Photo showing mulching using banana leaves. (Rick Kamugisha)

Mulching using banana leaves (Uganda)

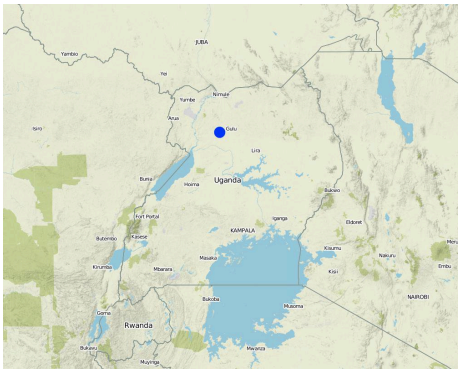
Labolo Ma Kipo Mwanyi

DESCRIPTION

Dry banana leaves are spread in the soil for growing banana plantation for improving soil fertility and moisture content retention.

Locally obtained dry banana leaves is a low cost mulching material used by farmers in Northern Uganda to mulch soil in order to grow banana with the aim of improving soil fertility and soil moisture content retention.
The land user identifies a banana plantation usually 0.5 to 2 acres planted with sweet banana, Bogoya, Fear 17 varieties and spread the banana leaves across the banana plantation usually below 40-60 cm to the mother plant using 2-4 people per day, hoes and pangas.
Mulching is preferred because it uses locally available banana leaves within the plantation. It does not require high maintenance costs to pay for labor, digging and transport. Costs would be incurred transporting the mulching material. In addition to conserving moisture in the soils, it reduces water runoff to avoid erosion and improves the soil as the mulch material rots.
However, it is important for the land user to be aware that mulching using banana leaves serve as breeding place for banana weevils and if the land user places the mulch too close to the mother plant it will affect the growth of the young suckers. This therefore means land users who need to use this low cost mulching material need to first work out proper procedures with the extension worker on how to mulch banana plantation before mulching.
To sustain this technology, the land users can integrate cultivating multipurpose tree species (Calliandra and Grivellea) to additionally stabilize the soils and improve soil fertility when the tree mature and leaves litter.

LOCATION



Location: Nwoya District, Northern Region,Uganda, Uganda

No. of Technology sites analysed: single site

Geo-reference of selected sites
- 32.02756, 2.67981

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

In a permanently protected area?:

Date of implementation: 2012; less than 10 years ago (recently)

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

Photo showing mulching using banana leaves by the farmer. (Issa)

CLASSIFICATION OF THE TECHNOLOGY

Main purpose

- [x] improve production
- [x] reduce, prevent, restore land degradation
- [ ] 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
- [x] mitigate climate change and its impacts
- [ ] create beneficial economic impact
- [ ] create beneficial social impact

Land use

Cropland

- Annual cropping
- Perennial (non-woody) cropping: banana/plantain/abaca
- Tree and shrub cropping: coffee, open grown

Number of growing seasons per year: 2

Water supply

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

Purpose related to land degradation

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

Degradation addressed

soil erosion by water - Wt: loss of topsoil/ surface erosion, Wg: gully erosion/ gullying

soil erosion by wind - Et: loss of topsoil

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

physical soil deterioration - Pc: compaction

biological degradation - Bc: reduction of vegetation cover

water degradation - Hs: change in quantity of surface water, Hg: change in groundwater/aquifer level

SLM group

- minimal soil disturbance
- integrated soil fertility management
- water harvesting

SLM measures

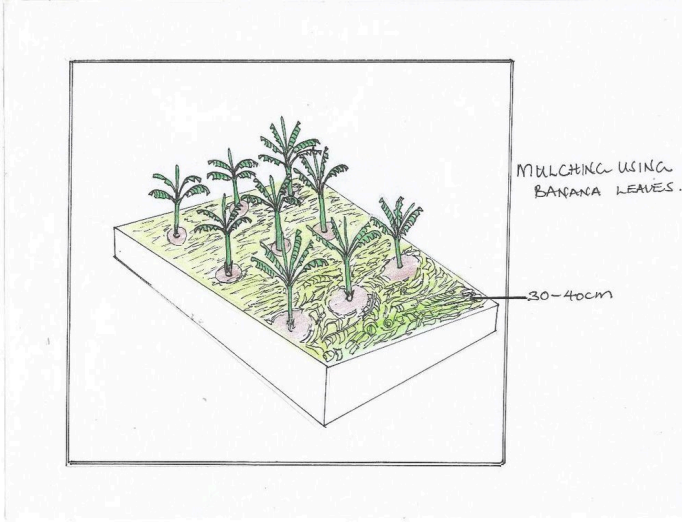
agronomic measures - A1: Vegetation/ soil cover, A2: Organic matter/ soil fertility

structural measures - S7: Water harvesting/ supply/ irrigation equipment

TECHNICAL DRAWING

Technical specifications

None



Author: Kaheru

ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS

Calculation of inputs and costs

- Costs are calculated: per Technology area (size and area unit: **2 acres**)
- Currency used for cost calculation: **UGX**
- Exchange rate (to USD): 1 USD = 3200.0 UGX
- Average wage cost of hired labour per day: 5000

Most important factors affecting the costs

Labour for cutting and laying the banana leaves is the most important factor affecting costs.

Establishment activities

1. Site selection (Timing/ frequency: Once before before establishment)
2. look for inputs (labour) (Timing/ frequency: Once before establishment)
3. Cut the banana leaves (Timing/ frequency: During establishment)
4. Lay the banana leaves (Timing/ frequency: During establishment)

Establishment inputs and costs (per 2 acres)

Specify input	Unit	Quantity	Costs per Unit (UGX)	Total costs per input (UGX)	% of costs borne by land users
Labour					
Persons days employed on monthly basis	persons	10.0	70000.0	700000.0	100.0
Equipment					
Hoes	Pieces	10.0	10000.0	100000.0	100.0
Pangas	Pieces	5.0	7000.0	35000.0	100.0
Other					
Training costs (transport)	sessions	3.0	30000.0	90000.0	100.0
Total costs for establishment of the Technology				**925'000.0**	

Maintenance activities

1. Re-mulching (Timing/ frequency: Twice a year)

Maintenance inputs and costs (per 2 acres)

Specify input	Unit	Quantity	Costs per Unit (UGX)	Total costs per input (UGX)	% of costs borne by land users
Labour					
Persons days on monthly basis	Persons	4.0	150000.0	600000.0	100.0
Fertilizers and biocides					
					100.0
Total costs for maintenance of the Technology				**600'000.0**	

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
- [x] humid
- [ ] sub-humid
- [ ] semi-arid
- [ ] arid

Specifications on climate
Average annual rainfall in mm: 1450.0
More rains during the wet season (March-May) with long dry spell around June - August.

Slope
- [ ] flat (0-2%)
- [ ] gentle (3-5%)
- [x] 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)
- [ ] 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
- [x] < 5 m
- [ ] 5-50 m
- [ ] > 50 m

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

Water quality (untreated)
- [x] good drinking water
- [ ] 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
- [ ] medium
- [x] 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
- [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
- [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
- [x] communal/ village
- [ ] group
- [ ] 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	
None	poor	good	

IMPACTS

Socio-economic impacts

Crop production

decreased — increased

As result of integration and application of manure from littered leaves of banana.

land management

hindered — simplified

The farmer uses mulch material from the same garden that is mulching.

expenses on agricultural inputs

increased — decreased

Expenses only incurred on purchase of pangas which are not high. Labour costs are high.

farm income

decreased — increased

From the sale of matooke.

workload

increased — decreased

Reduced labour and costs required on farm after mulching.

Socio-cultural impacts

food security/ self-sufficiency

reduced — improved

With Mulching , the farmer is able to realise more bananas produced which makes him food secure. Even the money obtained from sale of banana is used to buy food like posho and beans.

national institutions

weakened — strengthened

Especially with NUSAF which supported the farmer with trainings.

SLM/ land degradation knowledge

reduced — improved

Trained by Northern Uganda Social Action Fund (NUSAF) and extension workers on mulching using bananas.

Ecological impacts

harvesting/ collection of water (runoff, dew, snow, etc)

reduced — improved

Retained by mulch material.

surface runoff

increased — decreased

soil moisture

decreased — increased

soil cover

reduced — improved

Due to mulch material.

soil organic matter/ below ground C

decreased — increased

Due to decomposed mulch.

landslides/ debris flows

increased — decreased

Off-site impacts

water availability (groundwater, springs)

decreased — increased

Retained by the mulch material.

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 term with more labour costs for cutting and laying grass mulch while in the long run, less labour costs and more benefits (reduced soil erosion, increased production) resulting from decomposed mulch material.

CLIMATE CHANGE

Gradual climate change

annual temperature increase

not well at all — very well

seasonal temperature increase — not well at all ☐ ☐ ✓ ☐ ☐ very well — Season: dry season
annual rainfall increase — not well at all ☐ ☐ ✓ ☐ ☐ very well

Climate-related extremes (disasters)
drought — not well at all ☐ ☐ ✓ ☐ ☐ very well

ADOPTION AND ADAPTATION

Percentage of land users in the area who have adopted the Technology
- ☐ single cases/ experimental
- ☑ 1-10%
- ☐ 11-50%
- ☐ > 50%

Number of households and/ or area covered
4

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

Established a local collection centre for marketing bananas to avoid exploitation.

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 for soil moisture retention and soil fertility improvement.
- Maintenance costs are low in the long run.
- Uses locally available mulch material which is easily accessible in the plantation.

Strengths: compiler's or other key resource person's view
- The technology is appropriate for both small scale and large scale land users with a banana plantation.
- The technology can easily be promoted and replicated by other farmers in other areas.
- Once established, its easy to manage and mentain as long as labour is available at affordable cost.

Weaknesses/ disadvantages/ risks: land user's viewhow to overcome
- Prolonged drought affects the banana which may affect the quantity and quality of mulching material. Integrate agrofrestry trees within the banana plantation (Grivellea and Calliandra).
- Labour Intensive associated with high costs in case the farmer has 10 acres and more. Work in groups and exchange labour.
- Wind affects banana production which may affect the quality of mulching material. Promote agroforestry trees (Callindra, Grivellea 0 within the technology to acts as soil fertility improving trees and wind breaks.

Weaknesses/ disadvantages/ risks: compiler's or other key resource person's viewhow to overcome
- Prolonged drought affects the Banana yield and therefore may not be a solution to poor farmers, Promote agroforestry tree planting (calliandra, Grivellea) that addresses climatic change issues.
- Requires a lot of labour. Engage labour on monthly basis.
- Attract thieves who may want to eat and sell. Strengthen Community local bylaws.
  If found stealing or encroaching pay 2 times the equivalent of what has been stolen.
- The technology is mostly affected by wind. Promote agroforestry trees as wind breakers on the farm.

REFERENCES

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Resource persons
Andrew Ongai - land user

Full description in the WOCAT database
https://qcat.wocat.net/en/wocat/technologies/view/technologies_2757/
Video: https://player.vimeo.com/video/325827407

Linked SLM data
n.a.

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