Photo showing Pine Woodlot in Amuru District, Nothern Uganda. (Rick Kamugisha)

Pine Woodlot (Uganda)

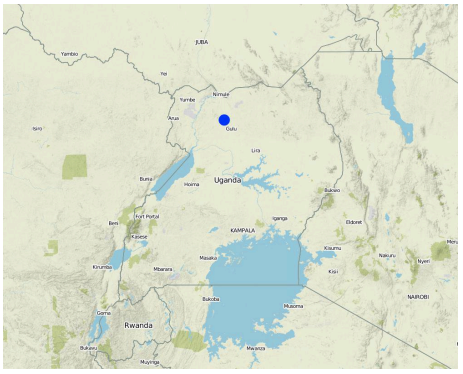
Pito Yen pine

DESCRIPTION

A Woodlot of Pine (Pinus caribaea) is a fast growing, tolerant tree based plantation established to address land cover depletion, soil fertility loss and soil erosion control.

To establish this technology, the farmer excavates a hole and wait for 4-6 days to allow air that can burn the seedlings first get out and then plant the seedlings. If the planting is done during the dry season, it is important that the farmer water the seedlings regularly to avoid drying.
The activities involved in establishing this technology include: (1) Looking for suitable land to establish the technology (2) Looking for labor, and appropriate seedlings and tools to use, (3) Identifying the expert/ trainer to train on how to plant and the right spacing (4) Digging the holes (30cm deep) and waiting for 4-6 days before planting. It is important that the farmer weeds the plantation if weeds develop.
Pinus caribaea is an important forest plantation tree that is fast growing, tolerant to poor soils which don't retain water and nutrients and often drains too well that may cause the roots to rot or fail to develop and its wood can be milled into timber, pulped or used as poles.
The common inputs required for establishing such a technology include a hoe, a panga, a planting string, seedlings, and a trainer.
This technology is easy and cheap to maintain once established. It is good for timber, firewood and environmental conservation with the costs of buying seedlings and payment for labor being high at the time of establishment compared to the costs of recurrent maintenance activities.
What is not liked about this technology is that the benefits are realized after a long time. Secondly, pine is not a source of food until when it is sold and cash is used to buy food unlike fruit trees such as mangoes and oranges.

LOCATION



Location: Amuru District, Northern Region,Uganda, Uganda

No. of Technology sites analysed: single site

Geo-reference of selected sites
- 32.13561, 2.9742

Spread of the Technology: evenly spread over an area (approx. < 0.1 km2 (10 ha))

In a permanently protected area?:

Date of implementation: 2015; less than 10 years ago (recently)

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

Photo of Pine Woodlot in Amuru District. (Rick Kamugisha)

CLASSIFICATION OF THE TECHNOLOGY

Main purpose

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

Land use

Forest/ woodlands Products and services: Timber, Fuelwood

Water supply

- [ ] rainfed
- [x] mixed rainfed-irrigated
- [ ] full irrigation

Purpose related to land degradation

- [x] prevent land degradation
- [ ] reduce land degradation
- [ ] restore/ rehabilitate severely degraded land
- [x] adapt to land degradation
- [ ] not applicable

Degradation addressed

soil erosion by wind - Et: loss of topsoil, Ed: deflation and deposition

chemical soil deterioration - Cn: fertility decline and reduced organic matter content (not caused by erosion)

biological degradation - Bs: quality and species composition/ diversity decline

water degradation - Hp: decline of surface water quality

SLM group

- forest plantation management

SLM measures

agronomic measures - A1: Vegetation/ soil cover, A2: Organic matter/ soil fertility, A3: Soil surface treatment, A4: Subsurface treatment, A5: Seed management, improved varieties

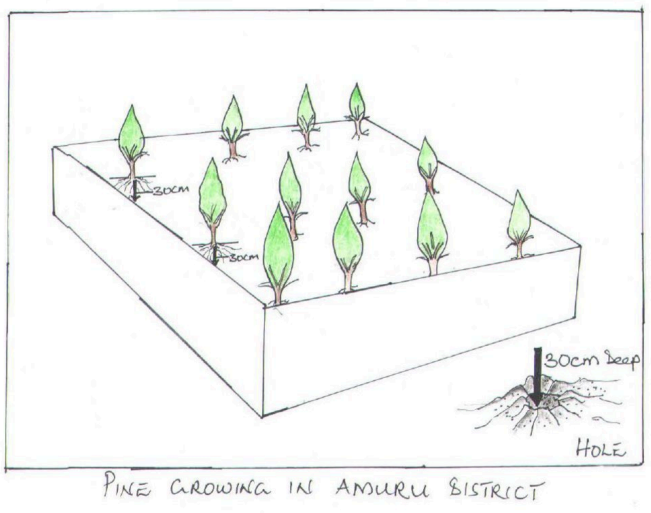
vegetative measures - V1: Tree and shrub cover

management measures - M1: Change of land use type, M2: Change of management/ intensity level, M3: Layout according to natural and human environment

TECHNICAL DRAWING

Technical specifications

2.5 metres within raws
3 metres between raws
10 metres between blocks
5-6 metres wide.



Author: Kaheru

ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS

Calculation of inputs and costs

- Costs are calculated: per Technology area (size and area unit: **0.5 acres**)
- Currency used for cost calculation: **UGX**
- Exchange rate (to USD): 1 USD = 3400.0 UGX
- Average wage cost of hired labour per day: 5000 per person per day

Most important factors affecting the costs

Seedlings and labour takes most of the costs.

Establishment activities

1. lookling for suitable land (Timing/ frequency: Before planting)
2. Looking for tools, labour and seedlings (Timing/ frequency: Before planting)
3. Looking for expert/trainer (Timing/ frequency: Before planting)
4. Preparing land for planting (Timing/ frequency: At the time of planting)
5. Digging the holes (30-60cm) (Timing/ frequency: During planting)
6. Planting with spacing of 3m x3m (Timing/ frequency: During planting)
7. Watering: Dry season (Timing/ frequency: After planting)
8. Monitoring and security provision. (Timing/ frequency: After planting)

Establishment inputs and costs (per 0.5 acres)

Specify input	Unit	Quantity	Costs per Unit (UGX)	Total costs per input (UGX)	% of costs borne by land users
Labour					
Labour	persons	10.0	5000.0	50000.0	100.0
Equipment					
Panga	Pieces	1.0	7000.0	7000.0	100.0
Hoe	Pieces	10.0	10000.0	100000.0	100.0
Panga	Pieces	3.0	7000.0	21000.0	100.0
Plant material					
Seedlings	Kgs	4000.0	2500.0	10000000.0	
Construction material					
Bamboo- bundles	Bundles	1.0	15000.0	15000.0	
Other					
watering can	Pieces	3.0	25000.0	75000.0	
Total costs for establishment of the Technology				**10'268'000.0**	
Total costs for establishment of the Technology in USD				*3'020.0*	

Maintenance activities

1. weeding/slashing (Timing/ frequency: Twice a year: when still young)
2. Watering (Timing/ frequency: During dry season: trees still young)
3. Prunning (Timing/ frequency: Twice a year)
4. Security and moniroring (Timing/ frequency: Daily)

Maintenance inputs and costs (per 0.5 acres)

Specify input	Unit	Quantity	Costs per Unit (UGX)	Total costs per input (UGX)	% of costs borne by land users
Labour					
Labour on monthly basis	Persons	10.0	150000.0	1500000.0	100.0

Total costs for maintenance of the Technology	1'500'000.0	
Total costs for maintenance of the Technology in USD	*441.18*	

NATURAL ENVIRONMENT

Average annual rainfall
- [ ] < 250 mm
- [ ] 251-500 mm
- [ ] 501-750 mm
- [ ] 751-1,000 mm
- [x] 1,001-1,500 mm
- [ ] 1,501-2,000 mm
- [ ] 2,001-3,000 mm
- [ ] 3,001-4,000 mm
- [ ] > 4,000 mm

Agro-climatic zone
- [ ] humid
- [x] sub-humid
- [ ] semi-arid
- [ ] arid

Specifications on climate
Average annual rainfall in mm: 1500.0

Slope
- [x] flat (0-2%)
- [ ] 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
- [ ] footslopes
- [x] valley floors

Altitude
- [ ] 0-100 m a.s.l.
- [ ] 101-500 m a.s.l.
- [ ] 501-1,000 m a.s.l.
- [x] 1,001-1,500 m a.s.l.
- [ ] 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
- [x] concave situations
- [ ] not relevant

Soil depth
- [ ] very shallow (0-20 cm)
- [x] shallow (21-50 cm)
- [ ] 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)
- [ ] medium (loamy, silty)
- [x] fine/ heavy (clay)

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

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

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

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

Water quality refers to:

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

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

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

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

CHARACTERISTICS OF LAND USERS APPLYING THE TECHNOLOGY

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

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

Relative level of wealth
- [ ] very poor
- [x] poor
- [ ] 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
- [ ] individual/ household
- [x] groups/ community
- [ ] cooperative
- [ ] employee (company, government)

Gender
- [x] women
- [ ] men

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

Area used per household
- [x] < 0.5 ha
- [ ] 0.5-1 ha
- [ ] 1-2 ha
- [ ] 2-5 ha
- [ ] 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
- [x] 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	from the planted pine trees.
forest/ woodland quality	decreased	increased	Due to prunning.
land management	hindered	simplified	Slashing and weeding.
expenses on agricultural inputs	increased	decreased	for labours.
farm income	decreased	increased	From the sale of timber and fuel wood.
diversity of income sources	decreased	increased	Timber and fuel wood.
workload	increased	decreased	Planting, watering, thinning and pruning and harvesting.

Socio-cultural impacts

Ecological impacts

soil cover	reduced	improved	Where the pine trees are planted.
soil loss	increased	decreased	Due to planted trees.
soil organic matter/ below ground C	decreased	increased	Especially where the trees are planted and was originally degraded.
invasive alien species	increased	reduced	Causing serious problems to natural habitat.
habitat diversity	decreased	increased	Due to Invasive species.
fire risk	increased	decreased	If not protected with fireline.

Off-site impacts

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

Benefits are low in the short run and high in the long run.

CLIMATE CHANGE

Gradual climate change

annual temperature increase	not well at all	very well	
seasonal temperature increase	not well at all	very well	Season: wet/ rainy season

ADOPTION AND ADAPTATION

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

- [ ] single cases/ experimental
- [x] 1-10%
- [ ] 11-50%
- [ ] > 50%

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

- [x] 0-10%
- [ ] 11-50%
- [ ] 51-90%
- [ ] 91-100%

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

- [ ] Yes
- [x] 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

- Good at providing fire wood in the short run after prunning.
- The costs are low after establishment (prunning, monitoring).
- Easy to establish once the seedlings are available and can easily be replicated by other farmers.
- Suitable for both small scale and large farmers with similar or different land sizes.

Strengths: compiler's or other key resource person's view

- The land user is managing the technology well and is likely to reap long term benefits (income and Timber).
- The technology is easy to manage after establishment. Maintenance is not laborious.

Weaknesses/ disadvantages/ risks: land user's viewhow to overcome

- The technology is not very much appropriate for soil fertility improvement as compared to other agroforestry trees (callindra, Grivellea and Alnus). The land user need to integrate other agroforestry and fruit trees in the technology.
- The technology is costly in terms of securing seedlings. The land user has to travel long distances 15km to buy the seedlings. The land user can be trained on how to raise her own seedlings.

Weaknesses/ disadvantages/ risks: compiler's or other key resource person's viewhow to overcome

- The benefits of the technology are long term and may not help the land user to meet urgent needs (school fees, medical care etc) The land user need to look at other alternative sources of income which are short term and multi-purpose e.g integrate tree planting with livestock for milk, manure and other benefits.
- The benefits of the technology are long term from 5 to 10 years. Explore alternatives and integrate other sources of income which are short term and multi-purpose but also good at addressing land degradation problems e.g poultry keeping.

REFERENCES

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Resource persons
Alex Okecokon - land user

Full description in the WOCAT database
https://qcat.wocat.net/en/wocat/technologies/view/technologies_2825/
Video: https://player.vimeo.com/video/323401705

Linked SLM data
Approaches: WALA Women Group Community Tree planting Approach https://qcat.wocat.net/en/wocat/approaches/view/approaches_2767/

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