Rehabilitation and Sustainable Forest Management in The Philippines

Ms. Aurea P. Lachica
DENR – Forest Management Bureau

ABSTRACT

The Philippines have experienced extensive deforestation and degradation over the last century. The country lost its forest cover rapidly through heavy logging, upland migration and agricultural expansion. As a result, the country faces timber shortages and heavily relies on imports to meet a large proportion of its demand. Vast flooding and landslides occurring almost annually are often attributed to deforestation which paved the way for the government to take extra caution in reviewing and implementing forest protection works. This incidence also caused the massive rehabilitation/restoration of degraded forest lands in the country.

A lot of initiatives to rehabilitate degraded forest lands of the country were undertaken. In fact forest restoration efforts in the Philippines began almost a century ago, and have gone through many phases. These initiatives have evolved in response to changing socio-economic, environmental and political realities; and have varied in scale, objectives, actors involved, funding sources and institutional arrangements. The endeavors were meant to rehabilitate forest cover, provide environmental services, supply timber, and contribute to the improvement of the socio-economic conditions of the local communities living in forestland.

At present, in order to rehabilitate and increase the productivity of our degraded forest as well as to expand forest cover, our government established the biggest reforestation program in our history through the execution of Executive Order No. 26 which declared the implementation of the National Greening Program (NGP) in 2011. As a part of the Social Contract of the President, we intend to plant 1.5 billion trees in 1.5 million hectares in six (6) years. We will plant more trees in six (6) years than what we have planted in the past 50 years. Under NGP, we intend to address poverty, food supply biodiversity and climate change. In addition, while we invest in the NGP it is also high time that we invest in the protection of our remaining forest as mandated under Executive Order No. 23 “Declaring a Moratorium on the Cutting and Harvesting of Timber in the Natural and Residual Forest and Creating the Anti- illegal Logging Task Force” also issued in 2011.

1 Paper submitted during the Workshop on Degraded Forest Rehabilitation and Sustainable Forest Management on July 1-12, 2014 held in Kunming China
2 Senior Forest Management Specialist, Natural Forest Management Division, Forest Management Bureau DENR
INTRODUCTION

Our country was once endowed with rich natural resources verdant mountains, blue water, fresh clean air and diverse flora and fauna. Among these, the Philippine forest is considered as the most vital resources. Both tangible and intangible benefits can be derived from it such as timber products, non-wood forest products (resins, vines, honey etc), the aesthetic value it can provide, recreational values and much more. Human dependency to forest resources is an obvious reason why forestry sector is the centerpiece of the country’s natural resource base and ecosystems. As early as the Spanish regime, various researches in forestry were already conducted, forest industry has been established, and the first forestry service was created to lead the management, development and conservation of Philippine forest resources.

The total land area of the Philippines is thirty (30) million hectares, legally classified as alienable and disposable land and forest land. As of 2012, classified forestlands covered 15.05 million hectares of 50.2%; unclassified forestland of 0.755 million hectares of 2.5% and alienable and disposable lands spanning 14.19 million hectares of 14.3%. Of the 15.05 million hectares forestlands, it is further categorized into established forest (10.056 million hectares or 66%); established forest reserves (3.270 million hectares or 21.7%); national parks, game refuge and bird sanctuaries and wilderness areas (1.34 million hectares or 8.9%); military and naval reservation (0.126 million hectares or 0.8%); civil reservation (0.166 million hectares or 1.1%) and fishponds (0.091 million hectares or 0.6%). There are about 755,009 hectares which are still unclassified forestland wherein the use of which has not been determined.

In 1900, out of the 30 million hectares total land area of the country, the forest cover was 70% or 21 million hectares. It was reduced to 60% equivalent to 18 million hectares and 50% or 15 million hectares in 1920’s and 50’s, respectively. In 1960’s the remaining forest cover was only 10.2 million hectares or 34% and it was further reduced to 7.4 million hectares or 24.6% in the 1980. According to estimates, forest cover at the beginning of 1999 was about 5.5 million hectares or 18% of the country’s land area, but in the 2003 statistics, a 1.8 million hectares increase was recorded. The increase is mainly attributed to the effort by both the government and private sectors particularly to develop the public lands through the development of industrial tree plantation and the management of natural forest areas within the Community-Based Forest Management, Socialized Integrated Forest Management Agreement as well as the private lands through the Private Land Forest Development Agreement and other reforestation initiatives of other sectors. However, based on the 2010 satellite imageries, the total forest cover of the Philippines is down to only 6.840 million hectares or 22.80% in 2010 from 7.168 million hectares or 23.89% in 2003 based from
the latest (2011) forest cover data analysis with National Mapping and Resource Information Authority (NAMRIA). This simply means that between years 2003 and 2010 our country loss around 328,682 hectares of forest cover or an annual forest cover loss of 46,954 hectares.

The decline in the Philippines forest cover is attributed to the continuous increase of the population in need of land for farming. (Agricultural expansion), settlement due to upland migration and other land uses. Another reason is the over exploitation of timber and other non-wood forest products as well as the ineffective implementation of forestry sector policies and the weak institutional linkages for forest protection and development.

As a response, the government has taken a number of efforts to address the problem of deforestation or the worsening condition of our forest. The massive rehabilitation/restoration of degraded forest through reforestation program, assisted natural regeneration, plantation establishment, agroforestry and the like are the priority task of the environment sector. These activities were also embedded on the basic Forestry Laws issued decades ago. These policies are as follows: Presidential Decree (PD) 705 known as the “Revised Forestry Code of the Philippines” which adopted the multiple use of forestland oriented to the development and progress requirements of the country as well as the protection, development and rehabilitation of forestland so as to ensue continuity in productive condition; the 1987 Philippine Constitutions which states that “the exploration, development and utilization of natural resources shall be under the full control and supervision of the State, thus It is the obligation of the State to protect the remaining forest cover areas of the country not only to prevent flash floods, but also to preserve biodiversity, protect threatened habitats and sanctuaries of endangered and rare species, and allow natural regeneration of residual forests and development of plantation forests”; R.A. 7586 or the NIPAS Law with major concerns on protected areas; Executive Order No. 263 known as the “Community-Based Forest Management Program” serve as the national strategy to achieve Sustainable Forest Management in the country promoting forest conservation and development activities through collaborative undertaking of all forestry stakeholders and that local cultures and rights of indigenous people to their ancestral lands shall be respected; and Executive Order No. 318 (2004) which promote Sustainable Forest Management in the Philippines” includes a) delineation, classification and demarcation of state forest lands; b) holistic, sustainable and integrated development of forest resources; c) community-based forest conservation and development; d) proper valuation and pricing of forestry resources and financing
SFM; e) incentives for enhancing private investment, economic contribution and global competitiveness of forest-based industries. 

Recently, in order recover further the forest that we lost, President Benigno S. Aquino III of the Philippines, has issued Executive Order No. 23 “Declaring a Moratorium on the Cutting and Harvesting of Timber in the Natural and Residual Forest and Creating the Anti-illegal Logging Task Force” and Executive Order No. 26 “Declaring the Implementation of the National Greening Program” (NGP) as one of the government priority program. Both policies were issued in 2011. The enforcement of forestry laws and regulations was strengthened for the smooth implementation of any development and management endeavor.

**APPROACHES/ POLICIES/ PROGRAMS TOWARD REHABILITATION OF DEGRADED FOREST**

**A. National Greening Program (Executive Order No. 26)**

The recent approach to rehabilitate and increase the productivity of our degraded forest as well as expand forest cover, is the National Greening Program (NGP) of our government as strengthened by the President of the Philippines through the issuance of Executive Order No. 26 on February 24, 2011. This marked and established the biggest reforestation program in the Philippine history. This is part of the Social Contract of the President aiming to plant 1.5 billion trees in 1.5 million hectares in 6 years from 2011 to 2016, in lands of the public domain, to include forestlands, mangrove and protected areas, ancestral domains, civil and military reservation and urban areas. We will plant more trees in 6 years than what we have planted in the past 50 years. Under NGP, we intend to address poverty reduction by providing alternative livelihood activities for marginalized upland and lowland households relating to seedling production and care and maintenance of newly-planted trees. Aside from being a reforestation initiative, the NGP is also seen as a climate change mitigation strategy as it seeks to enhance the country’s forest stock to absorb carbon dioxide, which is largely blamed for global warming. It also addresses food security and biodiversity conservation. Below is a Table showing the target per year of the National Greening program:

<table>
<thead>
<tr>
<th>YEAR</th>
<th>TARGET</th>
</tr>
</thead>
<tbody>
<tr>
<td>HECTARE</td>
<td>SEEDLINGS</td>
</tr>
</tbody>
</table>

83
Accomplishment shows that for the first year about 89.62 million seedlings have been planted in some 128,558 hectares of open and denuded forestland. This is about 17% above the 100,000 hectare target for 2011. For the past 3 years, we have planted 683,481 hectares. This is equivalent to what we have planted in the previous 23 years. This year, our target is to plant 381,546,538 trees in 428,000 hectares. Aside from the benefits from additional forests, the Program has so far employed more than 1,182,000 persons in upland and rural communities. The Program also provided high value food and cash crops to the communities, such as fruit trees, coffee, cacao, rubbers and others. For CY 2015 our proposed target is to plant 450,000 hectares.

Table showing the accomplishment of NGP from 2011-2013

<table>
<thead>
<tr>
<th>Year</th>
<th>Target Area (ha)</th>
<th>Area Planted [has]</th>
<th>Percent (%) Accomplishment of Area Planted</th>
<th>Number of seedling planted</th>
<th>Jobs Generated (No. Of POs, Extension Officers And Laborers Hired)</th>
<th>No. of Volunteer planters (POs, Students, NGAs, OGAs, NGOs, CSOs, Private Sector, Others)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>1,500,000</td>
<td>683,481</td>
<td>46%</td>
<td>397,769,713</td>
<td>1,182,764</td>
<td>1,574,741</td>
</tr>
<tr>
<td>2011</td>
<td>100,000</td>
<td>128,558</td>
<td>125%</td>
<td>89,024,121</td>
<td>335,078</td>
<td>715,552</td>
</tr>
<tr>
<td>2012</td>
<td>200,000</td>
<td>221,763</td>
<td>111%</td>
<td>125,596,730</td>
<td>380,696</td>
<td>387,472</td>
</tr>
<tr>
<td>2013</td>
<td>300,000</td>
<td>333,160</td>
<td>111%</td>
<td>182,548,862</td>
<td>456,590</td>
<td>471,717</td>
</tr>
<tr>
<td>2014</td>
<td>300,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>300,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>300,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Our National Greening Program is community based, meaning the communities are the one contracted to undertake the reforestation activities. We grow our own seedlings through our network of 22 clonal nurseries and 26 State Universities and Colleges (SUCs). We are now investing in the establishment of mechanized nurseries to improve the quality of planting material, and bring down the cost of seedling production. Those that cannot grow (e.g. coffee, cacao, rubber), we procure through competitive bidding, in accordance with the procurement law. We
also provided window for private sectors, Civil Society Organization (CSO)s and Local Government Unit (LGU)s to participate.

All program sites are geo-tagged, each site has pictures taken progressively with GPS reading, date and time when the pictures were actually taken. To monitor and validate our reforestation efforts, we are intending to use unmanned aerial vehicles. The regular reports submitted by our field personnel are all oaths and notarized by lawyers. We use good governance and latest technologies to ensure that every money we put in is used for reforestation.

It is estimated that about half of the total budget of the National Greening Program, P30B or about US$ 682M, will go directly to the communities through jobs and income. This will contribute to inclusive growth especially in the upland and rural areas.

B. Nationwide Logging Moratorium on Natural and Residual Forest (Executive Order No. 23)

While we invest in the rehabilitation of our denuded and degraded forest land under the National Greening Program, it is also high time that we invest in the protection of our remaining vegetated forest land to cope up with our target under the Philippine Development Plan that is to increase forest cover to 30% by 2016.

We have to recover the forest that we lost. To stop further depletion of our forest, our President has imposed a logging moratorium in all natural forests nationwide in 2011 through the issuance of Executive Order (E.O.) No. 23, "Declaring a Moratorium on the Cutting and Harvesting of Timber in the Natural and Residual Forest and Creating the Anti-illegal Logging Task Force". The E.O. 23 together with intensified enforcement, we apprehended and confiscated 25.5 million board feet of illegally cut and processed forest products. About 1,233 cases filed in courts, with 186 persons convicted so far. As a result, the number of illegal logging hotspots nationwide was reduced by 84%, from 197 municipalities in 51 provinces nationwide hotspots areas to only 31 municipalities in 12 provinces in a year operation/implementation.

To protect and expand our forest cover for 2015 we have submitted a total amount of P 906.268 Million above the baseline to strengthen our protection and law enforcement capabilities based on the updated Forest Protection Plan of each Region. Under this budget proposal we have to protect the remaining forests cover thru the different menu of options and specific strategies of the regions. This also captured
the strategic nature and unique geographical conditions of the provinces critical in our forest protection activity.

A new approach to achieve the ultimate goal in forest protection is described as **MENU OF OPTIONS** complete with Unit Cost to have a clear direction for effective and efficient forest protection and forest law enforcement. This Menu of Options comprises the list of strategies with set of activities for every strategy to choose from. This also provides immediate and long term impacts as the ultimate goal of the National Forest Protection program.

**There are eight (8) Menu of Options and these are as follows**

- Provision of full logistic material support essential in forestry law enforcement;
- Improvement of infra-structures, provision of institutional support in investigation, filling of information and/or criminal complaints and prosecution of forestry cases;
- Active collaboration and involvement of forest communities, other stakeholders in forest protection and law enforcement undertakings;
- Undertake capacity building for DENR field personnel and enhance their skill and competence for effective protection of forest and plantations for biodiversity conservation;
- Sustained a well planned Information, Education and Communications (IEC) campaign region-wide;
- Consistent apprehension and mandatory administrative adjudication and confiscation of undocumented forest products including conveyances and implements;
- Effective Forest Fire, Pest and Diseases Management measures; and
- Institute Forest Certification and Timber Legality and Assurance systems and other reforms

The long term impacts of the above MENU of Options will result to increase forest cover, improved forest ecosystems, mitigate climate change, provides available environmental goods and services and an instrument towards Sustainable Forest Management thru Forest Certification Scheme using assessment tools (the Philippine Criteria and Indicator System).
LESSONS LEARNED

The success of the programs/project can easily be achieved once there is a high support from the government. Likewise, project objectives are attainable with logistic and technical knowhow support for the project. With the implementation of the recent programs of the Philippine government in greening the country as well as to address poverty, food supply, biodiversity conservation and climate change mitigation and adaptation is an optimistic approach towards the attainment of our target to increase forest cover to 30% in 2016.

WAY FORWARD

We have done much in reforestation and forest protection, but there is still much more to be done. There is a need to establish on the ground where our Production and Protection Forests are specifically located. As an initial undertaking, we have effectively engage local government units in the sustainable management of our forests thru our investment in forest land use planning and later the integration of the forest land use plan to the comprehensive land use plan of every municipality.

SUMMARY

In the effort of the Philippine government particularly the DENR to achieve optimum results in the aspect of rehabilitating open and denuded forest areas, thus promote and established a balance equilibrium, various projects had been implemented by the government. The recent program is the National Greening Program by virtue of the Executive Order No. 26 Declaring the Implementation of the National Greening Program signed by the Philippine President on February 24, 2011. The NGP was considered as one of the priority program of the government. This program intend to plant 1.5 billion trees in 1.5 million hectares in 6 years (2011-2016). The National Greening Program intends to pursue sustainable development for poverty reduction, food security, biodiversity conservation and climate change mitigation and adaptation. Poverty, food supply, biodiversity and climate change. This program consolidates and harmonizes all the greening efforts of the government. Among the commodity roadmap to be planted are timber, fuel wood, coffee, cacao, rubber, bamboo, rattan and other fruit trees.

Another is the implementation of Executive Order No. 23 “Declaring a Moratorium on the Cutting and Harvesting of Timber in the Natural and Residual Forest and Creating the Anti-illegal Logging Task Force”. Which enhance and support the implementation of the National Forest Protection Activity in the country? The strengthening of the Forest Protection Activities aims towards the ultimate goal
of an effective and efficient protection of the country’s forest from further destruction and degradation by providing full logistic and material support in the enforcement of forestry laws, rules and regulations. Likewise, it aims for the active participation/involvement of various stakeholders, continued capacitation of DENR field personnel and sustained undertaking of IEC campaign in order to addressed forest degradation.

By the end of the Programs (NGP and Forest Protection), we will reverse our forest areas from degraded areas to a more productive one. Thus, will increase our forest cover from 24% to 30% of our land area.

However, in order to achieve optimum results in the aspect of rehabilitating open and denuded forest areas, thus promote and established a balance equilibrium the above cited programs of the government shall be fully implemented in collaboration with of private sector, Local Government Units (LGUs), Other Government Organizations (OGAs) and the non-government sector in order to become effective.

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Sri Lanka:

Rehabilitation and Restoration of Forests in Sri Lanka

Mr. W.T.B. Dissanayake
Forest Department

Abstract

Closed canopy natural forest cover of Sri Lanka has dwindled rapidly. In 2010, it was estimated at less than 24 percent of the total land area of the country. Official statistics show that the contribution of the forestry sector to the national economy is 0.4% of the total gross domestic product. The true contribution to the economy is however much greater.

Factors contributing to deforestation and forest degradation in Sri Lanka are extensive and complex. Poverty associated with the landlessness and the poor land-tenure systems are main underlying causes. Other human-created causes include, large scale agricultural and human settlement projects, shifting cultivation, excessive harvesting of forest products, and conversion of forests to arable land. Natural causes such as cyclones, tsunami, droughts, forest fires, wild elephant damages etc. also have a considerable share.

Of the various forms of forest rehabilitation and restoration programs carried out by the Forest Department since 1887, some of them have mixed success. An important initiative was formed in late eighties with the introduction of social forestry. To date number of projects and programs consisting of enrichment planting, development of buffer zones, agro forestry woodlot establishment, etc. are being carried out nationally with the involvement of local people and communities.

This paper analyses the different approaches adopted in Sri Lanka for the rehabilitation and restoration of degraded forests, taking into account the issues and challenges faced in the process and emphasize the need to develop partnership with local people, communities, NGOs, and the local private sector.

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1 Paper presented at the Workshop on Degraded Forest Management & Sustainable Forest Management, Yunnan, China, 1-12 July, 2014
INTRODUCTION AND BACKGROUND

Sri Lanka was once a heavily forested island, but over the present century its closed canopy natural forest cover has dwindled rapidly to less than 24 percent of the total land area. Historically, much of the loss was attributed to the creation of plantations of tea, rubber, and coconut and other crops during colonial times. In addition more recently, settlement schemes to provide livelihood for the landless poor, slash and burn agriculture, unplanned encroachment, village expansion due to population growth, illegal logging, uncontrolled harvesting of fuel wood, and forest fire, have contributed to the decline of island’s natural forest cover.

Sri Lanka is one of the smallest but biologically most diverse as well as highly populated counties in Asia. Consequently, it is recognized as a biodiversity hotspot of global and national importance. Its varied topography and tropical island conditions have given rise to extremely high levels of biological diversity and endemism, particularly in the natural forests. The ecological value of these forests is recognized even internationally. In addition the forestry sector in Sri Lanka is closely linked to the agriculture and energy sectors. Hydropower is the main source of electricity and it depends on a regular supply of unsilted water. The agriculture sector requires irrigation water and productive soils.

Sri Lanka has a strong tradition in conservation. Its system of protected areas is one of the most extensive in Asia and covers more than 28% of the total land area. About 1,846,000 hectares of the total land area is reserved and administered by either the Forest Department (FD) or Department of Wild Life Conservation (DWLC); 1,064,000 ha (16.1%) and 782,000 ha (12.4%) respectively.

According to the official statistics, the contribution of the forestry sector to the national economy in 2013 was 0.4% of the total gross domestic product. The true contribution to the economy is however, much greater. The national income and product accounts concentrate on market-oriented activities, and do not even include them properly because of lack of statistics. The statistics fail altogether to account for non-market production of sawn wood, fuel wood, and various non-wood forest products. Therefore it is justifiable to say that the forestry sector’s contribution to the national economy is grossly underestimated in the official statistics. According to the Forestry Sector Master Plan of 1996, a conservative estimate of the sector’s contribution to the national economy is 6%. 
National Forest Policy

The national forest policy (1995) acknowledges concern for safeguarding the remaining natural forests for posterity so as to conserve biodiversity, soil and water resources. It emphasizes the importance of retaining the present natural forest cover, and increasing the overall tree cover. The policy recognizes that home gardens and other agro-forestry systems, and trees on other non-forest land, have a crucial role in supplying timber, bio-energy, and non-wood forest products. It also recognizes that the state alone, or its main implementing agencies, cannot protect and manage the forests effectively. People’s participation in forestry development and conservation is to be promoted. The policy emphasizes the need to develop partnerships with local people, communities, NGOs and the local private sector.

Forest Degradation

The web of factors contributing to deforestation and forest degradation in Sri Lanka is extensive and complex. Some of them are outside the forestry sector. However, the route causes of forest degradation and denudation in Sri Lanka are socio-economic by nature. One of the main underlying causes of deforestation and forest degradation is poverty that is often associated with landlessness and a poor land tenure system. Other causes of deforestation are large agricultural and human settlement projects, such as Mahaweli project, along with its reservoir and hydropower projects, chena (shifting) cultivation, excessive harvesting of forest products, and the conversion of natural forests to plantation and arable land.

In a predominantly agricultural economy such as Sri Lanka’s, there is a strong link between population growth and deforestation and forest degradation. More food is needed to support the increasing population. Agricultural production has been increased mainly by expanding the area under cultivation. Since most of the other cultivable land was already in use, natural forests have been cleared. Forest area per capita has declined from about 1.3 ha in 1900 to less than 0.1 ha in year 2010. The remaining natural forests are placed under increasing pressure as the population keeps on growing and the resource base declining.

The depletion of the forest resources is also closely linked to the demand for forest products such as timber, non-wood forest products and fuel wood. Population increase combined with economic growth has resulted in higher demand for theses products.

Among the natural calamities, fire is the major cause for deforestation and forest degradation, especially in the dry and intermediate zones of Sri Lanka. Large extents
of natural as well as planted forests are subjected to fire during the dry season of the year, thereby gradually reducing their quality and ultimately turning them into grasslands. In addition, rare occurrence of extreme weather conditions such as cyclones are also causing damage to forest lands. The 2004 tsunami disaster accounted for the destruction of large extents of coastal forest eco-systems especially in the eastern and southern parts of the country.

Alongside these basic factors, one can find policy and institutional causes for deforestation. Inappropriate land-use trends are partly the result of insecure tenure and the lack of explicit land-use policy with clearly stated development objectives and associated legislation.

FOREST RESTORATION

The progressive decline in the forest resources combined with the increase in the county’s population was resulting in an emerging imbalance between sustainable timber and fuel wood supplies and demand. Consequently in late 1970s and early 1980s, widespread recognition of a need for reforestation and forest conservation measures emerged in both government and donor circles.

The forest rehabilitation and restoration programmes implemented in Sri Lanka can be categorized firstly by way of their silvicultural approaches and secondly based on their implementing arrangements/mechanisms.

Silvicultural approaches

A complete list of silvicultural options would require a deep analysis of the theory and practical variations of silvicultural systems. A simplified summary of the options, concentrating on the regeneration method, from less intensive to more intensive, would be as follows;

- **Assisted natural regeneration:** This is the most recent trend in restoration of degraded forests especially in the dry zone of the country where the degraded forests are mainly regenerating *chena* (shifting cultivation) lands, and only a few large trees per hectare exists. The main method to be employed is protection of new regeneration from fire. In addition tending and application of fertilizer will assist a rapid growth.

- **Enrichment planting with indigenous or exotic species:** This option is implemented in much degraded forests where indigenous trees still occur and have to be preserved, but where the pressure on land necessitates...
aiming at high sustainable yields. Species are selected according to the ecological zone and the desired end uses.

- **Forest plantations:** Conversion to forest plantations is being applied only when the indigenous forest has deteriorated beyond recovery. This is done after considering local socio-economic and ecological conditions. Tree species are selected according to the desired end uses, taking into account the sustained production potential of the site. Large extents of *Eucalyptus grandis* and *Eucalyptus microchoris* in the Wet Zone hill country and Teak, *Eucalyptus cameldulensis*, *Eucalyptus teriticornis* and *Acacia auriculiformis* in the dry and intermediate zones have been planted under this system.

- **Agro-forestry:** This system is the most common and most favored system whenever the local people are involved in reforestation of abandoned *chena* cultivation lands. Trees and field crops are grown together for about 3-5 years, but priority is given to the trees. Among the different tree species tried out, Teak in the dry zone has shown immense success under this system.

**Implementing arrangements**

Following are the main implementing arrangements/mechanisms being practiced in Sri Lanka for the rehabilitation of forests.

**Block Reforestation**

Block reforestation is defined here as the reforestation of medium to large size tracks of state land by the forest department, through hiring of labour directly or by taking an established contractor to do this work. This is often considered to be “classical” forestry, i.e. the normal work of forest departments. However it can create temporary employment in nearby communities, and can serve the needs, and protect the environment of local communities in the future. Although it is not often done on a participatory basis, it could be planned in cooperation with local people. The underline motive is usually either conservation (protection of catchments areas or in coastal areas, stabilization of sand dunes) or production, or a combination of these two objectives.

**Block planting by local level organizations**

This is a form of forestry in which the land remains in the hands of the state, but the work is done by a local level agency in cooperation with the Forest Department. The motivation of this local level organization may be environmental, in terms of protection of the village slopes and down stream cultivators or it may be simply
financial – providing employment for its members. The local level agency operates as a contractor, but because it is not strictly in the sphere of the private market, and because it offers opportunities for participation, it is considered to be qualitatively different from a commercial contractor. (Skutch, 1990)

**Social Forestry Approaches**

A large number of different approaches to social forestry have been taken up by the Forest Department. More than 15 different approaches to social forestry can be identified when analyzing the past social forestry projects. They range from purely conservationist (protection of soil and water resources) through programmes aimed at employment generation and income enhancement, to purely production (economic growth) objectives.

**a) Co-operative Reforestation/Village Reforestation/Taungya**

The Co-operative Reforestation Programme (which is recently named as village reforestation) in Sri Lanka is a modified version of Taungya as practiced in Myanmar. Farmers who practice shifting cultivation as their main livelihood are allocated 1-2 ha of state lands for a period of 4 years under lease agreements. The farmers are responsible for clearing the land and planting the seedlings. The seedlings, primarily teak (*Tectona grandis*) are being supplied by the Forest Department. Cultivators are permitted to grow agricultural crops between the trees during the lease period. They are also being paid four cash payment contingents upon satisfactory performance. This program was very successful during 1980s when degraded forestlands were available for raising teak. Nearly 12,000 ha of teak plantations were established under this program. (Ariyadasa, 1996)

**b) Farmers’ Woodlots**

Farmers’ woodlot program was one of the major components of the first Asian Development Bank (ADB) assisted community forestry project operated in the central part of the country during 1980s. It was further enhanced in the subsequent projects and at the moment operating successfully mainly in the dry zone.

Blocks of government land (0.2 to 1.0 ha, depending on the agro-ecological zone) are provided to farmers for the purpose of tree growing, on a long term lease of 25 years. In establishing woodlots, the application of agroforestry practices is encouraged as experience has shown that success has been achieved with farmers’ woodlots on sites where the soil quality is good enough to support an agricultural activity. A range of forest tree species and a selection of fruit tree species are being offered to participants free of charge. Although a notional spacing of 5m x 2m has
been prescribed, it can be adjusted according to the intercropping practices and species chosen. Application of soil and water conservation measures is also encouraged by planting boundary hedges, primarily with *Gliricidia sepium*. Trees planted became a property of the farmers in the earlier projects. However, in present projects 20% of the final harvest should go to the government.

As the beneficiaries of this program are resource-poor farmers, various incentives are provided to compensate for the opportunity cost of the time and the effort required to establish woodlots and to undertake the associated soil and water conservation measures. They include food or cash for work, based upon the work norms of the Forest Department. In addition certain amounts of fertilizer for tree seedlings are also provided. Training is conducted depending on the requirement.

**Private Sector Leasehold Reforestation**

The program “private sector participation in reforestation” was launched by the Forest Department in 1995 to obtain private sector involvement in tree growing in the dry zone lands. Applications were solicited from the private sector for the leasing of 10,800 hectares of abandoned state lands selected from 5 districts. In response, a total of 3572 applications were received. However, only 715 applicants sent project proposals in response to the request made by the department. Through an interview assessing the experience and financial capability of the applicants 53 were selected for the program in April 2000. The total extent allocated was 507 ha (Zoysa et al, 2002).

The lands demarcated for the purpose of leasing out to the private sector for a period of 30 years under an agreement subject to the conditions stipulated by the department. The lessee should primarily engage in reforestation, inter-cultivation of agricultural fruit crops, animal husbandry also allowed where he is entitled to the total harvest. Technical advice required for the establishment and management of plantations was supplied by the forest department. The lessee should pay an annual rent to the government based on the total value of the leased land.

The results of this program divulge a mixed success. About 50 percent of the agreement holders have commenced their work within the first five years and continue according to the agreement. Among them, some very enthusiastic leaseholders have achieved a great success by raising well managed high productive plantations. However, some of the participants failed to comply with the conditions stipulated by the Forest Department resulting there agreements being cancelled.
**Forest plantations as an investment scheme**

Establishment of commercial forest plantations based on the capital investments of general public is a very recent commercial entity developed by some private sector companies in Sri Lanka. There are more than five private companies operating in the dry zone and intermediate zone using Teak and Mahogany respectively as their main tree species. The program is implemented in medium to large scale private lands which are degraded and abandoned. People are invited to invest on a piece of land block where the company will hold the responsibility of planting and managing trees until they come to the maturity. Intercropping of fruit species is also done depending on the fertility of the land. The harvest of the intercrop as well the trees will be a property of the investor.

The companies were successful in involving large numbers of investors; mainly from the urban upper middle class; by way of some attractive advertisements through mass media. However, it was realized that their programs demonstrate more failures than success presumably due to financial mismanagement issues. Furthermore, the return on investment indicated by the companies also appears to be too optimistic and exaggerated.

**Non Governmental Organizations**

The role of NGOs in forest rehabilitation has been mainly indirect. They have helped to strengthen rural organizations and build up the confidence of the rural people in finding independent solutions to their problems. However, most NGOs involved in forestry conduct their activities in an *ad hoc* manner. The support of small-scale tree nurseries or community tree planting initiatives tends to arise as a part of a general program of rural development in a small geographical area.

**ISSUES AND CHALLENGES**

The emerging picture of the forestry situation in Sri Lanka is not bright. The continuation of current trends will not alleviate the pressure on the forest resources; on the contrary, pressure can be expected to increase. The expanding population base and economic growth will increase the demand for round wood and poles from about 2 million cubic meters in 1995 to 2.7 million cubic meters in 2020. During the same period, the need for biomass energy will increase from 9.3 million tones to 9.7 million. At the same time the closed canopy natural forest cover is projected to decline from 22% in 1998 to 17% by 2020 (FSMP, 1996).

The pressure placed upon forests of Sri Lanka is immense. Industry wants to produce sawn wood and other forest products, rural people need fuel wood to meet
their energy requirements, the growing population requires lands for agriculture, and the environmentalists and other concerned people want to ‘preserve’ the remaining natural forests intact. At the same time, international conventions such as Climate Change Convention require an increase in tree cover as sinks for carbon dioxide. Forestry professionals and other government officials are facing a multitude of problems and responsibilities, with too few resources to address the problems adequately. They have simultaneously responsible to conserve biodiversity, protect watersheds, provide land for the landless, and provide a multitude of forestry products to the increasing population.

Resolving these issues, reconciling the different, often conflicting demands placed on forests, and solving the conflict between short-term and long-term benefits and costs, are not easy tasks. However unless corrective action is taken now, future generations are likely to have a worse environment to live in. The capacity of the forests to provide various amenities will have been reduced, in many cases irreversibly. Because of the scope and complexity of the problems, the time needed for changing people’s values and perceptions, and the special long term nature of the forestry, it is apparent that all the problems cannot be solved quickly. The planning horizon has to be long, at least 20-25 years. During this time, it should be possible to reach a state that reflects the expectations set for the forestry sector. First, new policies have to be introduced and old ones modified or abolished, strategies have to be formulated, legislative and administrative reforms need to be carried out, and action needs to be taken to implement the approved policies.

The state has lost some of its control over much of the formerly forested land. In many localities people have become de facto forest managers. However, these people are not protecting the natural forests, as they do not have any incentive to do so. Farmers and businessman use the forests for their own short-term benefit. The deforested land is not being put back into forestry use but is taken up by the local people for farming, grazing and other uses. On the other hand it is clear that without people’s involvement the negative forestry trends can not be reversed. The importance of people’s involvement and the resources they represent is demonstrated by the fact that already most of the forest products needed by the country are produced by the rural people, mainly in home gardens and in plantation-crop enterprises.

Participatory forestry represents an important change in forestry thinking, but it will have to evolve towards people’s forestry, which will be people-driven, people-centered, and based on bottom-up planning and decision making. People’s participation is important, but in the long term, state foresters should also become
participants and support the people in their forestry activities. The state’s main task will be to develop an environment which will enable the rural people to manage the forests on a sustainable basis and under a controlled system.

Partnership with the industrial sector has been less favorably regarded by the society. This form of partnership has been exploitative and inequitable since most of the benefits have gone to favored few. Very often the private forest plantations benefit the rich company or individual outside the community. They often fail to deliver the promised social and environmental benefits. This may actively harm the poor village communities who were depending for a living on the forest resources (Foley and Barnard, 1984). The community often views the forest as an inexhaustible resource. Eventually, failure in communication and differences in cultural background become an obstacle, private forest growers may not adequately appreciate local ideas of land tenure and the productive capability of local inhabitants (Evans, 1992).

There is, nevertheless, a need to develop a partnership and dialogue with the national industrial sector, since industries provide the engine for development. Compared with all other plantation crops and export crops, where mainly incentive and subsidy schemes are available, there are not any incentive schemes, such as credit facilities or insurance available for the forestry sector in Sri Lanka.

Many NGOs involved in the environmental sector in Sri Lanka have shown a lack of social skills and silvicultural skills required for participatory forestry programmes. They therefore strongly reflect the views of the elite and middle classes of Sri Lanka, as well as various expatriate development organizations. However, there is a need to involve them actively in organizing and mobilizing local people and communities to become more active in forest rehabilitations activities.

WAY FORWARD

Effective forms of partnerships are needed, such as joint forest management and leasehold forestry. It is increasingly being accepted that the state alone cannot manage and protect the forest resources. It needs the active participation of the rural people, communities, NGOs, rural industries and other local private sector groups.

The State

The state must continue to be the highest authority in the forestry sector, responsible for forest policy and legislation, policy coordination, law enforcement, the management of the system of protected areas, the issuing of licenses and collection of revenue, and for supporting the other forestry partners and coordinating their development activities.
Local resource users as resource managers

Experience from Sri Lanka and other countries shows that farmers who have acquired secure tenure are ready to make long term investments. Where security of land ownership or control is created, and the rights to harvest and sell trees are secure, farmers plant more trees. Also people will help protect and manage state forests when they have incentive to do so. This can happen only if it is accepted that the local rural people and communities are “stakeholders” and that they should be involved in forest management in partnership with the state.

The role of the non-state sector in forest plantation development

Following the government’s economic policy, ways of involving local organized farmers, estate sector, local organized communities, and other local private sector groups in forest plantation establishment and management, for example through leasehold forestry, must be developed and promoted. It must be recognized that these changes in the forest plantation sub-sector cannot be effected until a supporting policy, legislation, and support systems such as extension and access to financing are in place. Environmental safeguards also must be introduced.

To encourage the private sector to grow trees in abandoned barren lands in the dry region, provision of commercial incentives and secured rights would be an important factor in the success of the program. Therefore, the government should provide sufficient incentives, such as extension services, technology transfer, subsidized credit programs, infrastructure improvements etc, to promote the private sector forest plantations. These promotional measures have to be continued until the program becomes self-sustaining.

The role of non-governmental organizations

In the future, NGO’s and various community-based organizations will have an increasingly important role to play in organizing and mobilizing local people and communities to become more active in the forestry sector.

NGOs will have to be strengthened and educated to carry out their functions successfully. It is important to try to institutionalize and formalize their involvement in at least some forestry development activities, such as forestry extension, policy formulation and possibly sectoral planning.
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Thailand:

Development of an integrated forest management in Thailand

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Abstract

Thailand rich forest covered more than half of nation’s territory until early 1960 and support livelihood of people by the mutual combination with agriculture and fishery. However, has experienced rapid deforestation down to less than 30% at the end of 20\textsuperscript{th} century. The government had paid great effort to recover such critical loss of nature and promote planting of fast growing tree species. Royal Forest Department therefore has launched on the research projects to develop the technique to improve plantation of tree species both to re-install rich forest ecosystem and to offer high economic value tree species. This article focuses on the role of forest resources movements that have an influence on state policies regarding forest plantation in Thailand and gives an overview of Thailand’s history of deforestation in relation to economic development. The working report show how integrated technologies support to approach sustainable forest management. The ownership of plantation forests extends from governments and large industrial corporations to individual farmers. The new vision and goal of rehabilitation, and plantation forestry in broader environmental terms are the subject of greater debate. It also explores the issues of land rights, forest policies and the ideological framework of forest protection strategies. These pose the greatest challenge to plantation foresters as we approach the millennium. This century offers us an excellent platform for rising to these challenges.

Keywords: forest management, reforestation, forest plantation
Introduction

Thailand covers a land area at 51.3 million ha. Thailand’s economy is predominantly agricultural and 70 percent of the populations earn their living in agricultural or related enterprises. Forests and forestlands are state property and under the responsibility and management of the Royal Forest Department (RFD). The Forest Act (1941), Section 4, defines “forest” as land that has not been taken up or acquired by any other means according to land law. Rapid population growth and economic development have put substantial pressure on Thailand’s forest resources.

The total forest area in Thailand by 2006 was estimated at 15,865,260 ha, representing about 30.92% of total land area. Estimates of forest cover range from 13.0 million ha to 14.8 million ha. Forest in Thailand can be classified as: (i) evergreen forests with three sub-types – tropical rainforests, semi-evergreen forests and hill evergreen forests (43% of the forest area), dominated by species of the genera *Dipterocarpus*, *Hopea*, *Shorea*, *Lagerstroemia*, *Diospyros*, *Terminalia*, and *Artocarpus*; (ii) mixed deciduous forest (22%), the dominant species being *Tectona grandis* (teak), *Xyilia kerrii*, *Pterocarpus macrocarpus*, *Dalbergia* spp. and *Afzelia xylocarpa*; (iii) pine forests (2%), mainly of *Pinus merkusii*; (iv) mangrove and coastal forests (2%), the main mangrove genera being *Rhizophora*, *Avicennia* and *Bruguiera* and the main beach genera *Diospyros*, *Lagerstroemia* and *Casuarina*; and (v) dry dipterocarp forest (31%) (FAO 2005). A network of parks and reserves encompasses more than 10% of the total land area. By 1999, 56% of the existing forest areas had been declared national conserved forests.

It is difficult to define either “afforestation” or “plantation forests” precisely. In particular, it is often not easy to distinguish between afforestation and either rehabilitation of degraded forest ecosystems or enrichment planting, or between plantation forests and various forms of trees on farms. The definition proposed by FAO to the 1967 World Symposium on man-made forests and their industrial importance, which uses as its criterion land use changes associated with afforestation or reforestation, has been the basis of subsequent official estimates.

Deforestation levels and forest resource depletion in Thailand have been relatively low since the introduction of a complete logging ban in January 1989. Income from the forestry sector has declined to 0.15% of real GDP from an average of 0.20% in the five previous years. It appears to have had a minimal downstream effect on the overall economic performance. (Sumantakul V. and Sangkul S. 2000)
The growth in wood-based industries remains strong, supplied by the import of logs and sawn wood from neighboring countries. Further, plantation replacement of old rubber clone trees on 320,000 ha will yield some 20 million m$^3$ of log volume; this can fill the demand of raw material for wood-based industries in the coming years. Because of difficulties with raw material supply to the plywood industry, the demands for panel products, as particle board and fiber board, have increased relative to the decline in the plywood industry. (Sumantakul V. and Sangkul S. 2000)

Regarding the regional impact, the sudden demand on a large scale for saw logs and sawn wood as raw material supplied to wood-based industries and for housing construction in Thailand, has led to wide over-exploitation of logging in neighboring countries. Recently, Lao PDR announced restrictions on log exports (but not on processed sawn wood) to create local jobs and added value to forest resources. Myanmar has also tightened controls by raising both fees and infrastructure requirements from foreign concessionaires. The future of Cambodia’s abundant forest resources is still unclear because of the political uncertainties which create a powerful deterrent for uncontrolled logging in resistance-held areas. (Sumantakul V. and Sangkul S. 2000)

**Forest Situation & Crisis**

In 1968, the RFD started to place all forestlands under management plans and prepared timber-harvesting schemes. Forest management plans have been reviewed and improved several times to suit environmental conditions and economic situations. Forest area depletion gradually decreased when the RFD launched more surveillance and forest protection measures. But forest clearing and encroaching still persist and illegal timber cutting occurs regularly. Timber used to be an important export commodity and has played a significant role in Thailand’s economic development. Foreign timber companies have harvested teak from natural stands in the north since the end of the nineteenth century.

Thailand used to be one of the richest forested countries in South East Asia. More than 50% of forest cover allowed Thailand to become one of the world’s leading wood exporters, especially teak wood. However, the situation has changed since 1989 when the logging operation was banned, which prohibited timber exploitation in natural forests. From that time until now, Thailand had suddenly changed to become a wood importing country. Most of the woods are imported from neighboring countries.
such as: Myanmar, Laos, Malaysia and Indonesia. Last two decades, the situation became worse. This was a turning point for forest management and planning. Forest protection and conservation activities have been strengthened. More forestlands have been declared as protected areas (e.g. national parks, wildlife sanctuaries, forest parks, and non-hunting areas). The remaining forests have been managed for protection and conservation purposes only; timber harvesting rights were revoked.

### Forest Policy

In 1961, Thailand began to use the National Economic and Social Development Plan (NESDP) for country development. From the First to the Tenth of Thailand’s national development plans, the development paradigm of national development plans has evolved in the context of global and domestic changes. A significant shift in the country’s development planning has taken place since the Eighth Plan (1997-2001) from a growth-oriented approach to the new model of holistic “people-centered development”. During the Eleventh Plan (2012-2016), Thailand has continued to face major global and internal changes such as world economic crisis, population increase, global warming and environment degraded.

In 1985, The National Forest Policy was established in order to manage and develop the forest resources for sustainability and in conformity with the development of other natural resources and reap social, economic, stability and environmental benefits. According national plan, the management aims to maintain the total forest areas for at least 40% of the country area. These forest areas were further divided into 25% for conservation forests and 15% for economic forests.

### The Organizations Dealing with Forestry Activities

The Ministry of Natural Resources and Environment (MONRE) is responsible for the natural resources and environment of the country. Its missions are to reserve, conserve, rehabilitate and develop the natural resources and environment with the
participation and active integration of all sectors. The strategies regarding forest resources are as follows:

- To balance between the conservation and the utilization of the natural resources in conformity with the sustainable development approach
- To manage the sustainable and fair utilization of biodiversity
- To manage the water resources by integrating into watershed systems
- To manage and develop the natural resources and environmental quality by the participation and integration at all levels.

Reforestation Past and Present

The history of reforestation in Thailand begins in 1906. The first teak (Tectona grandis) plantation of less than one ha was established by dibbling seeds on a shifting-cultivated area at Mae Paan forest, Sungmen district in Phrae province in the north, by the local forest office of the RFD. Plantations expanded to almost 160,000 ha by 1980. Up to 2000, the RFD had established 835,235 ha of forest plantations (Annual Report 2001). These plantations serve two main objectives: (i) reforestation of disturbed forests and (ii) rehabilitation of disturbed watershed areas. Some areas have been reforested for amenity or beautiful purposes but not for timber production.

Sixty years later, the Forest Industry Organization (FIO) and Thai Plywood Co. Ltd. have started their own forest plantations for commercial purposes. The same activity has been undertaken by the private sector in the last decade. The FIO, a government-owned enterprise, started a forest plantation program for timber production in 1967 and the main species was also teak. The timber is not old enough to be harvested yet; the organization has been affected adversely by the logging ban since 1989. Hence to reduce timber imports from neighboring countries, the RFD launched a forest plantation promotion project in 1994 to encourage and support private landowners and local farmers to establish forest plantations of commercial tree species covering 1.28 million ha within 12 years.

By 2000, forest plantations established under this program covered an area still below the target. The first forest plantations of fast-growing species with rotations of 10 to 15 years (e.g. Eucalyptus camaldulensis and Casuarina equisetifolia) were established by farmers and private landowners for commercial purposes more than 40 years ago. Some commercial companies and semi-private enterprises supported the RFD in establishing forest plantations (e.g. the Thai Petroleum Industry, the
Telecommunication Authority of Thailand and the Thai Cement Company). RFD also supports many royal-initiated projects to plant trees on various occasions. Nursery centers operated by the RFD nationwide regularly distribute millions of tree seedlings to local people and local institutes or communities free of charge. These planted trees will be additional sources of timber for rural communities in the future.

![Forest area of Thailand](image)

Source: 1961-2006 Forestry statistics of Thailand 2007, Royal Forest Department
2013 Forest Land Management Bureau, Royal Forest Department

In 2000, the area of planted forest in Thailand was estimated altogether 2.81 million ha, of which 83 percent is owned by the state and state enterprises and only 17 percent by the private sector. Based on area planted, the four most important tree species are teak (T. grandis), followed by two local pines (Pinus kesiya and P. merkusii) and a eucalypt (Eucalyptus camaldulensis). The species planted were: teak – 836,000 ha; Eucalyptus spp. – 443,000 ha; Acacia mangium and other Acacia spp. – 148,000 ha; other broadleaved species – 541,000 ha Pinus merkusii and Pinus spp. – 689,000 ha; and other conifers – 148,000 ha (FAO 2001).

**Changing of Forest Management**

Forest resources are of utmost importance to the economic and social development of the country. Protection and enrichment of forest resources for sustainable benefits, therefore, are crucial functions which involve various forestry activities. All forestry activities performed by MONRE’s organizations are based on the missions of each organization. For RFD, the forestry activities which are currently performed include forest protection, reforestation and rehabilitation, research and development, technology transfer, survey and research on forest biodiversity,
promoting participation of local communities, community forest establishment, forest land management, implementation of the Royal Initiative Projects, developing collaboration with international organizations, and providing services.

Forest Conservation

Its main objectives are to manage the forest resources for sustainable benefits to people and communities and to maintain the balance of ecosystem and environment. Its mandates thus include establishment of protected areas for forest conservation, reforestation and rehabilitation of degraded forests, conducting research and development on forestry and related subjects, and promotion people’s participation in forest conservation in harmony with the lifestyle of local communities.

The important forest conservation areas in Thailand are national parks, wildlife sanctuaries, no hunting areas, forest parks, biosphere reserves, areas in watershed class 1 and watershed class 2, botanical gardens, arboretums and various experimental areas such as species, province and progeny trials. For the national parks and wildlife sanctuaries, there are specific laws and regulations stipulated for the protection, control and management.
Some major forest conservation areas in Thailand

<table>
<thead>
<tr>
<th>Conservation type</th>
<th>Number</th>
<th>Total area (ha)</th>
<th>% of the country area</th>
</tr>
</thead>
<tbody>
<tr>
<td>National park</td>
<td>110 *</td>
<td>5'513'532</td>
<td>10.75</td>
</tr>
<tr>
<td>Wildlife sanctuary</td>
<td>57</td>
<td>3,657,872</td>
<td>7.13</td>
</tr>
<tr>
<td>No hunting area</td>
<td>60</td>
<td>523,304</td>
<td>1.02</td>
</tr>
<tr>
<td>Forest park</td>
<td>113</td>
<td>123,671</td>
<td>0.24</td>
</tr>
<tr>
<td>Botanical garden</td>
<td>16</td>
<td>4,137</td>
<td>0.01</td>
</tr>
<tr>
<td>Arboretum</td>
<td>55</td>
<td>4,265</td>
<td>0.01</td>
</tr>
</tbody>
</table>

* All gazetted
Source: Department of National Parks, Wildlife and Plant Conservation, 2008

Forest Plantation

Royal Forest Department set up the reforestation program as its mandate and thereafter has established plantations for both teak and other timber species annually according to the allocated budget. The plantations established by the Royal Forest Department consist of commercial plantations, watershed improvement plantations, plantations for restoration of degraded reserved forests, plantations for environmental conservation and plantations for the Royal Initiative Projects.

The reforestation in Thailand has also been carried out by private sectors for more than 30 years. Teak (Tectona grandis), Pinus spp., Casuarina spp., Eucalyptus spp. and Acacia spp. are the main tree species selected for reforestation. Particularly, Eucalyptus camaldulensis, which is and exotic fast growing tree species, is mostly chosen for reforestation by private sectors.

Thailand must significantly concentrate her funds and energies on sustainable management policies in addition to effective protection programs to preserve the Kingdom's forest resources. The sustainability of plantation forestry is an issue of wide interest and concern.

Forest Plantation Strategy

Situation led to shortages in domestic timber supply and timber importing from neighboring countries. In the long run Thailand will be forced to secure wood and timber demand with forest plantations. Final aim could be to fulfill the demand by a combination of the sustainable management of natural forests and efficient wood production from forest plantations. In the North most important tree species include teak (Tectona grandis) and Pinus spp., in the Northeast teak (Tectona grandis) and
Eucalyptus spp, and in the South and East Para rubber tree (Hevea brasiliensis). Teak goes for sawn timber and eucalyptus mainly for poles and pulp industry. Para rubber tree can be used for to produce latex, sawn timber and veneer.

The Royal Thai Government (RTG) has anticipated future timber shortages. Besides various forest plantation promotion strategies, the RFD has tried to encourage the private sector to invest in forest plantations. To reach this goal, research and training on the mass production of superior tree seedlings, utilizing biotechnology are essential.

<table>
<thead>
<tr>
<th>Item</th>
<th>Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Re-Afforestation by government budget</td>
<td>723,983</td>
</tr>
<tr>
<td>The reforestation campaign in Commemoration of the Royal Golden Jubilee</td>
<td>455,573</td>
</tr>
<tr>
<td>Reforestation by Forest Industry Organization</td>
<td>43,996</td>
</tr>
<tr>
<td>Reforestation by Thai Plywood Company Limited</td>
<td>5,743</td>
</tr>
<tr>
<td>Reforestation according to Ministry’s regulations</td>
<td>25,879</td>
</tr>
<tr>
<td>Reforestation by concessionaire budget</td>
<td>47,473</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,302,647</strong></td>
</tr>
</tbody>
</table>

Source: Forestry statistics of Thailand 2007, Royal Forest Department

**Research and Management**

Research in forestry has been conducted mainly by the research divisions of the RFD. The main topics of research concern silviculture, tree breeding, mangrove forests, forest economics, tree improvement, wood technology, forest insects, forest ecology, and watershed management. Effective research and development, based on appropriate genetic resources and good silviculture, are the foundations of successful plantation forestry production. Many plantation forests, particularly in the tropics, are not yet achieving their productive potential. The major research activities on reforestation have been long-term species and provenance experiment, breeding for tree improvement, and silvicultural techniques. Research on tissue culture for the production and enhancement of planting materials as well as for genetic improvement has been started recently, mostly for teak (Tectona grandis), eatable bamboo (Dendrocalamus asper), and E. camaldulensis.
### Plantation areas of government organizations and private sectors in 2008

<table>
<thead>
<tr>
<th>Species</th>
<th>Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tectona grandis</td>
<td>836,000</td>
</tr>
<tr>
<td>Pinus spp.</td>
<td>689,000</td>
</tr>
<tr>
<td>Casuarina spp.</td>
<td>148,000</td>
</tr>
<tr>
<td>Eucalyptus spp.</td>
<td>480,000*</td>
</tr>
<tr>
<td>Acacia spp.</td>
<td>148,000</td>
</tr>
</tbody>
</table>

*Private sectors only

## Teak Plantation

Teak is one of the most valuable timbers in the world. This is due to the good characteristics of the wood material. Teak is considered as an attractive, light but strong wood material with great resistance against fungi, humidity and insect damages. Without remarkable splitting, cracking, warping or materially altering shape of wood material, teak timber is found to be a user-friendly material for processing (CAB, 2000).

Teak is native in South East Asia. *T. grandis* tolerates a wide range of climates, but it grows best in a warm, moist, tropical climate. It prefers a dry season of 3 - 6 months which is typical for monsoon climate. The optimal annual rainfall is 1500 - 2000 mm, but it endures rainfall as low as 510 mm/year and as high as 5080 mm/year. During the dry season the water consumption is negligible because of the deciduous state. Under very dry conditions teak is usually stunted. Under very moist conditions, teak is large and fluted and usually behaves like a semi-evergreen species; the wood quality is poor in terms of colour, texture and density (Kaosa-ard, 1981). The optimal temperature for teak is between 27 – 36 °C degrees; it poorly tolerates cold and frost conditions during the winter period. (Kanchanaburangura, 1976 et al.) According to several studies teak requires relatively large amounts of calcium for its growth and development (Kaosa-ard, 1981). Teak may grow from sea level up to 1200 meters, but growth is slower on high elevations and on steep slopes. Teak seedlings are sensitive to severe drought. Teak is also tolerant to termites, but heavy grazing by pigs, rats, deer and bison may cause damage to teak shoots. The most serious animal threat for teak plantation is the elephant. (Kadambi, 1972)

The main objective of teak plantation establishment is to produce high quality timber in trees with good or acceptable growth rates. To achieve these objectives, the
planting site must be suitable for the growth and development of teak (Kaosa-ard, 1991).

Teak plantations have been widely established throughout the tropics with the main objectives to produce high quality timber within a period of 40-80 years. In general, the productivity of the teak plantation is 8-10 m³/ha/year. Teak grows well on moist sites. To produce high quality timber trees, the site should be subjected to a dry period of 3-5 months duration. Teak soil is deep, well-drained, and alluvial with high calcium, organic matter and other element content. The soil pH is 6.5-7.5. Teak is a light-demanding species. As a result, intensive weeding in 1-5 year-old plantations is very important. First and second thinning are conducted at ages 5 and 10 years in close spaced plantations using a simple mechanical thinning technique.

The supply of improved seed for planting program is a major problem especially in countries where teak is an exotic. A large quantity of improved seed can be obtained through establishment and management of Seed Production Areas and Seed Orchards. Clonal propagation by tissue culture is an option for mass production of planting stock. This technique is technically and economically feasible.

Appropriate and timely silvicultural management must be carried out to improve both the growth rate and quality. Initial spacing has marked effects on growth, quality and establishment cost. Planting time also plays an important role on initial growth and survival of the plantation.

All activities in the nursery produce high quality seedlings, strong, healthy and able to withstand the stress of transplantation. This is based on current knowledge. For some species we are close to the optimum production schedule, for others, more research is required to improve the efficiency and quality of production. Furthermore, the technological requirements for the nursery production of native species for forest restoration must address issues concerned with lack of knowledge.

There are many factors limiting the success of teak plantation establishment. Three main factors affect growth and quality of the plantation: site quality, seed supply and silvicultural management. Site is the primary factor influencing plantation growth and development.

**Timber Tracking System in Thailand**

Nowadays Thailand faces preparation for potential negotiations with the European Union, ASEAN’s agreement and international organizations in the field of sustainable forest management. On the one hand Thailand has been a significant net exporter of forest products and on the other timber trade is under increasing
competitive pressure from the international commitment of sustainable forest management. In addition, the government in its drive to make Thailand one of the largest furniture production centers in Asia. Hence Thailand needs to build up standards of performance, which represent that their Thai timber products come from legal and sustainable sources. In 2010, an action plan pilot project on electronic-Timber Tracking System was set up by cooperation between Royal Forest Department and Department of Customs in Thailand. Thailand’s timber tracking system was created using electronic equipment in order to manage the database and network information exchange for National Single Window. It has been developed based on the Chain of Custody Guidelines: Pan-ASEAN Timber Certification Initiative, Draft 2.0 28 March 2009. The system is not developed only for facilitating imported and exported timbers and timber products but also for enhancing former Chain of Custody paper-based documentation system. The new system also increase qualitative of database management and strengthens control information exchange through Chain of Custody (CoC) by network. Moreover, the digital system provides beneficial for the real-time information of entire wood supply chains.

Timber tracking system development is an important step to approach the applicability, law enforcement regulation of international trade and SFM in Thai forests. The initial focus by government appears to have been a technical one: to put in place the forest control technology (timber tracking) that would allow for the validation of legal timber. The challenge now is to achieve the right institutional mix to ensure a credible verification system and to establish the legal basis of the system itself. Hence the high priority of CoC/ timber tracking system that needs to be given to establish all components of the entire system under legal statute. Considerable investment of government has been made to establish a national timber verification system in Thailand. (Pupaiboon, 2012)

**Sustainable Forest Management in Thailand**

Sustainable forest Management was defined as a dynamic and evolving concept aims to maintain and enhance the economic, social and environmental value of all types of forests, for the benefit of present and future generations. Thailand continues to depend heavily on imported timber both in the present and in the future. However parts of associate SFM have been implemented. Thailand has also collaborated with other countries and international organizations at bilateral, regional and international levels for a number of forestry activities such as forest resources management, reforestation and forest rehabilitation, conservation of forest resources and wildlife, training and personnel development, etc. These collaborations are in the context of financial and technical assistances to Thailand and in the case of Thailand being a
membership of the international organizations, e.g.; Asia Pacific Association of Asian Nations (ASEAN); Center for International Forestry Research (CIFOR); Food and Agriculture Organization of the United Nations (FAO); Forest Research Institute Malaysia (FRIM) and etc.

In the present, RFD which is responsible for preparing timber harvesting plans has been dissolved. Demand of timber and timber products rising vary according to increasing of population. Most timber materials imported from exporter countries and timber products to be exported to consumer countries have to provide a verifiable system of traceability that allows timber to be tracked throughout its physical movement-the wood supply chain- from the forest from which it is sourced to the final product. To deal with these problems Thailand has to manage four things as following: (i) considering ASEAN Regional Criteria and Indicator for Sustainable Management of Natural Tropical Forests to be as Thailand SFM, (ii) providing special RFD unit to take responsibility for the Online Monitoring, Assessment and Reporting (MAR) Systems of Sustainable Forest Management (iii) Carbon stocks to be collected for reporting to MAR. In addition, Plans were put into actions in many areas, mainly in protected area and buffer zones of community or village - managed forests. The forest cover can be increased by forest regeneration under assigned manager: forestry staff, local communities, villagers, and industrialists. Most potential forest management projects, initiated and introduced by his majesty the King Bhumibol Adulyadej, have some similar important concepts in forest rehabilitation and development such as rehabilitation without planting on highland watershed areas.

Due to the national policy on strengthening Sustainable Forest Management the Thai government reduced the problems by promoting and supporting the private sector under the Economic Plantation Scheme in their own land outside the forest. After many successful reforestation schemes, Thailand still does not have enough forest areas to cope with the demand of population increased that reach over 60 million right now. Thailand is now facing a challenged on not only how to reach sustainable forest management, but also how to address the adverse impact of climate change in forestry.

For instance, the Forest Plantation Act of 1992 provides incentives to owners of forest plantations in the form of facilitating the movement of planted logs in the country. Without the act the transportation of any logs, whether planted or cut from private land was once controlled strictly by the Forest Act 1941, and hence it was too complicated and impeded any private or individual who is interested in commercial forest plantation. There are a number of private companies and individual farmers who invest in forest plantation, mostly teak and eucalyptus. In order to make
themselves stronger, they form Forest Farmer Cooperatives, and so on. These cooperatives receive limited support from government, mainly on planting technical support and capacity building in marketing. Existing legislation in Thailand is not particularly useful. Although some laws, for example those concerned with controlling exotic tree species. Hence, these commercial forest plantations are not added in control forest tree species, exotic species, by Forest Act 1976; such as pararubber (*Hevea brasiliensis*). Pararubber from harvesting area does not enter in verified control system.

**Challenges ahead and ways to move forward**

Present situations have been pointed out that deforestation and forest degradation continue at an alarming rate and that illegal logging remains a significant contributory factor. Land tenure and demand of land for agriculture also put more serious deforestation rate. To continuously strengthen the new policy to encourage people not to trespass the restricted forest, the people might or might not do it. Their participation will demonstrate their involvement in the policy. RFD should to research on how to prediction of cost benefit both in term of eco-socio income and benefit in term of environment to demonstrate effective positively of participatory forest management. Furthermore the new integrated action plans still needs to continuously evaluate and improve in crucial points what will directly influence to practice and management. Encourage people to do their forest plantation and make them realize the consequence of their actions as well as certain punishments. Intensively promote effective wood utilization and provide knowledge about the effect of global warming caused by deforestation and inefficient devices of wood energy usage. Conflict between Land tenure law and Forest Law/ Act are in urgent need of reform. Nevertheless, a problem confronted is the in collaborative approach among local communities. There are a large number of poor rural people who were attached to the land which had been declared as the protected forest. On my opinion, the difficulty of forest management in Thailand is humans. If we can management human resources to balance environment resources, we could expect the forest in the future to be brighter.

Utharat Pupaiboon, Senior Forestry Technical Officer
Forestry R&D Bureau, Royal Forest Department,
Ministry of Natural Resources and Environment,
Bangkok, Thailand
Reference

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Thailand:

The Degraded Forest Rehabilitation and Sustainable Forest Management: SFM Activities in Forest Industry Organization in Thailand

Ms. Wondee Supprasert
Forest Industry Organization

Key problems analyzed/studied

The urgency of rehabilitating degraded forests has become particularly important in the context of climate change adaptation and mitigation to reduce carbon mission, a significant share of which is contributed by deforestation and forest degradation. Degradation of forest ecosystems become the major problem in Thailand.

Approach adopted for rehabilitation

FIO so called Forest Industry Organization is under the jurisdiction of the Ministry of Natural Resources and Environment (MNRE), Thailand, established on July B.E.2499 (1956)

In the year 1957 Forest Industry Organization (FIO) launched the program of reforestation in degraded forest area located mostly in the northern part of Thailand. Modified from Tong-Ya system of Myanmar, forest village system were applied.

Without the right upon land, local people could plant their own crop in each economical plantations block. They regained daily wages and also harvested products at last. While they provided fertilizer to their own crops, degraded forest area became better and better.

Regarding to Thailand logging ban in 1989 (B.E.2532) and the government policy requiring more functional effectiveness, therefore, Sustainable Forest Management (SFM) have been initiated in FIO plantations since 1997 (B.E.2540). From that time Forest Stewardship Council scheme and principles have been assessed into FIO plantations as FSC-SFM program.

The Rainforest Alliance, founded in 1989, functions as Certification Body to certify responsible forestry practices of FSC-SFM program of FIO in 4 plantations of 19,000 hectares in 2 provinces – Lampang province; THUNG KWIAN; MAE MY, and Phrae province; WANG CHIN; KHUN MAE KHAM MEE.
FIO’s conformance with FSC regulations and principle, it is reflected how sustainable management of FIO is. The certificate is effective during year 2011-2016. Surveillance will be provided at the 2nd to 5th year to follow certification activities regarding to the regulation.

Main outcomes

The outcome of the FIO FSC FM program is the increasing of productive area. Deforested area can be decreased. Better livelihood of people nearby plantations can be seen clearly. SFM helps increasing timber supply from the plantations.

There are 16 plantations in FFF project with total area of 21,883.60 hectares. Next are plantations list as the main outcomes of the FFF project.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>List of FIO Plantations in 2013-2014 FIO SFM project</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>List of 10 FMUs (FIO Multi site)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Plantation Name</strong></td>
<td><strong>Address</strong></td>
</tr>
<tr>
<td>1 Mae Jang Plantation</td>
<td>Moo 3, SobPard, MaeMoh district</td>
</tr>
<tr>
<td>2 Mae Saroy Plantation</td>
<td>Moo 14, MaePung, Wangchin district</td>
</tr>
<tr>
<td>3 Mae Hor Phra Plantation</td>
<td>Moo 8, MaeHorPhra, MaeTaeng district</td>
</tr>
<tr>
<td>4 Mae Cham Plantation</td>
<td>Moo 12, Thapha, MaeCham District</td>
</tr>
<tr>
<td>5 Sri Satchanalai Plantation</td>
<td>Moo 7, MaeSam, SriSatchanalai district</td>
</tr>
<tr>
<td>6 Khao Krayang Plantation</td>
<td>Moo 1, KaengSopa, Wangthong district</td>
</tr>
<tr>
<td>7 Sai Yok 1 Plantation</td>
<td>Moo 4, WangKraj ae, SaiYok district</td>
</tr>
<tr>
<td>8 Sai Yok 2 Plantation</td>
<td>WangKraj ae, SaiYok district,</td>
</tr>
<tr>
<td>9 Krerng Krawia Plantation</td>
<td>Moo 4, ThaKhaNoon, Thongpaphum district</td>
</tr>
<tr>
<td>10 MaeSin-MaeSoong Plantation</td>
<td>Moo 3, Napoon, Wangchin District</td>
</tr>
</tbody>
</table>

Total 20314 hectares
Table 2  List of private owned plantations in 2013-2014 FSC FIO FM project

<table>
<thead>
<tr>
<th>List of 6 FMUs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Contact Person/Owner</strong></td>
</tr>
<tr>
<td>1 Mr. Kraisorn Swangdecharux</td>
</tr>
<tr>
<td>2 Mr. Virote Theerawatwathee</td>
</tr>
<tr>
<td>3 Mr. Likhit Worasiri</td>
</tr>
<tr>
<td>4 Mr. Neam Boonrom</td>
</tr>
<tr>
<td>5 Ms. Porntipa Pompanapong</td>
</tr>
<tr>
<td>6 Mr. Wutiphong Chaisaeng</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

**Key element relating to the case study**

Compliance with the SFM standard, FIO has set forest policies under the 5 elements of the best practice of sustainable forest management in FIO plantations for the next decade. They are as follows:

1. Compliance with laws
2. Safeguards of environment and biodiversity
3. Good livelihood of local people
4. Sustainable yield
5. Monitoring of impacts

**The way forward**

Reforestation should be emphasized in every parts of the land. Starting from family, school, university and sectors, everyone have to realize how important the tree planting is.
The way forward, FIO will be the for-runner of the economic wood business plantation-based which all of 244 plantations will be certified by both FIO local standard or FSC international standard of SFM within the year 2020.

In the FSC website’s press release:

The Forest Stewardship Council (FSC) is an independent non-governmental organization that promotes environmentally sound, socially beneficial, and economically prosperous management of the world’s forests. FSC was created in 1993 to help consumers and businesses identify products from well-managed forests. FSC sets standards by which forests are certified, offering credible verification to people who are buying wood and wood products. Currently more than 175 million hectares and 25,000 companies are certified to FSC standards world-wide.

The theme for this year’s World Environment Day – ‘Raise your Voice, Not the Sea Level’ – focuses on the importance of Small Island Developing States, and Carstensen’s Director General is well aware of the importance these countries have in global biodiversity.

“Tropical forest countries, many of which are Small Island Developing States, are a priority for FSC. We currently have 20 million hectares certified in tropical forest countries; about 10 per cent of FSC certified forest. We are the strongest and most widespread certification system in the Tropics, but we need to do more. Certification is a tool that can be used to secure a social and economic alternative to deforestation in these valuable regions, and help in the fight against climate change, so we need to increase those 20 million hectares substantially moving forward,” said Mr. Carstensen.

“I echo the sentiments of the United Nations Secretary-General - ‘Planet Earth is our shared island’ – and forests play a vital role in protecting our ‘island home’. We hope businesses and consumers around the world choose FSC as a way to help secure the planet for generations to come,” declared Mr. Carstensen. (http://ic.fsc.org)

Summary

The rehabilitation of degraded forest has become an urgent issue in the context of climate change adaptation and mitigation to reduce carbon emissions because a significant share of the emissions comes from deforestation and forest degradation.

Compliance with the SFM standard, FIO has set forest policies under the 5 elements of the best practice of sustainable forest management in FIO plantations for the next decade. They are as follows:

1. Compliance with laws
2. Safeguards of environment and biodiversity
3. Good livelihood of local people
4. Sustainable yield
5. Monitoring of impacts

From now on, SFM becomes an effective management tool for FIO plantations that helps increasing carbon reservoir and enhancing local community livelihood.
PART I. CURRENT STATUS OF FOREST REHABILITATION

I. Current forest status resources

Vietnam has a natural area of over 33.12 million hectares, of which 12.6 million ha of forests and 6.16 million ha of barren land are targeted for agriculture and forestry production. Thus, the forestry sector has been managing and running production activities on the largest area of land, as compared with other sectors in the national economy. The forest land area is distributed mainly in the mountainous and hilly areas of the entire country, where 25 million people from different ethnic groups live. These people have low education levels, backward farming practices, slow economic development and many livelihood problems.

II. Changes in forest cover

Due to unsustainable management and a very high need for conversion of forest land and for forest products for socio-economic development, the forest area and forest quality have been continuously decreased over the years. Based on available documents, in 1943 Vietnam had 14.3 million ha of forests, with 43% forest cover; by the year 1990 only 9.18 million ha remained, with a forest cover of 27.2%. During the period 1980 – 1990, the average forest lost was more than 100,000 ha each year. But from 1990 to the present, the forest area has been increased gradually, due to afforestation and rehabilitation of natural forest (exception for the case of some areas, like the Central Highlands and the South-East region, where the forest area still has the tendency to be reduced). Based on the official statement in Decision No. 1970/Qfl/BNN-KL-LN, dated 6 July 2006, the total national forest area was 12.61 million ha (forest cover of 37%), including 10.28 million ha of natural forest and 2.33 million ha of plantation forest, which can be classified into the 3 forest types as follows:
Special-use forest: 1.93 million ha, comprising 15.2%;

Protection forest: 6.20 million ha, comprising 49.0%; and

Production forest: 4.48 million ha, comprising 35.8%.

Government programs played a key role in this increasing coverage. Despite this increase, the forests of Viet Nam are under serious threat and various regions have high deforestation rates—including parts of the Central Highlands, the Central Coast and the Southeast region. Furthermore, forest degradation and fragmentation are significant throughout the remaining natural forests. Over two-thirds of Viet Nam’s natural forests are considered poor or regenerating, while rich and closed canopy forest constitutes only 4.6% of the total. Between 1999 and 2005 the area of natural forest classified as rich decreased by 10.2%.

With these forest resources, the present average in our country is 0.15 ha forest/person and 9.16 m3 timber/person. Vietnam belongs to the low group of countries, in comparison with the international averages of 0.97 ha/person and 75 m3/person, respectively.

The unused land of the entire country is 6.76 million ha, of which barren land on hilly and mountainous areas is 6.16 million ha, equivalent to 18.59% of the total national area. The gradual decreased distribution of barren land for the regions as follows: North East 28%, North West 21%, North Central Region 19%, South Central Coast 13%, Central Highlands 12%, South East 5%, etc. Out of the total bare land area, 71% is located at the elevation less than 700 meters and 38% of the area has slopes of 160-350. This bare land and denuded mountainous, hill area will be a potential but also a challenge for development of forest production in of the land is on the slope, degraded and scattered in distribution.
Some causes of deforestation in Vietnam

The causes of forest cover decline are complicated and diverse, and somewhat debated. Many experts agree on the following as the main causes:

- Land conversion for farm land.
- Forest fires.
- Fuelwood and timber over-harvesting by state organizations, but also illegal logging by individuals and units.
- Poor management capacity of the forestry sector and a deficient institutional and legal framework.

III. Early Forest Rehabilitation Efforts

Vietnam is known for its efforts to rehabilitate its forest cover, in addition to its drive to develop its forestry, and wood and non-wood forest product-based industries.

Scattered Tree Planting: A significant contribution to Vietnam’s forest rehabilitation is the scattered tree planting initiative. This initiative has its origin in the 1950s and was endorsed by Chairman Ho Chi Minh in 1959 as the Tet Tree Planting Festival. It has lead to an annual repetition of tree planting by people in all walks of life. Several billion trees have been planted since 1955 as part of this initiative, and 300–400 million trees annually since 1986. In total some 3.6 billion scattered trees were planted between 1960 and 1985. Estimated 1-2 billion scattered has been planted in Vietnam equivalent of 1 to 2 million ha of forest plantation.

World for Food Program: A second program that had great significance for Vietnam’s forest rehabilitation early on is the World Food Program. WFP implemented six forestry projects, with an allocated budget of USD 160 million. These funds were allocated to supply food to rural communities, and provide equipment and materials for 450,000 ha of forest plantation, construct forest roads, organize fire protection teams, and improve forest extension services. The forestry projects carried out under the WFP program focused on the development of demonstration plots and agroforestry production on steep slopes. Farmers were given the opportunity to select their own crops and species to plant.

The forestry projects carried out under WFP had good results. Large areas of land have been planted to trees, jobs were created, livelihoods in communities improved, forest plantation and agroforestry techniques have been transferred,
gender equity in forestry has been promoted, and local staff have been trained in the organization and management of forestry projects.

Rehabilitated Forests at the Beginning of the Large Programs: Since the early 1990s, following the United Nations Conference on the Environment and Development and the era of the Tropical Forestry Action Plans, Vietnam has also embarked on major reforms of natural resource management. The three major forest rehabilitation programs of the so called Greening the Barren Hill Program (Program 327), the Five Million Hectare Restoration Project (Program 661), are shaped by this change. The first, Greening the Barren Hill Program, started and was completed during the 1990s. The Five Million Hectare Restoration Project started in 1998 and had final horizon of 2010.

PART II. VIET NAM FORESTRY DEVELOPMENT STRATEGY AND FOREST REHABILITATION PROJECTS

I. Viet Nam Forestry Development Strategy 2006-2020

The current national strategy for the forest sector is the National Forest Development Strategy (NFDS), 2006-2020. It builds on previous strategies and programs, setting out ambitious targets for policy reform, plantations, financial support for forest protection and plantations and a greater role and responsibility for the local communities. It seeks to modernize forestry, so that forestry can play its part in the industrialization and modernization of rural agriculture, in hunger eradication, in poverty reduction for people in mountainous areas, and in environmental protection. The NFDS is relatively strong on the need for clear ownership conditions for land and forest. It also discusses the enforcement of land laws, providing guidance on related responsibilities.

Objective

- Sustainably establish, manage, protect, develop and use 16.24 million ha of land planned for forestry
- Increase the ratio of land with forest up to 42 – 43% by the year 2010 and 47% by 2020; to ensure a wider participation from various economic sectors and social organizations in forest development
- Increase their contributions to socio-economic development, environmental protection, biodiversity conservation and environmental services supply
- Reduce poverty and improve the livelihoods of rural mountainous people
Contribute to national defense and security

**Solutions**

1. Solutions on policy and laws
   - Policies for forest and forest land management
   - Finance and credit policies
2. Renovation of organizing forest production and business and encouragement of economic entities participating in forest protection and development
3. Solutions on planning, plan and monitoring
4. Solution on sector organization and management
5. Solutions on science and technology
6. Solution on training human resources
7. Solutions on international cooperation

**Programs**

The objectives and orientations of the Forestry Development Strategy are implemented through:

**Three development programs:**

1. Sustainable forest management and development program
2. Forest protection, biodiversity conservation and environmental services development program
3. Forest products processing and trade program

**Two support programs**

1. Research, education, training, and forestry extension program
2. Renovation of the forestry sector institutions, policies, planning and monitoring program

**II. Forest Rehabilitation Projects in Vietnam**

The three types of forest defined in the Forest Protection and Development Law (2004) are useful to group forest rehabilitation projects. As a rule, the purpose of the
rehabilitation projects on each type of forest land is consistent with the forest land on which the project takes place.

- Protection Forest Rehabilitation Projects
- Special-use Forest Rehabilitation Projects
- Projects on Production Forest Land:
  - Raw material for paper production
  - Woodchips
  - Valuable wood from indigenous tree species
- Projects Supporting Forest Rehabilitation Projects:
  - Technical assistance projects
  - Seed production projects
  - Social forestry projects

**Objectives**

In Vietnam, the three forest types each have a specific key objective: protection forest to protect upstream areas of watersheds or control sand movements in coastal formations; special-use forest to conserve natural or cultural heritage; production forest to supply forest products. However, single forest types, and subsequently projects to rehabilitate particular forest types, as a rule pursue more than one objective.

The objectives of the projects reviewed can be grouped into seven categories:

- Catchments protection/biodiversity conservation
- Restore forest cover/regreening
- Poverty, rural development, employment
- Promoting tourism
- Production
- Knowledge & technology creation
- Others

The executing agencies of forest rehabilitation projects can be grouped into eight categories:
Beneficiaries

Local people were said to benefit from all the surveyed production, protection and special-use forest projects. Other beneficiaries are: companies, enterprises, non local/public, tourists/tour operators and executors.

Funding

Funding sources for forest rehabilitation projects can be divided into national and international funds:

National Funds:

- State budget
- Loan
- Direct Investment
- Self-financed

International Funds:

- Technical assistance funds
- ODA non-repayment fund
- ODA loan
- Joint venture funds

Method

There are 7 forest rehabilitation methods used in the projects. Some form of plantation continues to be the dominant method of forest rehabilitation. Plantation included agroforestry and intercropping methods. Forest rehabilitation through
protection using natural regeneration or combined enrichment and natural regeneration, was particularly relevant in protection forest and special-use forest.

- Natural regeneration
- Natural regeneration & enrichment
- Enrichment
- Protection
- Plantation with natural regeneration
- Plantation, replanting
- Agroforestry, intercropping

**Challenges**

- Population growth is increasing and spontaneous migration is still happening. Inefficient land use in mountainous areas puts constant pressure on forests for expansion of agricultural land areas.
- Increasing demands for forest products have put pressures on forest resources and the environment, particularly on natural forests. The current demands for forest products exceed the sustainable supply from the forest. The suitable land areas for afforestation of high-yielding production forest are limited and scattered.
- The competitiveness of forestry production is still low. International integration not only is an opportunity, but also a great challenge, for the forest product processing industry and trade of forest products. The competition will be more critical in the future, in both international and domestic markets.
- There exist inadequacies between the requirements for fast, comprehensive and sustainable development and the restricted resources of the forest sector (e.g. human resources, infrastructure, funding, management capacity, etc).
- The importance of forestry has not been comprehensively, objectively and fairly evaluated, which has affected the formulation of investment and development policies of the sector.

**III. Outcomes of Vietnam’s Forest Rehabilitation Projects (up to 2005)**

**Forest cover - conservation achievements**

- Planting forest, and improving landscape quality (1350 ha)
- Forest cover reached proposed objective
• Restoration of barren lands in special-use forest
• 43,000 ha replanted
• 3000 ha of acacia planted between 1992–2003
• Reforestation, tending and protection
• Core area of special-use forest well protected
• Selected appropriate species for dry and coastal areas
• Cutting of natural forest reduced
• Annual monitoring of biodiversity

Social achievements

• People participate in reforestation
• Resettlement and training
• Training to transfer reforestation technology in alkaline soil for local staff and farmers
• Farmers have stable prices for wood
• Improvements for education, health and culture
• Lives of local people improved
• Local people participating to formulate plan and carry out forest rehabilitation and utilize forest
• Assistance to ethnic groups to leave protected areas
• Productivity achievements
• Stable supply of raw material for Vietnam Paper Corporation
• Supply of wood to VIJACHIP (Vietnam Japan Chip Corporation Ltd—an afforestation and woodchip production business company)
• Enhance productivity and improve quality of forest
• Technology outcomes
• Selection of species that are appropriate and of high economic value in alkaline soil in Cuu Long delta region
PART III. SUMMARY AND LESSONS LEARNT

I. The Results of 50 Years of Forest Rehabilitation

Vietnam has a long history of forest rehabilitation, as it started to give tree planting its due importance in the mid-1950s. The country has since then spent a great deal of effort on bringing back tree vegetation where forests have disappeared.

There are various indicators that demonstrate the success of Vietnam’s forest rehabilitation. Over 85% of the projects that were surveyed as part of this report had met their main and specific objectives. The people who provided success ratings of their projects rated over 50% as successful or good, while over 80% of the projects rated between quite successful and very successful.

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

Project achievements fairly well matched the objectives. Besides, there is an additional outcome of some of Vietnam’s forest rehabilitation projects, as they have improved dialogue between the authorities and other stakeholders.

A different indicator that reflects the success of Vietnam’s forest rehabilitation is the relation between areas rehabilitated, and the existing area of rehabilitated forest at various points in history. Plantation forest area has increased markedly year by year: 1.050 million ha in 1995; 1.471 million ha in 2000; 2.218 million ha in 2004; 2.219 million ha in 2009; 3.438 million ha in 2012. There is no indication of how much forest had been rehabilitated naturally until the early 1990s as a result of active protection or
abandonment. However, it is obvious that maintenance and assisted natural regeneration of exhausted forests, especially in watershed areas, has contributed to the increase in forest coverage. Up to the year 2005, assisted natural regeneration has been applied in an area of 723,450 ha of forest under the 5MHRP (accomplishing 72% of the plan). In 1995 forest covered only 28% of the country, but this figure increased to 35%, 36.7%, 39.1%, 40.7% in 2000, 2004, 2009 and 2012, respectively.

According to the Ministry of Agriculture and Rural Development report on the achievements of the 5MHRP, until 2010, an area of 2.45 million ha of plantation forest had been established, of which 631,317 ha was protection and special-use forest, 683,396 ha was production forest, and 86,954 ha was fruit tree and industrial crop plantation on forestry land.

Forest plantations have progressively contributed to wood supply in Vietnam. In 2001 the forestry industry consumed 1.6 million m3 of forest plantation wood. It is difficult to establish how much forest rehabilitation has contributed to the total role of the forestry industry in the national GDP. With an area of over 2 million ha, special-use forests, including national parks and natural reserves, have huge advantages in biodiversity and gene conservation.

There are positive outcomes of forest rehabilitation for local communities. Local people were mentioned as one group of beneficiaries. They obtained benefits in terms of cash income, savings and non-cash incomes, forest protection contracts, use of fuelwood from non-timber forest products and improvements in education. There was little or no improvement in food security, health conditions, access to health care or housing. There are also positive environmental outcomes of the forest rehabilitation projects in terms of floristic diversification, landscape diversity, soil quality and reduction of soil erosion. Many projects achieved a recuperation of forest cover.

II. Explaining Outcomes

Policy and Legislation

The policy and legislation in Vietnam has been highly conducive to forest rehabilitation. The Government of Vietnam has made forest rehabilitation a priority since the mid-1950s, and this commitment has been boosted since the early 1990s. The policy of forest rehabilitation has been clearly reflected through the projects carried out at the national scale. Various projects and programs in the field of forest rehabilitation have been implemented consecutively over many years. The protection function of forests, forest environment and conservation of forest biodiversity are clearly taken into account.

The successful results of forest rehabilitation also depend greatly on sectoral and non-sectoral policies. The policies related to land ownership, support, incentives, land
use planning and environmental services. Particularly relevant have been the revisions of the Land Law (in 1993, 1998, 2000, 2003 and 2013) and the enactment of the Forest Protection and Development Law. The Land Law clearly states that the land is planned and generally managed by the state but can be allocated to individuals, households, social organizations and communities for long-term use in compliance with agreed purposes. Rights are quite comprehensive as owners can exchange, transfer or inherit land use rights, or use the land as collateral for bank loans. The Forest Protection and Development Law defines the legal opportunities for forest land allocation and the leasing of forests to individuals, households, management boards, economic organizations and communities. The Law indicates the state policy of investing in, encouraging and supporting forest protection and development; expanding the market for forestry products and insuring plantation forest. There are also a number of decrees and decisions issued by the government regarding land allocation and forest contracting, support and credit policies for forest protection and development. Many policies have been endorsed and amended to make them consistent with the actual situation.

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

**Funding**

Vietnam has for many years invested considerable amounts of funds in forest rehabilitation, especially since the 1990s. This national investment has been complemented with significant international support.

Under current arrangements of payments for the protection of forests, state financing of forest protection needs to continue if the forests are to be kept. There is little other funding being mobilized for forest rehabilitation, especially for the rehabilitation of production forest land that is meant to boost the forestry sector’s contribution to the national economy.

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

The objectives that are pursued in Vietnam’s forest rehabilitation include environmental, economic and social objectives. The objectives are fairly compatible. Productive objectives can be carried out on production forest land, and in principle these objectives can be compatible with social objectives, like improving the well-being of the rural poor. In practice, however, the link between those objectives is difficult. Prices paid for wood and timber are limited by profit margins, and they may be too low to be attractive to small scale tree growers. Local markets for wood or other forest products may be limited. Commercially interested entrepreneurs may have little interest in dealing with many small producers. These are all constraints that diminish the compatibility of various objectives of forest rehabilitation.

The objectives of forest rehabilitation are relatively flexible and can be adjusted if needed. For example, as mentioned above, considerations are currently being made regarding narrowing the area of protection and special-use forest, and expanding the area of production forest.

Economics, Markets and Demand

Various arguments have been already stressed in the previous paragraphs related to economics, markets and demand. The woodchip and derivatives sector may suffer from high production costs, in which case nationally produced products may end up being more expensive than those produced elsewhere. New product development will be an important aspect that will have to be addressed if the planned expansion is to be successful, and forest rehabilitation on production forest land economically viable. The more environmental function-oriented forest rehabilitation does not appear likely to become profitable any time soon, while some of the anticipated benefits that stimulated forest rehabilitation may not be realized because of the unclear link between forest cover and downstream flooding, or limited water volumes.

Recently, although forest plantation has increased its contribution to covering the need for industrial materials such as paper, fibre and particle board, and woodchips, the demands remain large. In the recent years, for instance, furniture exports have increased vigorously, yet 80% of raw materials are from imports. Thus forest plantations to improve timber supplies become more and more urgent. More effort should be made to meet current and future demand for wood materials.

Technology, Extension, Technical Assistance and Training

Various policy makers on Vietnam’s forestry sector have observed technical limitations to forest rehabilitation, including inadequate seed material, poor soils in plantation sites, and inadequate plantation maintenance. It should be acknowledged that science and technology, as well as the application of advanced techniques in
production, have contributed significantly to the outputs of forest rehabilitation in Vietnam. A group of tree species that have high productivity, are economically and environmentally valuable, and can grow on the degraded barren hilly land, sandy coastal and drought-stricken areas, has been available since the early 1990s. Advanced methods in terms of breed improvement, intensive afforestation, productivity increases, and planting site selection have been widely applied in the field. Good results for natural forest rehabilitation through maintenance, assisted regeneration and enrichment planting have also been achieved through the application of techniques obtained from relevant research. However, the need to improve tree productivity and the supply of high quality tree breeds remains.

The forestry extension service has drawn attention. Agriculture and forestry extension organizations, as well as governmental extension programs, have been established from the central to the local level. A number of projects for agriculture and forestry extension have been implemented. However, the effectiveness of the service is still unsatisfactory.

III. Lessons learnt

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

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

2. The procedure of project appraisal, management and monitoring of project operation is essential to ensure the success of the projects.

3. Clear and detailed benefits for households and articulated participation will vastly enhance project results.

4. 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.

5. The implementation of forest rehabilitation projects should be integrated with other projects that aim to improve the socio-economic conditions of local populations.

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

- Forest Protection Department. 2014. Statistical data of forest succession.
- Ministry of Agriculture and Rural Development. 2005. Conclusion of Deputy Prime Minister Nguyen Tan Dung in the meeting of evaluation of the implementation of 5 million hectare forestation project and forest protection. Science and Technology Journal of Agriculture and rural Development.
INTRODUCTION

Western Highlands (sometimes also called Central Highlands or Midland Highlands) is one of the regions of Vietnam containing the provinces of Dak Lak, Dak Nong, Gia Lai, Kon Tum and Lam Dong with 5,462,666 ha of the total natural area. Its differences in geography, topography, climate and soil have created the typical forest ecosystems diversifying the forms of floras and faunas. Western Highlands is a home of multiple families: from Malaysia - Indonesia characterized by the Dipterocarpaceae; from India - Myanmar characterized by the Combretaceae, the Lythraceae; from the Himalayan - Yunnan - Guizhou typical with the Pinaceae and from the northern Vietnam such as Fagaceae, Orchidaceae, Asteraceae. All of them have made the most diversified highland forest resources in the country. According to statistical figures, Western Highlands has over 224 families of 1200 genera and 4,500 species. Particularly, the tree species has over 700 species belonging to 90 families of two divisions Gymnospermae and Angiosperms.

However, Western Highlands forests have been degraded due to many different causes. The current main direct causes of degradation are generally agreed to be a result of: conversion of forestland to agriculture use (particularly to industrial perennial crops), unsustainable logging (notably illegal logging), agricultural expansion by people migrating to forested areas, infrastructure development and forest fires. Many natural forests, especially the dry dipterocarp forests which is seriously invaded by planting industrial crops, have made the area of forests in the Central Highlands
significantly reduce. Typically, some dry dipterocarp and broadleaf evergreen forest ecosystems are alarm.

Therefore, the construction of the project "Restoration and Sustainable Management of the Forest Ecosystem in the Central Highlands in the period 2013-2020, vision 2030" aims to restore the degraded forest ecosystem and to serve the sustainable socio-economic development and the national security in Central Highlands, is essential.

I. THE CURRENT STATUS, OBJECTIVES AND TASKS

1. The current status of protection and management of the forest ecosystem in the Central Highlands

The forest protection and management in the Central Highlands are shown in the following aspects:

- The protection of forests
- Sustainable management and logging of forests, including: operating the sustainable forest management model with international standards; building plans for sustainable forest management and control; managing the processing manufactories.
- Performance of forest companies, boards of the protection forest management and boards of special-use forest management.
- Implementation of rubber tree plantation.
- Implementation of policies of payment for forest ecosystem services.

According to the data publishing the current status of the national status in Decision No. 1739/QD-BNN-TCLN dated 07.31.2013 of Minister of Agriculture and Rural Development, the total forest area in the Central Highlands was 2903803 ha, the cover of the whole area was 52.94%.

According to reports of the provinces of the Central Highlands, within 5 years (2007-2011), the forest area lost was 129,686 ha, of which 107,425 ha of natural forests and 22,261 ha of forest plantations was due to conversion of forestland to other use, illegal encroachment, logging and deforestation. Along with the loss of the forest area, the forest quality (especially the quality of natural forests) had been significantly decreased. Forests of high quality and large volume remained unremarkable (rich forests constituted only 16%), and were special-use forests concentratively. Forests recently restored by natural regeneration were young forests primarily, of which the value of biodiversity, the ability of supplying forest products, and the protection function were low.
Central Highlands is the hotspot of violating Law on forest protection and management in the whole country. From 2008-2012, there were 8643 cases of illegal deforestation discovered in here. The management of the forestry revealed many weaknesses. Severe deforestation taking place in many localities had caused a sharp decline of the forest quality. In addition, forestry companies had operated inefficient. Many of them were on the brink of bankruptcy. A large number of processing plants nearby forests, of which implementation were unplanned, not associated with a stable source of raw materials, and lack of efficient and regular management, had organized collections of woods and become places of illegal wood consumption. Furthermore, boards of protection forest management and boards of special-use forest management were incompetent to protect their forests. The status of harvesting woods and forest products of high economic values focused essentially in natural forests, nature reserves, Yok Don and Chu Yang Sin National Park.

2. Objectives

- Protect and restore the existing forest ecosystem; effectively and sustainably use the forest resources and the land fund for forestry planning.

- Increase the forest cover to 55% by 2020; increase the productivity, quality and overall value of forests.

- Create jobs, promote forest-based livelihoods, contribute to hunger eradication and poverty reduction; ensure security and defense.

3. Tasks

3.1. In the period: 2013-2020

a. Protection of forests

- Protect, restore and develop sustainably 2.889 million ha of forest (Dak Lak province: 640,900 ha, Dak Nong province: 285,200 ha, Gia Lai province: 719,800 ha, Kon Tum province: 665,200 hectares, the province Lam Dong: 578,300 ha).

- Reduce ultimately violations of Law on forest protection and management; promote effectively protection functions, protect the ecological environment and the biodiversity of the forest ecosystem, contribute to sustainable socio-economic development of the country.

- Protect, regenerate unoccupied lands of regenerating trees to increase the forest area and cover. Strictly protect regions of genetic resources of rare and valuable plant and animal species. Encourage all individuals, organizations and all economic sectors in participation
of protection and management contracts. Strengthen forest rangers, forest fire prevention, functional subdivisions of special-use forests and responsibilities of administrations of communes.

**b. Development of forests**

- Increase the productivity and quality of natural production forests with 1.6 million ha of a permanent forest stand. Sustainable management and commerce of the forest stand to stabilize the average growth at 4-5 m³/ha/year by 2020.

- Increase the productivity and quality of 302,091.6 ha of existing plantations (priorly increase the productivity and quality of 253,075 ha of production forests); plant 47,815 ha of production forests to increase the production forest area to 300,890 ha, including 220,000 ha eligible for large logging with the average cycle is 12 years and average yield is 10 m³/ha. Establish material zones, of which area is stable, sustainable and associated with a synchro-advanced processing network, to provide actively raw materials for factories and exporting processing plants, and to supply sufficiently raw materials for producing, processing, exporting.

- Plant 9,342 ha of protection forest: plant protection forests on watersheds of large rivers, lakes, hydropower and irrigation dams, and border corridor regions, especially on critical and flood swept sectors.

- Plant special use forests: priorly plant native tree species to renovate landscapes and upgrade botanical gardens...

- Afforesting on forestland conversed to other uses.

- Nurture forests after logging; nurture poor forests and young forests restored after hill farming; facilitate the growth and development of generating trees.

- Annually naturally regenerate 14,669 ha of special-use and protection forest on unoccupied lands of regenerating trees.

- Improve natural production forests to plant 100,000 ha of economic plantation on the poor dipterocarp forestland.

- Enhance the movement of scattered tree planting in organizations, agencies, schools, local communities and households.
3.2. Vision 2030

- Protect, restore and sustainably develop 3,113 million ha of the existing forests area.

- Continue to protect the unoccupied land area of regenerating trees to increase the forest area and cover; strictly protect zones of genetic resources of rare and valuable plant and animal species and forest ecosystems; encourage all individuals and organizations, economic sectors to participate in forest protection and management contracts; strengthen forest rangers, forest fire prevention, functional subdivisions of special-use forests, and responsibilities of administrations of communes.

- Continue to contracts around 25-30% of the existing natural forest area on the protection and special-use forestland, and about 10% of the existing natural forest area on the production forest land.

- Continue to improve the productivity and quality of natural production forest, sustainably manage and commerce the area to stabilize the average growth at 5-6 m³/ha/year by 2020.

- Continue on the care and cultivation of protection and production forests to increase the forest cover, and continue plant headwater forests on large river basins, critical sectors at high risk of landslides, flash floods, and the border corridor regions.

- Plant special-use forests: primarily plant native trees to renovate landscapes and to upgrade botanical gardens.

- Afforesting on forestland conversed to other uses, such as hill farming land…

- Continue to foster forests after logging; foster poor forests and young forests restored after cultivating; facilitate the growth and development of generating trees.

- Promote the movement of scattered tree planting in organizations, agencies, schools, local communities and households.
CONTENTS AND SOLUTIONS

1. Contents of restoration and sustainable management of the forest ecosystem in the Highlands in the period 2013-2020, vision 2030

1.1 Forest protection:

- Protect, restore and sustainable develop 2.889 million ha of the existing forest area, consisting of 640,900 hectares in Dak Lak province, 285,200 ha in Dak Nong province, 719,800 ha in Gia Lai province, 665,200 ha in Kon Tum province and 578,300 ha in Lam Dong province.

- Forest protection contracts: in the period 2013-2020, contract 20% of the natural forest area equivalent to the average area of 200,274 ha per year of special-use and protection forest lands, including 94,342 ha per year of natural forests on use-special forest lands (account for 47% of total area of contracted forestland) and 105,932 ha per year of natural forests on protection forestlands (about 53% of the total area of contracted forestland).

1.2. Forest Development:

- Improve the productivity and quality of natural production forests with 1.6 million ha of a permanent forest stand. Sustainable manage and commerce the forest stand to stabilize the average growth at 4-5 m3/ha/year by 2020.

- Increase the productivity and quality of 302,091.6 ha of existing plantations (priorly increase the productivity and quality of 253,075 ha of production forests); plant 47,815 ha of production forests to increase the production forest area to 300,890 ha, including 220,000 ha eligible for large logging with the average cycle is 12 years and average yield is 10 m3/ha.
<table>
<thead>
<tr>
<th>Order</th>
<th>Region/Province</th>
<th>Sum (ha/year)</th>
<th>Special use forests</th>
<th>Protection forests</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Forest ecosystem group with low impact</td>
<td>Forest ecosystem group with low impact</td>
</tr>
<tr>
<td></td>
<td>Central Highlands</td>
<td>200,274</td>
<td>471,709</td>
<td>94,342</td>
</tr>
<tr>
<td></td>
<td>Gia Lai</td>
<td>36,051</td>
<td>55,663</td>
<td>11,133</td>
</tr>
<tr>
<td></td>
<td>Dak Lak</td>
<td>58,688</td>
<td>219,932</td>
<td>43,986</td>
</tr>
<tr>
<td></td>
<td>Dak Nong</td>
<td>12,630</td>
<td>28,982</td>
<td>5,796</td>
</tr>
<tr>
<td></td>
<td>Kon Tum</td>
<td>50,127</td>
<td>89,217</td>
<td>17,843</td>
</tr>
</tbody>
</table>

*Table 1. Protection contracts in provinces of Central Highland by 2020*

*Unit: Ha*

Plant protection forests divided into 3 periods: in the period 2013-2020, plant 9,342 ha; in the period 2013-2015, plant 13,662; in the period 2016-2020, plant 6,673 ha.

Plant special-use forests: priorly plant native tree species to renovate landscapes and upgrade botanical gardens.

Afforesting on forestland conversed to other uses.

Nurture forests after logging; nurture poor forests and young forests restored after hill farming; facilitate the growth and development of generating trees.

Annually naturally regenerate 14,669 ha of special-use and protection forest on unoccupied lands of regenerating trees in the period 2013-2020, including 5,421 ha of special-use forest and 9248 ha of protection forest per year.
Table 2. Improvement of natural production forests for economic plantation in provinces of the Central Highlands by 2020 *Unit: Ha*

<table>
<thead>
<tr>
<th>Order</th>
<th>Forest type</th>
<th>Region/Province</th>
<th>Production forest</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Forest ecosystem group with high and average impact</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Current state in 2013 (ha)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sum</td>
</tr>
<tr>
<td>1</td>
<td>Poor Dipterocarp</td>
<td>Gia Lai</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>forest</td>
<td>Dak Lak</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Dak Nong</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Kon Tum</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Lam Dong</td>
<td></td>
</tr>
</tbody>
</table>
• Improve natural production forests for economic plantation. In the period 2013-2020, improve natural production forests to plant 100,000 ha of economic plantation on the poor dipterocarp forest land in the whole Central Highlands region divided into 3 period: in the period 2013-2015: plant 28,571 ha; in the period 2016-2020: plant 71,429 ha; the average area: 14,286 ha/year.

• Enhance the movement of scattered tree planting in organizations, agencies, schools, local communities and households. In the stage 2013-2020, plant about 28,000 scattered trees in the whole region; the average output will reach at 4,000 scattered trees/year.

1.3. Synthesis of investment and labor demand:

a. Synthesis of investment

The total expected investment demand in Central Highlands in the period 2013 - 2020 will be about 6,153.3 billion Vietnam dong, of which the state budget will be 789 billion dong, accounting for 12.8% of total investment; the remains will be around 5,364.3 billion dong, accounting for 87.2% of total capital investment. Gia Lai Province: about 1,291.5 billion dong, accounting for 21%; Dak Lak: accounting for 24.4% (about 1,502.4 billion dong); Dak Nong provinces: about 930.3 billion dong (account for 15.1%); Kon Tum province: about 1,156.9 billion dong (accounting for 18.8%); Lam Dong province: 1,272.2 billion dong (accounting for 20.7%).

The average capital investment of the whole region will be about 879 billion/year, including about 1.758 billion in the period 2013-2015, accounting for 28.6% of the total projected investment needs; and about 4395.2 billion, accounting for 71.4% of the total projected investment needs in the period 2016-2020.

b. Demand for labor:

To perform the project efficiently, the demand for labor will be approximately 800,000 employees, leading the average demand for labor will be nearly 23,000 employees/year for each province.

2. Solutions for restoration and sustainable management of Central Highland forest ecosystem in the period 2013-2020, vision 2030

• Solutions on forest protection

• Solutions on forest development
II. ASSESSMENT OF THE EFFECTIVENESS OF THE PROJECT

1. Investment efficiency

1.1. Roles of the project

The construction of the project "Restoration and Sustainable Management of the Forest Ecosystem in the Central Highlands in the period 2013-2020, vision 2030" will have significant meanings in the short term and long term in equal measure. It will positively change the whole face of the forestry sector in the Central Highlands. Besides, it will strongly impact on livelihoods of local people. Moreover, it will consolidate the national defense and security system, maintain the social order, ensure the food security, and serve socio-economic needs.

Therefore, the building of the project "Restoration and Sustainable Management of the Forest Ecosystem in the Central Highlands in the period 2013-2020, vision 2030" is ultimate and decisive to manage the Highlands forestry sector as it will provide specific and concentrative operation orientations to promote effectively the roles of forests and to develop the forestry sector.

1.2. Economic efficiency

- Implementing contents of restoration and sustainable management of the forest ecosystem by 2020 as mentioned above will maintain the income from the direct value of forest towards sustainable forest management, and the forest cover (estimated over 55% by 2020), and conserve the current state of the forest resources (2,889 thousand ha). In addition, it will help to effectively exploit values and financial resources from payment for ecosystem services. Therefore,
it will contribute to hunger eradication and poverty reduction associated with environmental protection in the context of Vietnam and other countries efforts to combat climate change.

- The production forest area will be raised up to 300,890 ha consisting of 220,000 ha qualifying for large logging per year with a cycle of 12 years and a productivity of 10 m3/ha/year.
- GDP per capita will reach at 20.7 million dong by 2015, equivalent to 1,080-1,110 dollar, and approximately 38.5 million dong by 2020, equivalent to 1,930-1,950 dollar.

1.3. The effect on the environment

The effective development of natural forests, regeneration forests, forest plantations and scattered tree systems in urban areas and industrial zones, and the establishment of agro-forestry system will increase the ability of headwater protection, soil erosion prevention, flood limitation and disaster mitigation. Moreover, it will renovate landscapes of urban areas and industrial zones. Besides, it will ensure the national security and preserve the ecological environment. In addition, it will contribute to improving the quality material and spiritual lives as well as to creating favorable conditions for the development of tourism, especially ecotourism.

1.4. The effect on society

- The project will contribute to the socio-economic development of remote areas and areas with special difficulties, and to mobilizing labors for agro-forestry sectors. This annual labor mobilization will create jobs for the ethnic living close to forests at a rate of more than 39.7%.

- Estimated employees working in fields of afforestation, forest rehabilitation, forest protection and management will account for 85% of the total quantity of silvicultural workers; exploiting and processing forest product workers will constitute of 15% of the total quantity of silvicultural workers.

- The average income of local people from agro-forestry production activities will be raise up to 30-35 million/ha/year.

- A large deal of actors of the management of natural forest resources (State-owned enterprises, private enterprises, organizations, communities, households…) will strengthen the socialization of the
forestry sector and restrict significantly losses of the forest resources. The State forest owners, including Boards of forest management and limited liability companies of one forestry member will be determined as the core forces.

- The investment in infrastructure and services such as the construction of forestry roads, agroforestry and farms system, and breeding forestry and industrial trees will create favorable conditions for local people to improve their forestry skill and to greater access to commodity markets. For this reason, it will help to positively change the socio-economic face of mountainous rural areas.

- The creation of stable incomes and propagandizing proper forest policies will consolidate the belief of local people, especially the ethnic, on the renovated policies and guidelines of Viet Nam government. As a result, the local people and ethnic will actively participate in the forestry activities, and contribute to the social order and safety and political security in the provincial areas.

- Awareness of the rehabilitation and sustainable management of forest ecosystem of privates, organizations and households will be strengthened towards the regulation "The more efforts of forest rehabilitation and protection you contribute to, the more benefits you earn". That is inhabitants paid by companies, enterprises using the forest environment services as results of their labor will absolutely understand purposes of rehabilitating and protecting forest as their labor value will become commodities.

2. Catalog of prior projects

- Projects of forest protection and development in the period 2011-2020 by Decision 57/QD-TTg dated January 9, 2012 of the Prime Minister; and projects of foreign investment and assistance related;

- The projects related to Payment for forest ecosystem services.

- The project of forest inventory in the Central Highlands in 2013-2014.

- The project of the large wood plantation associated with processing and exporting.
● The project of conversion of poor forests to economic plantations associated with forest management and protection.

● The project of exploitation of natural forests;

● The project of restructuring and renovating state forestry companies.

3. Organization of implementation

a. People’s Committee of provinces of the Central Highlands

● After approving, publishing and announcing the project “Restoration and Sustainable Management of the Forest Ecosystem in the Central Highlands in the period 2013-2020, vision 2030”, People's Committee of provinces will be responsible for calling for domestic and foreign investors to participate in the project.

● Guide the implementation of objectives, tasks and contents of the project under its schedule and current regulations of the state.

● Conduct reviews and adjustments of the project of restoration and sustainable management of the forest ecosystem corresponding with the zoning orientation.

● Continue to research and propose mechanisms and regional, local, sector policies to authorities for approval to carry out the objectives of regional projects; monitor, verify and supervise the implementation of the regional projects in the sectors and the local.

b. Departments of Agriculture and Rural Development of provinces

● Build, synthesize and propose implementing plans of the project to People’s Committee of provinces.

● Organize, direct and supervise the implementation of development plans of the projects of provinces.

● c. Boards of Project Management

● Organize the implementation of approved programs and plans of the project.

4. Recommendations

● Propose the Prime Minister and Ministry of Agriculture and Rural Development guiding People’s Committees of provinces of the
Central Highlands to implement the forest inventory in 2013 and 2014 associated with establishment, review, adjustment and clear determination of stable stands throughout the Central Highlands.

- Organize the implementation of the project of restoration and sustainable protection of forest ecosystems in the Central Highlands.
- Concentrate on protection, regeneration, plantation and enrichment of forest ecosystems, especially poor and degraded plantations; converse the plantations without abilities of restoration to other uses to maintain the function of environmental protection and improve livelihoods.
- Propose the Ministry of Agriculture and Rural Development evaluating the poor forest planning, particularly dipterocarp forest ecosystems for the guidance of implementing specific rehabilitation and reforestation of rubber tree plantations on the forest land.
- Propose provinces of Central Highlands collaborating with Vietnam Rubber Group for the sustainable development orientation of the rubber tree plantation in the long term.
- Propose the government considering early approving the project of natural forest exploitation for unifying implementations of forest plans.
- Propose Ministries, sectors and localities continuing to renovate and consolidate forest companies.

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LEGAL BASIS FOR THE CONSTRUCTION PROJECT

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- Decree No. 117/2010/ND-CP dated December 24, 2010 of the Government on the organization and management of special-use forest system.
- Decision No. 186/2006/QĐ-TTg, dated August 14, 2006 of the Prime Minister promulgating the Regulation on forest management.
- Decision No. 147/2007/QĐ-TTg dated September 10, 2007 of the Prime Minister on a number of policies for development of production forests in the period 2007-2015.
- Decision No. 24/QĐ-TTg dated June 1, 2012 of the Prime Minister on the policy of special used forest development and investment for the period 2011-2020.
- Decision No. 1565/QĐ-BNN-TCLN dated July 8, 2013 the Ministry of Agriculture and Rural Development approving the forestry sector reform proposal.
- And other local legal documents.