

A six-year old plantation of drought-resistant Teak trees (Tectona grandis) (Otto Richard Kawawa)

Teak-Based Afforestation for Timber Production (Uganda)

Bonga teak

DESCRIPTION

Teak (Tectona grandis) is preferred as a timber species in northern Uganda because the tree species better endures drought conditions compared to other species such as Pine. A tree plantation of Teak is established mainly to provide timber but also sequester atmospheric carbon and act as wind break.

Drought-tolerant Teak (Tectona grandis) is suitable for planting in semi-arid areas. In northern Uganda, farmers are establishing plantations of Teak for timber production as opposed to other plantation species like Pines and clonal Eucalyptus.

Seeds are raised in pots, small seedling containers in which they grow into seedlings. When the rains start, usually around April, or September, the seedlings are planted out, with 1,100 seedlings planted per hectare. Teak trees are planted at a spacing of 3 x 3 meters and thinned at 5 and 9 years to retain approximately 450 trees per hectare. To ensure that the timber produced from the trees does not have knots, pruning is done to remove lower branches as the tree grows. Pruning is normally done starting at the age of 3 years. Like most tree planting projects, framers tend to plan Teak on less productive land, leaving the fertile parts of their land for food and other high-value cash crops.

The cost of establishing a Teak plantations is high in the first 2-3 years but reduces significantly after first thinning. The cost of weeding can be reduced by spot-weeding of seedlings up to age 3 years, after which slashing or spraying with herbicides (usually Round-up) is used for weed control. Wood from thinning is also sold as firewood or construction poles to recover some the establishment costs. Shading of leave by Teak is heavy during the dry season and this causes a risk of fire. Therefore, fire control is done by establishing a fine-line, an open space of 6 meters to separate the plantation into compartments in order to restrict fire from spreading from one part to another part.

Farmers like Teak because it endures dry conditions and can provide high-quality timber. Although not exploited yet, these Teak plantations can be used for carbon trade and further improve the income of the farmer. What farmers do not like about Teak is that unlike several other specie where livestock can be integrated in the plantation, it is not possible for teak because it does not support undergrowth.

LOCATION



Location: Padibe s/county Lamwo District, Northern, Uganda

No. of Technology sites analysed: single site

Geo-reference of selected sites:

- 32.837600, 3.577600

Spread of the Technology: evenly spread over an area (approx. < 0.1 km²)

Date of implementation: 2012

Type of introduction

- [x] through land users' innovation
- [ ] as part of a traditional system (> 50 years)
- [ ] during experiments/ research
- [ ] through projects/ external interventions



A plantation of Teak (Tectona grandis) immediately after pruning at the age of five years ()

CLASSIFICATION OF THE TECHNOLOGY

Main purpose

- ☐ improve production
- ☐ prevent, reduce land degradation; restore/rehabilitate land
- ☐ conserve ecosystem
- ☐ protect a watershed/ downstream areas – in combination with other Technologies
- ☐ preserve/ improve biodiversity
- ☐ reduce risk of disasters
- ☑ adapt to climate change/ extremes and its impacts
- ☑ mitigate climate change and its impacts
- ☐ create beneficial economic impact
- ☐ create beneficial social impact

Purpose related to land degradation

- ☐ prevent land degradation
- ☐ reduce land degradation
- ☐ restore/ rehabilitate severely degraded land
- ☑ adapt to land degradation
- ☐ not applicable

SLM group

- forest plantation management

Land use



Forest/ woodlands
Products and services: Timber, Fuelwood, Protection against natural hazards

Water supply

- ✓ rainfed
- ○ mixed rainfed-irrigated
- ○ full irrigation

Number of growing seasons per year: 2

Degradation addressed



biological degradation Bc: reduction of vegetation cover

SLM measures

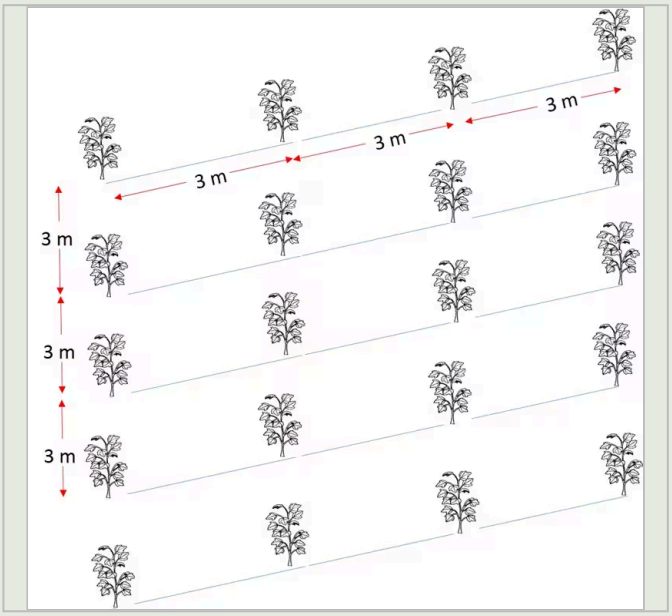


vegetative measures V1: Tree and shrub cover



management measures M5: Control/ change of species composition

TECHNICAL DRAWING



Author: Bernard Fungo

Seeds of Teack (Tectona grandis) are first raised in a nursery until they are 4 months old
Planting is done at the start of the rainy season (April or September)
Spacing between trees is 3 x 3 meters
Weeding is done by spot-weeding to reduce labour and soil disturbance
Pruning is done starting at the age of 3 years
Thinning is done at 5 and 9 years

ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS

Calculation of inputs and costs

- Costs are calculated: per Technology area (size and area unit: **5 Acres**)
- Currency used for cost calculation: **Uganda Shillings**
- Exchange rate (to USD): 1 USD = 3500 Uganda Shillings
- Average wage cost of hired labour per day: 5000

Most important factors affecting the costs

Raising seedlings and planting

Establishment activities

1. Raising seedlings in the nursery (Timing/ frequency: At the start of the establishment of the technology)
2. Land clearing (Timing/ frequency: Once at the start of the establishment of the technology)
3. Pitting and Planting (Timing/ frequency: Once at the start of the establishment of the technology)
4. Weeding (Timing/ frequency: Once every year)
5. Pruning (Timing/ frequency: At age 3 and 7 years)
6. Thinning (Timing/ frequency: At age 5 and 9 years)
7. Protection against fire (Timing/ frequency: Every year)

Establishment inputs and costs (per 5 Acres)

Specify input	Unit	Quantity	Costs per Unit (Uganda Shillings)	Total costs per input (Uganda Shillings)	% of costs borne by land users
Labour					
Raising seedlings in the nursry	Mandays	120	5 000.00	600 000.00	100
Land clearing	Acre	1	200 000.00	200 000.00	100
Planting	Acre	1	200 000.00	200 000.00	100
Equipment					
Watering Cans	Number	3	10 000.00	30 000.00	100
Jerricans	Number	5	8 000.00	40 000.00	100
Plant material					
Seeds of Teak	kg	1	100 000.00	100 000.00	100
Construction material					
Poles for the nursery	Number	30	5 000.00	150 000.00	100
Grass for shading the seedlings	Bundles	10	10 000.00	100 000.00	100
Total costs for establishment of the Technology (Uganda Shillings)				**1 420 000.00**	
Total costs for establishment of the Technology in USD				*405.71*	

Maintenance activities

1. Weeding (Timing/ frequency: Every year)
2. Pruning (Timing/ frequency: At age 3 through 7 years)
3. Thining (Timing/ frequency: At 5 and 9 years)

Maintenance inputs and costs (per 5 Acres)

Specify input	Unit	Quantity	Costs per Unit (Uganda Shillings)	Total costs per input (Uganda Shillings)	% of costs borne by land users
Labour					
Weeding	Acre	1	150 000.00	150 000.00	100
Pruning	Acre	1	200 000.00	200 000.00	100
Thinning	Acre	1	200 000.00	200 000.00	100
Regular patrol for fire protection	Years	15	600 000.00	9 000 000.00	100
Equipment					
Hoes	Number	5	15 000.00	75 000.00	100
Pangas	Number	5	8 000.00	40 000.00	100
Pruning saws	Number	5	20 000.00	100 000.00	100
Total costs for maintenance of the Technology (Uganda Shillings)				**9 765 000.00**	
Total costs for maintenance of the Technology in USD				*2 790.00*	

NATURAL ENVIRONMENT

Average annual rainfall

- ☐ < 250 mm
- ☐ 251 – 500 mm
- ☐ 501 – 750 mm
- ☐ 751 – 1 000 mm
- ☑ 1 001 – 1 500 mm
- ☐ 1 501 – 2 000 mm
- ☐ 2 001 – 3 000 mm
- ☐ 3 001 – 4 000 mm

Agro-climatic zone

- ☐ humid
- ☑ sub-humid
- ☐ semi-arid
- ☐ arid

Specifications on climate

- [ ] > 4 000 mm

Slope
- [ ] flat (0-2%)
- [x] gentle (3-5%)
- [ ] moderate (6-10%)
- [ ] rolling (11-15%)
- [ ] hilly (16-30%)
- [ ] steep (31-60%)
- [ ] very steep (>60%)

Landforms
- [ ] plateau/plains
- [ ] ridges
- [ ] mountain slopes
- [ ] hill slopes
- [x] footslopes
- [ ] valley floors

Altitude
- [ ] 0 – 100 m a.s.l.
- [ ] 101 – 500 m a.s.l.
- [ ] 501 – 1 000 m a.s.l.
- [ ] 1 001 – 1 500 m a.s.l.
- [x] 1 501 – 2 000 m a.s.l.
- [ ] 2 001 – 2 500 m a.s.l.
- [ ] 2 501 – 3 000 m a.s.l.
- [ ] 3 001 – 4 000 m a.s.l.
- [ ] > 4 000 m a.s.l.

Technology is applied in
- [ ] convex situations
- [ ] concave situations
- [x] not relevant

Soil depth
- [ ] very shallow (0-20 cm)
- [ ] shallow (21-50 cm)
- [x] moderately deep (51-80 cm)
- [ ] deep (81-120 cm)
- [ ] very deep (> 120 cm)

Soil texture (topsoil)
- [ ] coarse/ light (sandy)
- [x] medium (loamy, silty)
- [ ] fine/ heavy (clay)

Soil texture (> 20 cm below surface)
- [ ] coarse/ light (sandy)
- [x] medium (loamy, silty)
- [ ] fine/ heavy (clay)

Topsoil organic matter content
- [ ] high (>3%)
- [x] medium (1-3%)
- [ ] low (<1%)

Groundwater table
- [ ] on surface
- [ ] < 5 m
- [x] 5 – 50 m
- [ ] > 50 m

Availability of surface water
- [ ] excess
- [x] good
- [ ] medium
- [ ] poor/ none

Water quality (untreated)
- [ ] good drinking water
- [ ] poor drinking water (treatment required)
- [x] for agricultural use only (irrigation)
- [ ] unusable

Is salinity a problem?
- [ ] Yes
- [x] No

Occurrence of flooding
- [ ] Yes
- [x] No

Species diversity
- [ ] high
- [x] medium
- [ ] low

Habitat diversity
- [ ] high
- [x] medium
- [ ] low

CHARACTERISTICS OF LAND USERS APPLYING THE TECHNOLOGY

Market orientation
- [ ] subsistence (self-supply)
- [x] mixed (subsistence/ commercial
- [ ] commercial/ market

Off-farm income
- [ ] less than 10% of all income
- [x] 10-50% of all income
- [ ] > 50% of all income

Relative level of wealth
- [ ] very poor
- [ ] poor
- [x] average
- [ ] rich
- [ ] very rich

Level of mechanization
- [x] manual work
- [ ] animal traction
- [ ] mechanized/ motorized

Sedentary or nomadic
- [x] Sedentary
- [ ] Semi-nomadic
- [ ] Nomadic

Individuals or groups
- [x] individual/ household
- [ ] groups/ community
- [ ] cooperative
- [ ] employee (company, government)

Gender
- [x] women
- [x] men

Age
- [ ] children
- [x] youth
- [x] middle-aged
- [ ] elderly

Area used per household
- [ ] < 0.5 ha
- [ ] 0.5 – 1 ha
- [ ] 1 – 2 ha
- [ ] 2 – 5 ha
- [x] 5 – 15 ha
- [ ] 15 – 50 ha
- [ ] 50 – 100 ha
- [ ] 100 – 500 ha
- [ ] 500 – 1 000 ha
- [ ] 1 000 – 10 000 ha
- [ ] > 10 000 ha

Scale
- [x] small-scale
- [ ] medium-scale
- [ ] large-scale

Land ownership
- [ ] state
- [ ] company
- [ ] communal/ village
- [ ] group
- [x] individual, not titled
- [ ] individual, titled

Land use rights
- [ ] open access (unorganized)
- [ ] communal (organized)
- [ ] leased
- [x] individual

Water use rights
- [ ] open access (unorganized)
- [ ] communal (organized)
- [ ] leased
- [x] individual

Access to services and infrastructure

health	poor		✓	good
education	poor		✓	good
technical assistance	poor		✓	good
employment (e.g. off-farm)	poor	✓		good
markets	poor			✓ good
energy	poor		✓	good
roads and transport	poor		✓	good
drinking water and sanitation	poor	✓		good
financial services	poor	✓		good

IMPACTS

Socio-economic impacts

wood production	decreased						✓		increased
forest/ woodland quality	decreased					✓			increased

energy generation	decreased	✓	increased
expenses on agricultural inputs	increased	✓	reduced
farm income	decreased	✓	increased
diversity of income sources	decreased	✓	increased
workload	increased	✓	decreased

Ecological impacts

drought impacts	increased	✓	decreased
wind velocity	increased	✓	decreased

Off-site impacts

wind transported sediments	increased	✓	reduced

COST-BENEFIT ANALYSIS

Benefits compared with establishment costs

Short-term returns	very negative	✓	very positive
Long-term returns	very negative	✓	very positive

Benefits compared with maintenance costs

Short-term returns	very negative	✓	very positive
Long-term returns	very negative	✓	very positive

CLIMATE CHANGE

Gradual climate change

seasonal temperature increase	not well at all	✓	very well	Season: dry season

ADOPTION AND ADAPTATION

Percentage of land users in the area who have adopted the Technology

- single cases/ experimental
- ✓ 1 – 10 %
- 11 – 50 %
- > 50 %

Of all those who have adopted the Technology, how many have done so without receiving material incentives?

- 0 – 10 %
- 11 – 50 %
- 51 – 90 %
- ✓ 91 – 100 %

Has the Technology been modified recently to adapt to changing conditions?

- Yes
- ✓ No

To which changing conditions?

- climatic change/ extremes
- changing markets
- labour availability (e.g. due to migration)

CONCLUSIONS AND LESSONS LEARNT

Strengths: land user's view

- Teak is drought-tolerant and and provides high quality timber which, guarantees profits from the investment
- Other ecological benefits can be realized from the plantation, such as the role of wind breaks and carbon sequestration

Weaknesses/ disadvantages/ risks: land user's view — how to overcome

- The cost of establishing the plantation is high for majority farmers in the area — Community nurseries can provide seedlings to reduce establishment costs
- The risk of fire during the dry season is very high — Protection against fire has to be considered as part of the investment, to construct fire lines and regular patrols

REFERENCES

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