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

Muturi G.M., Kariuki J.G., Omondi, S.F. and Muchiri D.
Overall Goal
Quality plantations of indigenous species are extended in the ASALs of Kenya

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

KEFRI’s capacity for implementing forest tree breeding of indigenous species (*Melia volkensii* and *Acacia tortilis* as pioneer trial) is strengthened.

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

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

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)

Quality Seed/Seedlings

- DNA Analysis
- Study on Drought Tolerance

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
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
Melia and Acacia

Melia Orchard

Nursery stage

Melia Progeny test 3 years old

Acacia CPT

Nursery stage

Seedling seed orchard/Progeny test
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$^3 \times 10^3$)</th>
<th>% of Superior</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>
</tbody>
</table>

- Eastern Mwingi–Tseikuru
- Eastern Mwingi–Nuu
- Central Eastern Katulani–Kavisuni
- South Eastern Mutha–Inyali
- Coastal Voi–Mwatate

Artificial crossing

Rogueing inferior clones

All Plus Trees
Marimanti Progeny test site
Roadmap of Tree Breeding

Superiority for target trait

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

Natural stands
Selection
1st generation
Progeny Test
2nd generation
Progeny Test
Afforestation
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

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