Teak improvement and genetic resource conservation in Sri Lanka

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Presentation plan

- Introduction
- Teak improvement before 1990s
- Teak improvement/breeding after 1990s
- Genetics and conservation status
- Propagation
  - CSO development
  - Clonal forestry
- Way forward
Teak industry in SL

- Over 35000 ha owned by FD and large extent of small scale farmers
- The main timber species for SL furniture industry
- Seed and propagule mainly derived from local CSOs and SPAs established in 1970s
TEAK IMPROVEMENT – BEFORE 1990’S
- 2 CSO (plus trees from plantations)
- SPAs extent 50 ha
  - Maspotha
  - Melsiripura
  - Ice peella

CSO at Kurunegala planted in 1970s
## Teak CSOs- progeny untested

<table>
<thead>
<tr>
<th>Orchard</th>
<th>Established year</th>
<th>Extent ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barigoda</td>
<td>1976</td>
<td>16</td>
</tr>
<tr>
<td>Horakelle</td>
<td>1977</td>
<td>12</td>
</tr>
</tbody>
</table>
AFTER 1990’S IMPROVEMENT AND CONSERVATION STRATEGIES
Teak improvement plan 2006

- Natural forest/plantations
  - Plus trees
    - 1st generation
      - OP-progeny test
      - Clonal tests
    - Clonal tests
      - 2nd generation
        - OP-progeny test
        - Clonal tests
  - Seed production areas
    - Clonal seed orchards
    - Clonal bank
    - Clonal seed orchards
    - New propagation Population

- Plantations
  - Seeds
  - Seeds
  - Cuttings

Flowchart details the process of improving teak through various stages including natural forest/plantations, plus trees, seed production areas, clonal tests, and propagation populations.
GENETICS
Progeny trials - 2007

- Two locations – Anapallama and Nikavehera intermediate RF sites
- Seed sources – Local plantation plus trees (225)
- Design – Row column
- Both trials will act as the base for the future breeding programs
<table>
<thead>
<tr>
<th>Forest Division</th>
<th>Region</th>
<th>Seedlot (Family)</th>
<th>No.of families</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hambanthota</td>
<td>1 Middeniya</td>
<td>16-30</td>
</tr>
<tr>
<td>2</td>
<td>Rathnapura</td>
<td>2 Timbolkettiya</td>
<td>31-51</td>
</tr>
<tr>
<td>3</td>
<td>Kurunegalla</td>
<td>3 Kubalpola</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 Sundarapola</td>
<td>53-68</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 Aveniyawa</td>
<td>69-88</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 Progeny trail - Horakelle</td>
<td>89-113</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7 Nikavehera - Makulpota</td>
<td>114-133</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8 Gomadiyagala</td>
<td>134-157</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9 Moragolla - Thoraya</td>
<td>158-172</td>
</tr>
<tr>
<td>4</td>
<td>Ampara</td>
<td>10 Karabana</td>
<td>173-180</td>
</tr>
<tr>
<td>5</td>
<td>Anuradhapura</td>
<td>11 Batuwatte</td>
<td>181-200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12 Kahalla</td>
<td>182-213</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13 Mintale</td>
<td>214-233</td>
</tr>
<tr>
<td>6</td>
<td>Polonnaruwa</td>
<td>14 Ratmale</td>
<td>234-263</td>
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<td>15 Habarana</td>
<td>264-308</td>
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<tr>
<td>7</td>
<td>Matale</td>
<td>16 Innamaluwa - 1</td>
<td>309-323</td>
</tr>
<tr>
<td></td>
<td></td>
<td>17 Innamaluwa - 2</td>
<td>324-338</td>
</tr>
<tr>
<td>8</td>
<td>Monaragala</td>
<td>18 Ice paella</td>
<td>340-353</td>
</tr>
<tr>
<td></td>
<td></td>
<td>19 Anapallama</td>
<td>354-369</td>
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<tr>
<td></td>
<td></td>
<td>20 Daragalla</td>
<td>371-404</td>
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<tr>
<td>9</td>
<td>Badulla</td>
<td>21 Mahiyangana</td>
<td>370</td>
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</table>
Mother trees for seed collection
A progeny trial at Anapallama 4 years of age
Volume of the 21 seed sources and the families within seed sources- 8 years after planting
### Individual tree heritability estimates

<table>
<thead>
<tr>
<th>Trait</th>
<th>h mean</th>
<th>Sigma2_t</th>
<th>Sigma2_m</th>
<th>Sigma2_f</th>
<th>$h_f^2$</th>
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</thead>
<tbody>
<tr>
<td>DBH</td>
<td>2.34</td>
<td>5.29</td>
<td>0.31</td>
<td>0.71</td>
<td>0.11</td>
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<tr>
<td>Height</td>
<td>2.34</td>
<td>1.16</td>
<td>0.33</td>
<td>0.05</td>
<td>0.10</td>
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<tr>
<td>Straightness</td>
<td>2.01</td>
<td>0.70</td>
<td>0.04</td>
<td>0.02</td>
<td>0.14</td>
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<tr>
<td>Volume</td>
<td>2.34</td>
<td>3998542</td>
<td>814784</td>
<td>124299</td>
<td>0.10</td>
</tr>
</tbody>
</table>
PROPAGATION - CLONAL SEED ORCHARD DEVELOPMENT
Reinvestigation of the knowledge on CSO development 2009-2010

- Budded teak plant development
  - Root stock
  - Scion
  - Grafting method
  - Timing

- Maintenance in the nursery
  - Shade management

- Establishment
  - Spacing
Clonal orchard establishment at Ethgala

1 year

1.5 years
CLONAL PROPAGATION -VP
Indonesian method
Clonal propagation – macro cuttings
Way forward and issues

- Inclusion of the exotic genetic material to the breeding program (?)
- Expansion of CSO with tested materials—25 ha 2018 (?)
- Development of easy VP method—Macro cutting/or in-vitro (?)
- Development of a mechanism to provide improved materials for the small scale farmers
Thank you