

TOTAL LANDCARE TANZANIA

TREE TRIAL AT TUMBI AGRICULTURAL RESEARCH STATION, TABORA TANZANIA: YEAR 1 RESULTS

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Design

A tree trial was established at Tumbi Agricultural Research Station in Tabora to evaluate the potential of other tree species for the future.

The design was a randomized block design with 3 replications of each species with and without fertilizer. **Figure 1** shows the design and layout of the trial. Tree survival and growth rates at the age of 5 months were recorded and were analyzed statistically by multi-variate analysis.

1st Year Results

A summary of results is shown in **Table 1** with details in **Tables 2-4** and **Figures 2-4**.

Key observations are described below:

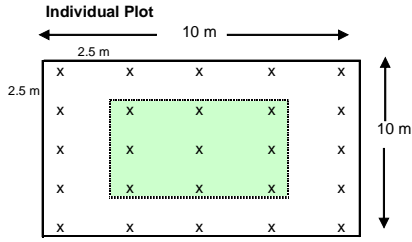
- ➔ Nursery seedlings were outplanted very young due to delays in starting the project (see comments in the introduction). Despite this, the trees are thriving well.
- ➔ The trial is being managed very competently with timely weeding and pruning practices.
- ➔ No plots received chemical treatment against termites or other insect pests.
- ➔ Mortality was very low; replacement of the few seedlings that died was done only in the 1st month after planting. No further replacements will be done in the interest of assessing the survival ability of each species.
- ➔ Application of fertilizer has shown no visible effects on tree performance to date. No additional fertilizer will be applied next season.
- ➔ Survival rates were high (94-100%), but mortality from termites is expected to increase for certain species during the dry season, especially *Acacia crassicarpa*.
- ➔ Analysis of growth rates showed strong differences between tree species (see **Table 1**).
- ➔ An overall ranking of species was performed by combining individual rankings for survival, height and basal diameter. Although it is far too early to draw any conclusions, it is encouraging that the 3 species currently recommended for both TLC and ATTT programs are all in the top 5 - *Senna siamea* (2), *Acacia polyacantha* (4), and *Albizia lebbeck* (5).
- ➔ Two other species show excellent potential: *Albizia saman* ranked 1 in every category, and *Terminalia mantaly* ranked 3. This is a naturalized species originally from Madagascar and commonly planted in the Tabora region, mainly as an ornamental.
- ➔ The trial at Tumbi will continue for the life of the project to identify other promising species for the program. In addition, a new trial is proposed at TLTC's Urambo Seed Farm where other promising species will be evaluated against the top 5 here.

Table 1: Overall Tree Survival and Growth Rates, Tumbi Trial Tanzania, May 2007

Tree Species	Origin	Overall Rank	Survival %	Basal Diameter Cm	Height Cm
<i>Albizia saman</i> (rain or saman tree)	<i>S. America</i>	1	100.0	1.69	98
<i>Senna siamea</i> (cassia) *	<i>India / SE Asia</i>	2	99.3	1.56	56
<i>Terminalia mantaly</i> (mantaly) *	<i>Madagascar</i>	3	100.0	1.24	54
<i>Acacia polyacantha</i> (white thorn)	<i>Indigenous</i>	4	99.3	1.19	90
<i>Albizia lebbeck</i> (woman's tongue) *	<i>India / SE Asia</i>	5	99.3	1.05	63
<i>Acacia crasscarpa</i> (crasscarpa)	<i>Australia</i>	6	94.0	1.16	82
<i>Acacia xanthophloea</i> (fever tree)	<i>Indigenous</i>	7	99.3	1.14	50
<i>Faidherbia albida</i> (winter thorn)	<i>Indigenous</i>	8	98.0	0.85	63
<i>Azadirachta indica</i> (neem) *	<i>India / SE Asia</i>	9	98.7	0.98	52
<i>Tectona grandis</i> (teak)	<i>India / SE Asia</i>	10	98.0	1.32	26
<i>Albizia procera</i> (tall albizia)	<i>India / SE Asia</i>	11	100.0	0.66	26
<i>Balanites aegyptiaca</i> (torchwood)	<i>Indigenous</i>	12	99.3	0.52	33
<i>Albizia glaberrima</i> (lowveld albizia)	<i>Indigenous</i>	13	98.0	0.84	41
<i>Acacia nilotica</i> (scented thorn)	<i>Indigenous</i>	14	96.7	0.59	31
Overall Means		7	98.6	1.06	55
Effect of Fertilizer	No significant effect on survival or growth ($p > 0.1$)				
Species Differences	Strong significant difference between species ($p < 0.01$ to $p < 0.0001$)				

* Naturalized species in Tanzania

Fig. 1: Tree Trial Design and Layout for Tanzania



- Species in Replicated Trial**
- 1 *Acacia crassicarpa*
 - 2 *Acacia polyacantha*
 - 3 *Albizia glaberrima*
 - 4 *Albizia lebbeck*
 - 5 *Albizia procera*
 - 6 *Albizia saman*
 - 7 *Azadirachta indica*
 - 8 *Balanites aegyptiaca*
 - 9 *Acacia nilotica*
 - 10 *Acacia xanthophloea*
 - 11 *Senna siamea*
 - 12 *Tectona grandis*
 - 13 *Terminalia mantaly*
 - 14 *Faidherbia albida*

- Code**
- AC
 - AP
 - AG
 - AL
 - APR
 - AS
 - AZ
 - BA
 - AN
 - AX
 - SS
 - TG
 - TM
 - FA

- Species in Observation Trial**
- 15 *Acacia galpinii*
 - 16 *Terminalia superba*
 - 17 *Milletia excelsa*
 - 18 *Acacia gerrardii*
 - 19 Bamboo
- Code**
- AGP
 - TS
 - ME
 - AGD
 - B

Instructions for Trial Layout / Management

- 1 Each plot measures 10 m x 10 m
- 2 Pit size is 30 x 30 cm
- 3 25 seedlings per plot; 150 seedlings per species Total seedlings: 2100 Tubes: 2450
- 4 3 replications (plots) per species (i.e., 3 plots per species / treatment)
- 5 Total plots = 14 species x 6 plots = 84 plots; Total Area = 0.84 ha
- 6 Arrangement/order of plots is random - Fit the plots into the site as best you can;
- 7 Try to maintain uniformity in soils, at least within a given REP
- 8 No plots should receive any chemical treatment against termites.
- 9 Keep plot weed free 1 m around the seedling, and make a basin to catch rainfall
- 10 Select 6 Plants in central portion of the plot for measuring height and basal diameter - select the first 6 encountered, If there are less than 6 surviving plants, select the 6 nearest plants to the center of the plot for the measurements

- With Fertilizer (even numbered blocks i.e. 2, 4 and 6)
- Without Fertilizer (odd numbered Blocks i.e. 1, 3 and 5)
- Plots for species observation
- Border/filler plots - could include application of fertilizer or not as per the block in question

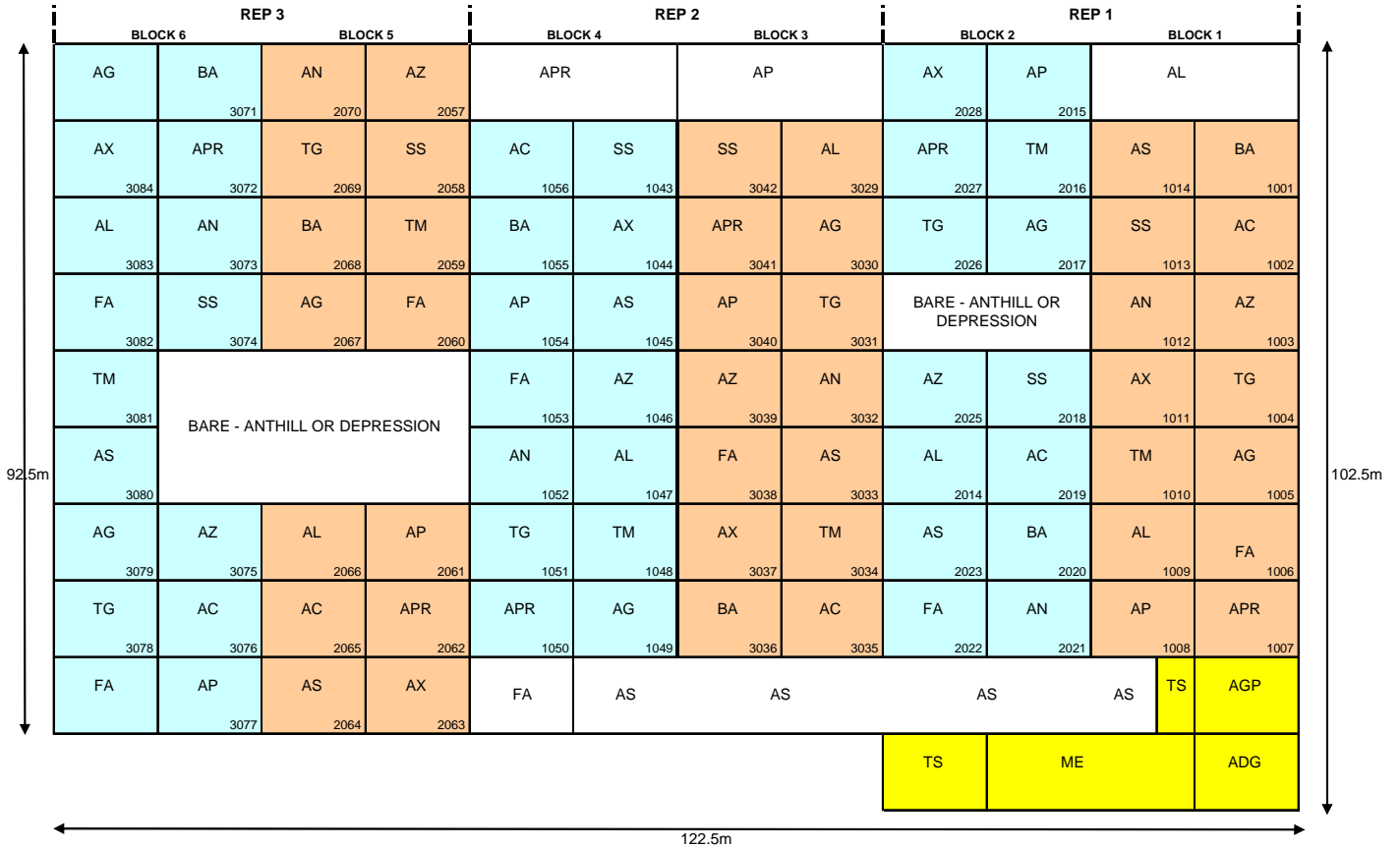


Table 2: Tree Survival Rates for each Species at 5 Months, Tumbi Tree Trial Tanzania (May 2007)

Tree Species	MEAN SURVIVAL %								
	No Fertilizer				With Fertilizer				Overall Mean
	Rep 1	Rep 2	Rep 3	Mean	Rep 1	Rep 2	Rep 3	Mean	
<i>Acacia crassicaarpa</i>	88.0	88.0	100.0	92.0	96.0	100.0	92.0	96.0	94.0
<i>Acacia nilotica</i>	100.0	100.0	92.0	97.3	96.0	100.0	92.0	96.0	96.7
<i>Acacia polyacantha</i>	100.0	100.0	100.0	100.0	100.0	96.0	100.0	98.7	99.3
<i>Acacia xanthophloea</i>	100.0	96.0	100.0	98.7	100.0	100.0	100.0	100.0	99.3
<i>Albizia glaberrima</i>	100.0	100.0	96.0	98.7	96.0	100.0	96.0	97.3	98.0
<i>Albizia lebbeck</i>	100.0	100.0	96.0	98.7	100.0	100.0	100.0	100.0	99.3
<i>Albizia procera</i>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<i>Albizia saman</i>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<i>Azadirachta indica</i>	100.0	100.0	92.0	97.3	100.0	100.0	100.0	100.0	98.7
<i>Balanites aegyptiaca</i>	100.0	100.0	100.0	100.0	100.0	100.0	96.0	98.7	99.3
<i>Faidherbia albida</i>	100.0	100.0	96.0	98.7	100.0	92.0	100.0	97.3	98.0
<i>Senna siamea</i>	100.0	100.0	100.0	100.0	100.0	96.0	100.0	98.7	99.3
<i>Tectona grandis</i>	96.0	100.0	100.0	98.7	100.0	100.0	92.0	97.3	98.0
<i>Terminalia mantaly</i>	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Means	98.9	98.9	98.0	98.6	99.1	98.9	97.7	98.6	98.6

Table 3: Tree Basal Diameter for each Species at 5 Months, Tumbi Tree Trial Tanzania (May 2007)

Tree Species	MEAN BASAL DIAMETER (cm)								
	No Fertilizer				With Fertilizer				Overall Mean
	Rep 1	Rep 2	Rep 3	Mean	Rep 1	Rep 2	Rep 3	Mean	
<i>Acacia crassicaarpa</i>	1.0	1.2	1.1	1.1	1.2	1.3	1.2	1.2	1.2
<i>Acacia nilotica</i>	0.7	0.6	0.4	0.5	0.7	0.6	0.6	0.7	0.6
<i>Acacia polyacantha</i>	1.3	1.3	1.7	1.4	0.6	1.0	1.4	1.0	1.2
<i>Acacia xanthophloea</i>	1.1	1.2	1.4	1.2	0.7	1.3	1.0	1.0	1.1
<i>Albizia glaberrima</i>	0.8	1.0	0.8	0.9	0.9	1.0	0.6	0.8	0.8
<i>Albizia lebbeck</i>	1.2	0.9	1.1	1.1	1.3	0.9	0.9	1.0	1.0
<i>Albizia procera</i>	0.4	0.7	0.5	0.5	0.9	0.7	0.8	0.8	0.7
<i>Albizia saman</i>	1.7	1.7	1.7	1.7	2.1	1.8	1.3	1.7	1.7
<i>Azadirachta indica</i>	0.9	0.9	1.0	0.9	0.8	1.3	1.1	1.0	1.0
<i>Balanites aegyptiaca</i>	0.4	0.6	0.6	0.5	0.6	0.5	0.4	0.5	0.5
<i>Faidherbia albida</i>	1.0	0.8	0.9	0.9	0.8	0.8	0.8	0.8	0.9
<i>Senna siamea</i>	1.7	1.3	1.3	1.4	1.6	1.8	1.7	1.7	1.6
<i>Tectona grandis</i>	1.2	1.3	0.9	1.1	1.6	1.4	1.6	1.5	1.3
<i>Terminalia mantaly</i>	1.4	1.3	1.2	1.3	1.2	1.5	0.8	1.2	1.2
Means	1.05	1.04	1.03	1.04	1.08	1.13	1.00	1.07	1.06

Table 4: Tree Heights for each Species at 5 Months, Tumbi Tree Trial Tanzania (May 2007)

Tree Species	MEAN HEIGHT (cm)								
	No Fertilizer				With Fertilizer				Overall Mean
	Rep 1	Rep 2	Rep 3	Mean	Rep 1	Rep 2	Rep 3	Mean	
<i>Acacia crassicaarpa</i>	86.2	87.3	67.8	80.4	73.8	91.7	86.3	83.9	82.2
<i>Acacia nilotica</i>	38.5	31.3	25.2	31.7	33.8	31.2	25.5	30.2	30.9
<i>Acacia polyacantha</i>	93.0	95.3	125.7	104.7	39.2	83.7	105.0	75.9	90.3
<i>Acacia xanthophloea</i>	56.5	54.8	51.2	54.2	42.7	47.0	49.5	46.4	50.3
<i>Albizia glaberrima</i>	35.2	44.3	39.8	39.8	46.0	49.7	28.2	41.3	40.5
<i>Albizia lebbeck</i>	62.7	53.3	72.0	62.7	87.5	47.3	55.2	63.3	63.0
<i>Albizia procera</i>	10.2	26.0	20.7	18.9	37.3	30.0	30.0	32.4	25.7
<i>Albizia saman</i>	90.2	90.7	109.0	96.6	125.2	93.3	77.2	98.6	97.6
<i>Azadirachta indica</i>	52.5	50.0	52.3	51.6	49.0	54.3	54.0	52.4	52.0
<i>Balanites aegyptiaca</i>	26.3	38.5	40.2	35.0	33.8	34.5	27.0	31.8	33.4
<i>Faidherbia albida</i>	75.7	61.7	79.2	72.2	52.8	61.8	49.5	54.7	63.4
<i>Senna siamea</i>	66.3	42.3	49.8	52.8	54.0	63.5	60.8	59.4	56.1
<i>Tectona grandis</i>	20.7	24.2	15.0	19.9	42.5	27.7	25.0	31.7	25.8
<i>Terminalia mantaly</i>	65.7	51.0	58.0	58.2	49.2	66.8	32.5	49.5	53.9
Means	55.7	53.6	57.6	55.6	54.8	55.9	50.4	53.7	54.7

Fig 2: Effect of Fertilizer on Survival and Growth at 5 Months, Tumbi Trial Tanzania, May 2007

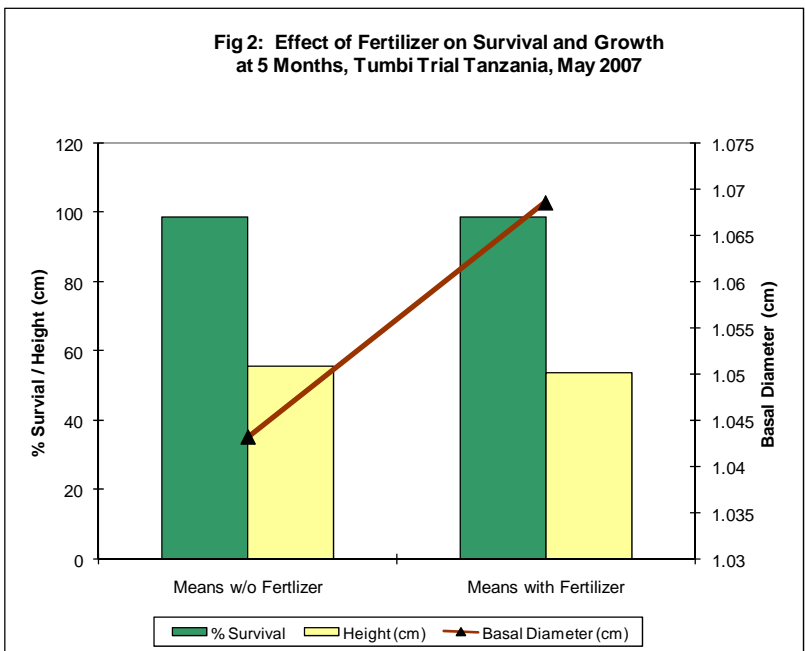


Fig. 3: Survival Rates of Tree Species at 5 Months, Tumbi Trial Tanzania, May 2007

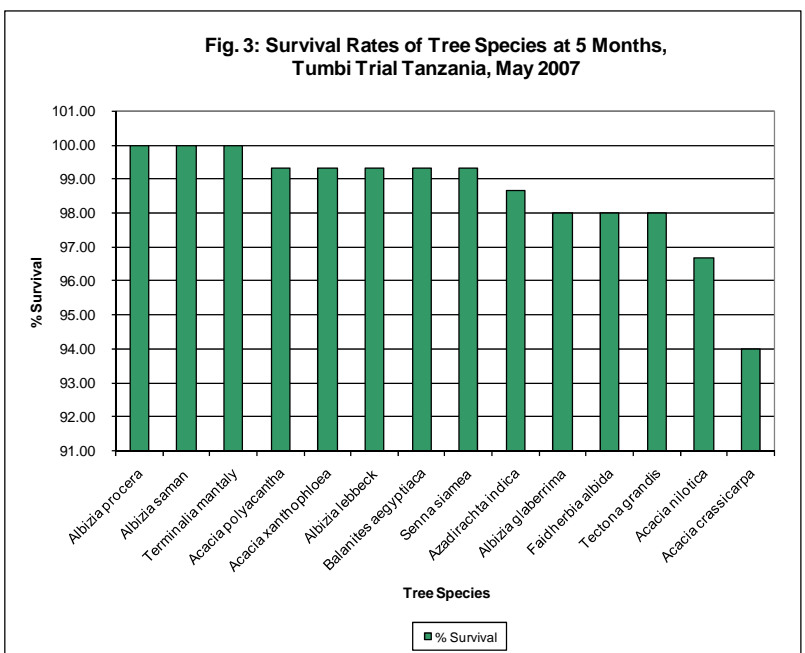


Fig. 4: Growth Rates of Tree Species at 5 Months, Tumbi Trial Tanzania, May 2007

