I. Introduction

The natural forests play a very important role in the living conditions of local people. Besides their functions as natural suppliers of wood, timber, wildlife and many other precious forest products, they are also active in their role of crop protection, soil conservation, water supply regulation, and climatic and environmental stabilization. The Forest Development Department has clearly pointed out that there are some 8.252 million hectares of natural forests in Vietnam, of which 5.184 million are of evergreen broad-leaved type, which are rated to contain 567,500 hectares (or 121%) of rich forests, 1,717,000 hectares (or 33.1%) of medium productivity forests and 2,896,300 hectares (or 55.9%) of poor ones. Most rich forests now occur in remote and inaccessible areas, the terrain conditions of which do not seem to favor productive forest product extraction, on the other hand, poor forests are covered only with regrowths of poor vigour alternating with large but open stretches of shrubs, where parent trees do not seem to have the quality required for an acceptable natural regeneration, because most of them are ordinary timber species of low value.

Natural regeneration has been focussed on for ages. A number of research projects were carried by the Forest Science Institute of Vietnam in more than one province, in particular in Cau Hai, Phu Tho (1964), Quy Chau, Nghe An (1974), Kon Ha Nung, Gia Lai (1980), Loc Ninh, Binh Phuoc (1983), La Nga, Ma Da, Dong Sai (1984), Phu Quoc, Kien Giang (1984), Tanh Linh, Binh Thuan (1985) with all of them being quite successful at the first attempts, enabling forest practitioners to have some early ideas on how to select suitable forest tree crops for some specific areas. However, due to a shortage of readily available resources, most of the research/study sites have been abandoned - some for good for them to have become gradually inexisting.

In Binh Phuoc, poor secondary regrowths now extend over 50,000 ha, all of them require urgent research to find out rational but easy and effective forest improvement treatments/operations to enrich the forest vegetation with a new “set” of valuable fast growing timber species capable of better soil conservation and high timber production in near future. Because of that since the beginning of 1998, a research project on the restoration of poor secondary forest regrowths has been started with an approach mainly based on enrichment planting following strips on a compact area of 20 hectares in the forest type Ic found at compartment no.9, block no. 382 under the management of Tan Lap Division, in Dong Xoai district, province of Binh Phuoc.

II. Methodology and research materials

1. Collection of Data at the Research site, the main activities for it are:

   - Survey for the making of a comprehensive list of valuable indigenous timber species;
   - Studies to point out the main chemical and physical properties of soil, using for this five “representative” soil – profile pits dug at the site.

2. Experimentation Using “Randomized Strips” with Three Replications and Two treatments:

   - Trees planted in strips of shrubby forest vegetation of 6 – 8m high;
   - Trees planted in strips of shrubby forest vegetation of 6 – 8m high and sparse timber species trees of 15 – 20m high.

3. The Strips Are Arranged to Run East and West: with their width being of 4m and all shrubs, climbers, wild grasses, thorny bamboos (except valuable timber regrowths) being removed to create better light conditions for tree crop growth, and with only one row of tree crops which are 4 metres apart from each other in that row. The left over strip is 6m wide, with all climbers, wild grasses, thorny bamboos being cleared. The resulting spacing between rows of tree crop is about 10m, and seedlings are put into holes of 50 x 50 x 50cm in size in August 1998. The neighboring plots of natural forest not disturbed are regarded as control for comparison.

4. Annual Tree Mensuration to Collect Data on: the growths of trees in particular their diameter and height increments.

5. The research materials include: valuable indigenous tree species and some exotics well acclimated to the Region, the seed supply of all of which does not seem to cause serious problems. Enrichment
planting is made with seedlings produced in nurseries in PE tubes. The shot listed species are:

- Dù níc  
  *Dipterocarpus alatus* Roxb.
- Sao ông  
  *Hopea odorata* Roxb.
- Vỏn vỏn  
  *Anisoptera costata* Korth.
- Chữ chữ  
  *Parashorea stellata* Kurz.
- Gà uía  
  *Afelia xylocarpa* Craib.
- Giống hưng  
  *Pterocarpus macrocarpus* Kurz.
- Muang ông  
  *Cassia siamea* Lam.
- Lim xanh  
  *Erythrophloeum fordii* Oliv.
- Xíc nội  
  *Khaya senegalensis* A. Juss
- Xíc nội lứná  
  *Swietenia microphylla* Cam.
- Giố nghĩa  
  *Swietenia macrophylla* King.
- Chiều liêu  
  *Terminalia superba*
- Trăm trống  
  *Canarium album* Roesch

### III. Research Findings

Data on the growth of forest tree crops are given below

**Growth of forest tree crops (following tree measurements made in August 1998 and December, 2000).**

<table>
<thead>
<tr>
<th>Tree species (Vernacular)</th>
<th>Planted in August, 1998</th>
<th>Measured in December 2000</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>H (m)</td>
<td>D (cm)</td>
</tr>
<tr>
<td>Dù níc</td>
<td>0.82</td>
<td>0.8</td>
</tr>
<tr>
<td>Sao ông</td>
<td>0.75</td>
<td>0.6</td>
</tr>
<tr>
<td>Vỏn vỏn</td>
<td>0.72</td>
<td>0.8</td>
</tr>
<tr>
<td>Chữ chữ</td>
<td>0.45</td>
<td>0.5</td>
</tr>
<tr>
<td>Lim xanh</td>
<td>0.35</td>
<td>0.4</td>
</tr>
<tr>
<td>Muang ông</td>
<td>0.55</td>
<td>0.4</td>
</tr>
<tr>
<td>Gà uía</td>
<td>0.88</td>
<td>0.9</td>
</tr>
<tr>
<td>Giống hưng</td>
<td>0.90</td>
<td>0.9</td>
</tr>
<tr>
<td>Xíc nội</td>
<td>0.95</td>
<td>1.1</td>
</tr>
<tr>
<td>Xúc cố</td>
<td>0.95</td>
<td>1.2</td>
</tr>
<tr>
<td>Giố nghĩa</td>
<td>0.75</td>
<td>0.6</td>
</tr>
<tr>
<td>Chiều liêu</td>
<td>0.78</td>
<td>0.7</td>
</tr>
<tr>
<td>Trăm trống</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The data in hand point to the fact that:

- Forest tree crops planted in strips next to the left- over ones with trees of 6 – 8m high perform better than those planted in strips adjacent to left –over strips with trees of 15 – 20m;

- The indigenous forest tree species known as Dau rai, sao den, ven ven, cho chi, go do, giang huong are growing slowly even in strips where light conditions are rated as adequate;

- Other forest tree crops such as lim xanh, chieu lieu, muong den, giai ngua, xa cu, xa cu la nho, when planted in strips well provided with sunlight perform well, with some of them growing to the height of residual trees left over in strips not disturbed, i.e. to over 8m high, only after less than three (3) years.

- Lim xanh (*Erythrophloeum fordii*) as an overgreen species is still budding and does not shed its leaves even during the driest months of the year, while others such as go do (*Afelia xylocarpa*) and giang huong (*Pterocarpus macrocarpus*) have all their foliage lost during that period of the year.

- Generally speaking, all the forest tree crops used in planting have somewhat been affected by the shading of the residual trees left behind in the neighbouring left- over strips; as a result they grow quicker in height and shed their lower branches earlier than usual, to the prejudice of their diameter growth; and
- As some clearing of climbers and non-target tree species has been made on leftover strips, the forest conditions therein have got improved to allow better natural regeneration and regrowth.

IV. Discussion and conclusions

- The objectives of enrichment planting are to begin to improve and then enhance the productive and protective functions of existing natural forests, using the technical approach of introducing a quite large number of valuable tree crops through plantation for them to grow parallel with the residual trees left behind on sites. The process, as it is, is complex and as such requires careful studies and intensive management first to remove the prevailing negative interactions and then to build up much more positive relationships between the introduced tree crops and the natural vegetation, wildlife, insect population and many other microorganisms during the whole development process of the new ecosystems from start to finish.

- Technical approaches to make the system much more manageable i.e. to decrease the number of non-valuable timber species and increase the percentage of target fast-growing timber species for the development of the new should be encouraged and directed over time towards full success.

- Trial enrichment planting in strips at Tan lap in degraded regrowths of types 1b and 1c, although newly established with 13 forest tree species, has brought in promising results, following which much more sustained efforts to follow the results for improvements and eventual application of the technology seem to be much required.

References


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