Project on Development of Drought Tolerant Trees for Adaptation to Climate Change in Drylands of Kenya

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PROJECT DESIGN

**Overall Goal**
Quality plantations of indigenous species are extended in the ASALs of Kenya

**Project Purpose**
Research capacity and extension system necessary for promoting indigenous species plantation in the ASALs is enhanced.

KEFRI’s capacity for conducting research on genetic diversity of indigenous species (*Melia volkensii* and *Acacia tortilis* as pioneer trial) is strengthened.

Quality seed and seedling supply system for *Melia volkensii* is established.

Awareness of relevant stakeholders on the importance of quality seed and seedling is raised.
**Melia volkensii**

- A drought tolerant, termite resistant tree that produces high quality timber (used for making high value furniture, doors and windows frames)
- Provides fodder and fruits for animals
- Potential for large scale dryland afforestation (see suitable conditions next slide)
Acacia tortilis

- Provides fodder
- Fuelwood and charcoal
- Fuelwood of high calorific value (4400 kcal/kg)
Project Outline

**Tree Breeding**

**Melia volkensii**
- Plus Tree Selection
- Propagation > (Seed Orchard)
- Evaluation (Progeny Test)

**Acacia tortilis**
- Plus Tree Selection
- Propagation (Seed Stand)

**DNA Analysis**

**Study on Drought Tolerance**

**Quality Seed/Seedlings**

**Extension**
- Market Research
- Extension Material (Guidelines, etc)
- Seminar/Training
Stratification of *Acacia tortilis* and *Melia volkensii* natural populations in Kenya & Selection of Candidate Plus Trees (CPTs)

100 CP trees – *M. volkensii*

100 CP trees – *A. tortilis*
Some selected *Melia volkensii* Candidate Plus Trees

Mwea

Marimanti

Voi

Tharaka
Dendrogram showing the structuring of *Acacia tortilis* populations in two major groups (A and B)
Phenotypic variation of Acacia tortilis seedlings depending on the CPT

Straight

Bending
Result of Progeny Test (Height)

- We will investigate the growth and select the recommended varieties in each area.
- Eventually categorize sites according to forest site index classification.
Fig. Volume of P.T. on each CPT at 1 year after planting

<table>
<thead>
<tr>
<th>Region</th>
<th>Volume (m$^3$ × 10$^{-3}$)</th>
<th>% Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superior</td>
<td>5.04</td>
<td>117%</td>
</tr>
<tr>
<td>ALL</td>
<td>4.32</td>
<td></td>
</tr>
<tr>
<td>Eastern Mwingi–Tseikuru</td>
<td>5.04</td>
<td>117%</td>
</tr>
<tr>
<td>Eastern Mwingi–Nuu</td>
<td>4.32</td>
<td></td>
</tr>
<tr>
<td>Central Eastern Katulani–Kavisuni</td>
<td>4.32</td>
<td></td>
</tr>
<tr>
<td>South Eastern Mutha–Inyali</td>
<td>4.32</td>
<td></td>
</tr>
<tr>
<td>Coastal Voi–Mwatate</td>
<td>4.32</td>
<td></td>
</tr>
</tbody>
</table>

Marimanti Progeny test site

1 month

8 months

3 years
Roadmap of Tree Breeding

Superiority for target trait

Breeding Project (2012-17)  CADEP (Comp. 4) (2017-21)

Natural stands  Selection  1st generation  2nd generation  Progeny Test  Afforestation
Results: Variation of growth duration and trends between fast and slow growing clones at Tiva and Kibwezi

☑ Stem growth started together and the slope of growth was same with Inferior and superior clones.
☑ Inferior clones stopped their growth earlier than superior clones.
☑ As a result, the growing period of inferior clone became shorter and dormant period longer than those of superior clones.
Contribution of drought index development to tree breeding

Drought tolerance
Growth response to soil moisture
Growth during dry & wet seasons
Photosynthetic rates
Xylem pressure potential
Chlorophyll fluorescence

Index

Population of *Melia* tree

Selection of *plus* tree

Secondary selection of *plus* tree

Elite tree

General procedure for selecting elite tree
Extension: Establishment of Matithini demo plot through FFS

FFS Training at formative stage

FFS Members’ session

FFS members and staff from KEFRI and KFS
Thank You