NASA-LCLUC Science Team Joint Meeting with MAIRS, GOFCGOLD and SEA START on LC/LU Change Processes in Monsoon Asia Region
Jan.12-17, 2009

Land Use/Land Cover Change Research and Management in Vietnam

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OUTLINE

• INTRODUCTION
• LAND USE / LAND COVER CHANGE RESEARCH
• LAND USE / LAND COVER CHANGE
• LAND USE / LAND COVER MANAGEMENT
Introduction

- Vietnam has an area of about 330 thousands km², 3/4 covered by mountains and highlands
- By 2007, totally Vietnam has forest areas of 12.84 mil ha (39.4%):
  - Natural forest: 10.28 mil hectares, and
  - Plantation forest: 2.56 mil ha.
- Total timber volume for the whole country:
  - 751.5 mil m³; and
  - 8.4 bill bamboo stems.
LAND USE / LAND COVER CHANGE RESEARCH ACTIVITIES

- Forest Inventory and Planning Institute (FIPI) as a governmental organization was established in 1961;
- 4 nationwide inventories: every 5 yrs:
  - 1991 to 1995;
  - 1996 to 2000;
  - 2001 to 2005; and
  - 2006 to 2010
- The objectives of the inventory is to:
  - Assess the status of the country’s forest resources, its distribution, areas and total volume stocks.
  - Monitor changes occurred;
  - Analyze the reason for changes
METHODOLOGY

- Maps
- Data

• The data needed for studying land use/land cover change are collected in the numbers of Primary Sample Plots (PSP) systematically distributed by the grid 8 x 8 km in forested lands.

• Approximately 3 thousands PSP were inventoried during the 5 year period.
Distribution of Primary Sample plots
Distribution of Secondary Plots in PSP: Total 40 SSP
Data collected in PSP

- Species composition;
- Tree Height;
- Tree Diameter;
- undergrowth;
- Soil;
- Tree quality;
- etc
METHODOLOGY

• Data collection:
  – Satellite images: Landsat, SPOT
  – Aerial Photos,
  – Available thematic maps,
  – Biophysical and socio-economic data,
  – Ground survey and validation

• Image classification and mapping:
  – The imagery visually or digitally interpreted.
  – The map then validated in the field to create final LU/LC map
Flowchart of forest / land cover classification
Land cover map
METHODOLOGY

Data analysis:

- Overlay LU/LC maps of multi-date to produce coincidence Matrix and LU/LC change map
- The maps overlaid with various thematic maps to generate statistical data from the land cover to create matrices by groups of factors.
- Transition process occurred in the area during study period.
Land use Land cover map of Dai Tu in 1984

Land use Land cover map of Dai Tu in 1992

Land use Land cover map of Dai Tu in 2000
Identifying driving forces:

• Based on the results of multiple analysis of changes and matrices by groups of factors in land use/land cover identify driving forces leading to the changes.

• Analyze and assess these forces in the context of socio-economic conditions and economic development of the country.
RESEARCH ACTIVITIES

▪ Research on Monitoring and assessing forest resources and land uses dynamics for:
  Northeast region: 1976-1990, 1990-1998; and
  Mekong River Delta: 1976-1990

▪ In 2010, a report on LU/LC change for 6 regions and for the whole country will be prepared
OTHER PROJECTS

- Forest Cover Monitoring Project in lower Mekong basin implemented in 1994-1998 funded by GTZ
  Main Outputs:
  - Interpretation Keys
  - Interpretation of Satellite data for land use mapping for the whole MR basin (Vietnam);
  - Digitization of maps
  - Analysis and Assessment of forest cover dynamics
  - Database

- Land use / Land cover change in Tam Dao National Park. A case study in the framework of SEARRIN APN Project
- Land use / Land cover change in Dai Tu, Thai Nguyen.
- Etc.
Land Use and Land Cover Change for South East Asia
Tam Dao National Park, Vietnam
In 1943 Vietnam possessed about 14.3 million hectares of forests or 43% of total country's area.

By the end of 2007:

- Total area of forested land: 12.8 million hectares,
  - Natural forest: 10.3 million hectares; and
  - Plantation forest at 2.5 million hectares.

- The total volume:
  - standing wood: 751.5 mil m3; and
  - 8.4 bill bamboo stems.
<table>
<thead>
<tr>
<th>Year</th>
<th>Natural Forest</th>
<th>Plantation forest</th>
<th>Forest land</th>
<th>cover(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1943</td>
<td>14.3</td>
<td>0</td>
<td>14.3</td>
<td>43.0</td>
</tr>
<tr>
<td>1976</td>
<td>11.1</td>
<td>0.1</td>
<td>11.2</td>
<td>33.8</td>
</tr>
<tr>
<td>1980</td>
<td>10.5</td>
<td>0.4</td>
<td>10.9</td>
<td>32.1</td>
</tr>
<tr>
<td>1985</td>
<td>9.3</td>
<td>0.6</td>
<td>9.9</td>
<td>30.1</td>
</tr>
<tr>
<td>1990</td>
<td>8.4</td>
<td>0.7</td>
<td>9.2</td>
<td>27.8</td>
</tr>
<tr>
<td>1995</td>
<td>8.2</td>
<td>1.0</td>
<td>9.3</td>
<td>28.2</td>
</tr>
<tr>
<td>2000</td>
<td>9.4</td>
<td>1.5</td>
<td>10.9</td>
<td>33.2</td>
</tr>
<tr>
<td>2005</td>
<td>10.2</td>
<td>2.4</td>
<td>12.6</td>
<td>38.2</td>
</tr>
<tr>
<td>2007</td>
<td>10.3</td>
<td>2.5</td>
<td>12.8</td>
<td>39.4</td>
</tr>
</tbody>
</table>
Land use Land cover map in 1943

Land use Land cover map in 1983

Land use Land cover map in 2005
LAND USE / LAND COVER STATUS AND CHANGES

As compared to 1990 statistics, the national forest cover in 2007 increased from 27.8% to 39.4%. Forested area increased by 3.6 mil ha, of which natural forest increased by 1.9 mil ha.

• Plantation forest area increased by 2 times as compared to 1990:
At present, forest lands in Vietnam are divided into 3 categories:

- Production Forests,
- Protection Forests and
- Special Use Forests.

**Production forests** are used mainly for wood, non-wood products. Production forest has an area of 4.6 mil. ha, occupying 37.6% of the total country forested lands.
The special-use forests are set aside for conserving nature and the national forest ecosystems and the forest fauna and flora genetic resources, undertaking research works, maintaining historic-cultural relics, beauty spots and for recreation and tourism.

- The special-use forests include national parks, nature reserves and cultural-historical and research sites.
- The Special use forest: 1.8 mil ha, occupying 15.2% of the total country forested lands;
Forest Protected Areas System in Vietnam
Protection forests are mainly designated to water and soil control, land erosion protection, climate regulation and environmental protection in general.

- The protection forests have an area of 5.7 million hectares, occupying 47.1% of the total country forested lands;
- The system of protection forests is grouped into:
  - Watershed management forests,
  - Wind and sand blowing prevention forests, sea-wave control, and
  - Seashore encroachment forests and
  - Environmental conservation forests.
# DYNAMICS OF FOREST CATEGORIES

(‘000 hectares)

<table>
<thead>
<tr>
<th>Year</th>
<th>Protection Forest</th>
<th>Special Use Forest</th>
<th>Production Forest</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>3,478.7</td>
<td>898.3</td>
<td>4,928.0</td>
</tr>
<tr>
<td>2000</td>
<td>5,350.7</td>
<td>1,524.9</td>
<td>4,040.1</td>
</tr>
<tr>
<td>2005</td>
<td>5,698.5</td>
<td>1,844.2</td>
<td>4,551.8</td>
</tr>
</tbody>
</table>

Change 1995-2000:

<table>
<thead>
<tr>
<th>Areas</th>
<th>1.872,0</th>
<th>626.6</th>
<th>- 887.9</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>53.8</td>
<td>69.8</td>
<td>- 18.0</td>
</tr>
</tbody>
</table>

Change 2000-2005:

<table>
<thead>
<tr>
<th>Areas</th>
<th>347.8</th>
<th>319.3</th>
<th>511.7</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>6.5</td>
<td>20.9</td>
<td>12.7</td>
</tr>
</tbody>
</table>
POLICIES POSITIVELY INFLUENCING LAND USE AND LAND COVER CHANGE

The policies may well be the driving forces behind the changes:

- Forest Protection and Development Law clarified in function to relating organizations from central to local in forest resources management.
- Forest land allocation policy on allocating forest land to organizations, households, individuals for stable and long-term use for the sake of forestry. regulated the rights and obligations of the land users.
- The forest has real owners, therefore deforestation as well as forest fires have been reduced.
POLICIES POSITIVELY INFLUENCING LAND USE AND LAND COVER CHANGE (Contd.)

- 327 Projects: policies on usage of forest, bare hill and lands, alluvial ground onshore and offshore with the main purpose to cover bare hills and lands with forests
- Program 245: Responsibility of state management on forestry and forest land was taken by the People’s Committee of all levels
- Five Million Hectares Reforestation Program (1998)
- Others
Vietnam forestry is presently facing the following challenges:

- The continuous degradation of the standing stock of timber and the timber production volume;
- Backward logging, wood and non-wood forest product processing technology, low rate of timber utilization, low quality products and, consequently, a low competitive capability of forest products in world market.
- In mountainous areas, the socio-economic infrastructure is not yet developed.
NEGATIVE INFLUENCES CAUSING LAND USE/LAND COVER CHANGES

- Overexploitation (many of rare and valuable forest fauna and flora species are in danger of extinction)
- Illegal cutting
- Forest fires
- Shifting cultivation: the cultivation custom of minority people in the highland for a long time.

  • Fortunately, the area under shifting cultivation has decreased thanks to changes in the policies on land use and land cover management in Vietnam.
## RATE OF CAUSES LEADING TO THE DEFORESTATION

<table>
<thead>
<tr>
<th>Region</th>
<th>Over log</th>
<th>Shifting Cult-n</th>
<th>Convrt to Agr</th>
<th>Migrn</th>
<th>War</th>
<th>Others</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red River Delta</td>
<td>12</td>
<td>0</td>
<td>17</td>
<td>41</td>
<td>9</td>
<td>21</td>
<td>100</td>
</tr>
<tr>
<td>Northeast</td>
<td>27</td>
<td>29</td>
<td>11</td>
<td>7</td>
<td>8</td>
<td>18</td>
<td>100</td>
</tr>
<tr>
<td>Central North</td>
<td>29</td>
<td>27</td>
<td>16</td>
<td>9</td>
<td>5</td>
<td>23</td>
<td>100</td>
</tr>
<tr>
<td>Northwest</td>
<td>11</td>
<td>36</td>
<td>12</td>
<td>11</td>
<td>3</td>
<td>27</td>
<td>100</td>
</tr>
<tr>
<td>Northern Central</td>
<td>34</td>
<td>21</td>
<td>14</td>
<td>6</td>
<td>14</td>
<td>11</td>
<td>100</td>
</tr>
<tr>
<td>Southern Central</td>
<td>28</td>
<td>17</td>
<td>11</td>
<td>9</td>
<td>6</td>
<td>29</td>
<td>100</td>
</tr>
<tr>
<td>Western Highland</td>
<td>31</td>
<td>24</td>
<td>21</td>
<td>5</td>
<td>2</td>
<td>17</td>
<td>100</td>
</tr>
<tr>
<td>Southern</td>
<td>29</td>
<td>15</td>
<td>13</td>
<td>9</td>
<td>10</td>
<td>24</td>
<td>100</td>
</tr>
<tr>
<td>MR Delta</td>
<td>19</td>
<td>4</td>
<td>19</td>
<td>21</td>
<td>6</td>
<td>31</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: MARD 2005
### NUMBER OF FOREST FIRES

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Cases (1000 VND)</th>
<th>Areas affected (ha)</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>Natural</td>
<td>Plant.</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>477</td>
<td>1,548</td>
<td>495</td>
<td>944</td>
<td>923,734</td>
</tr>
<tr>
<td>2001</td>
<td>490</td>
<td>2,466</td>
<td>591</td>
<td>1,874</td>
<td>289,360</td>
</tr>
<tr>
<td>2005</td>
<td></td>
<td>5,114</td>
<td>455</td>
<td>4,659</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td></td>
<td>2,328</td>
<td>696</td>
<td>1,631</td>
<td></td>
</tr>
</tbody>
</table>

Source: Forest Protection Department
## ILLEGAL EXPLOITATION OF FOREST

<table>
<thead>
<tr>
<th>Activities</th>
<th>Number of cases / ha</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2000</td>
</tr>
<tr>
<td>Illegal Logging</td>
<td>7,592</td>
</tr>
<tr>
<td>Shifting Cultivation</td>
<td>2,208</td>
</tr>
<tr>
<td></td>
<td>883</td>
</tr>
</tbody>
</table>

Source: Forest Protection Department
Forest Fires Risk Map in Northern part of Vietnam
Forest Fires Risk Map in Southern part of Vietnam
CONCLUSION

• Forest cover in Vietnam changes drastically from 1943 to 1990, slightly from 1990 to 1995 and increases from 1995.
• Last increase in forest cover mostly thanks to increase of secondary growth with low quality (volume stock, structure etc.) and protection value.
• Land use change study in Vietnam get more and more attention with using remote sensing and GIS technique and with more emphasis on socio-economical factors and human dimension.