An improved trash line, laid out along the contour, in a field of beans. (William Critchley)

Improved trash lines (Uganda)

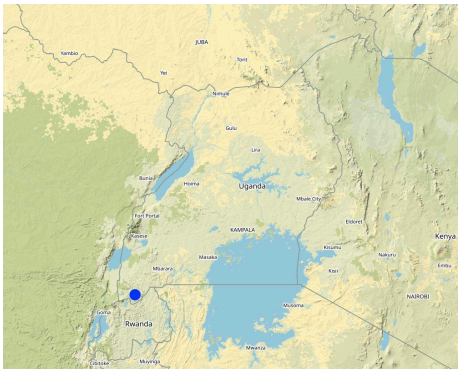
Emikikizo (Lukiga)

DESCRIPTION

Weeds and crop residues laid in bands across the slope of annual crop fields to conserve soil and water, and to incorporate organic matter into the soil after decomposition.

Trash lines of organic material across the slope constitute a traditional land husbandry practice in south-west Uganda. These traditional, 'unimproved', trash lines are beneficial, but even better is an improved version designed through Participatory Technology Development (PTD). Improved trash lines are smaller, closer spaced, and of longer duration than the traditional type. They are more effective in controlling runoff and maintaining soil fertility. All trash lines (improved and traditional) are composed of cereal stover (straw) and weeds that are collected during primary cultivation (hand hoeing), and heaped in strips along the approximate contour. Creeping grasses should not be used in trash lines: they can alternatively be decomposed in bundles, and then used as mulch in nearby banana plantations. Trash lines are used in hillside fields where annual crops, including sorghum, finger millet, beans and peas, are grown. The recommended spacing between the improved trash lines is 5-10 m, depending
on the slope: the steeper the closer. The amount of material available determines the cross section of each trash line (typically ±0.5 m wide and ±0.3 m high). Improved trash lines are left in place for four seasons (there are two seasons a year in Kabale) before they are dug into the soil. Much of the material used has, by this time, decomposed or been eaten by termites. Through incorporation into the topsoil, they improve soil fertility acting effectively as 'mobile compost strips'. New trash lines are then established between the sites of the former lines. Upkeep comprises removal of weeds that sprout within the lines - before they set seed - and the addition of more trash during each new cultivation and weeding cycle.
Improved trash lines are multipurpose in retarding dispersed runoff while, as discussed, maintaining soil fertility. They are a low-cost option for soil and water conservation. However, they need to be complemented by other measures on the steeper slopes. The climate in this part of Uganda is subhumid, with a bimodal rainfall regime, and average annual rainfall of around 800 mm. Hill tops are used for grazing, the lower slopes are cultivated with annual crops (where the trash lines are found) and the valleys are dedicated to bananas and other cash crops. Families are large: 8-10 persons, and the population density is high, at nearly 200 persons/km2.

LOCATION



Location: Kabale district, Kabale, Uganda

No. of Technology sites analysed:

Geo-reference of selected sites
- 29.98539, -1.24219

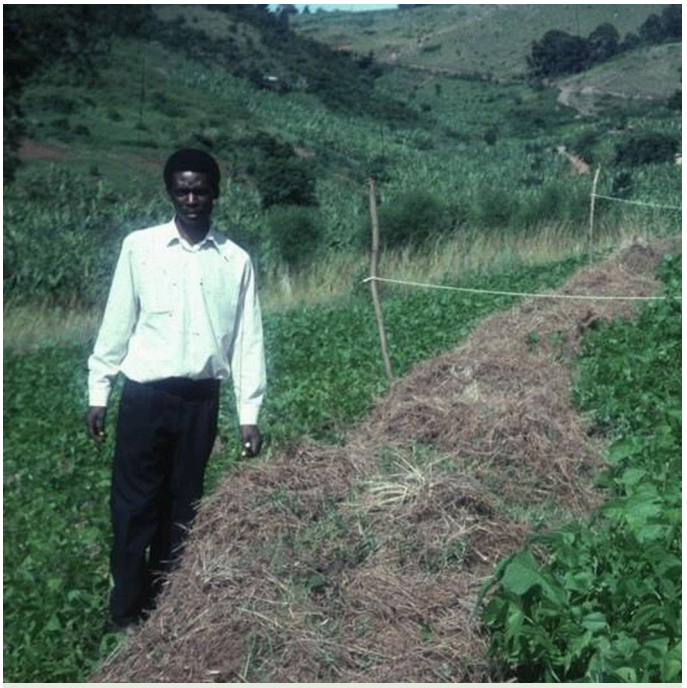
Spread of the Technology: evenly spread over an area (approx. 0.1-1 km2)

In a permanently protected area?:

Date of implementation: more than 50 years ago (traditional)

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

Extension agent with trash lines - newly formed from cereal residues. (William Critchley)



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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
- [x] adapt to climate change/ extremes and its impacts
- [ ] mitigate climate change and its impacts
- [ ] create beneficial economic impact
- [ ] create beneficial social impact

Land use

Cropland

- Annual cropping: cereals - millet, cereals - sorghum, legumes and pulses - beans, legumes and pulses - peas
- Perennial (non-woody) cropping: banana/plantain/abaca
- Tree and shrub cropping

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

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

water degradation - Ha: aridification

SLM group

- improved ground/ vegetation cover
- cross-slope measure
- water harvesting

SLM measures

TECHNICAL DRAWING

Technical specifications

Trash lines without crops (left)
and with crops (beans; right).
The insert shows the stages of the technology: regularly spaced trash lines are kept place for four seasons (1); then decompose over time and are incorporated into the soil (2); and finally new trash lines are placed between the previous strips (3).

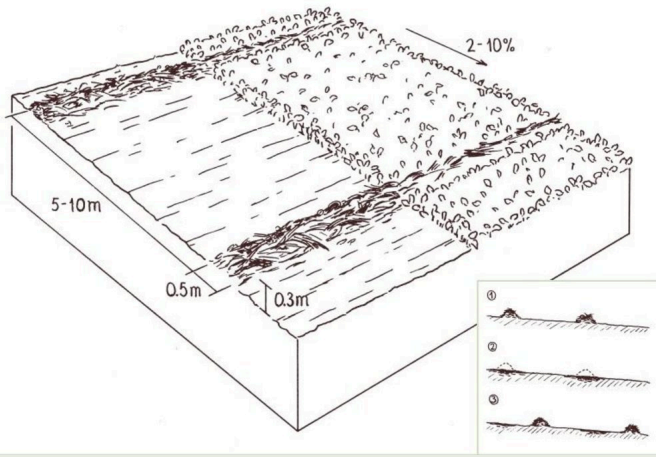
Technical knowledge required for field staff / advisors: low

Technical knowledge required for land users: low

Main technical functions: control of dispersed runoff: impede / retard, increase of infiltration, increase in soil fertility

Secondary technical functions: control of dispersed runoff: retain / trap, increase in organic matter, improvement of soil structure, sediment harvesting

Agronomic measure: mulching, trash lines
Material/ species: weed residue, sorghum
Remarks: along contour



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ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS

Calculation of inputs and costs

- Costs are calculated:
- Currency used for cost calculation: **Uganda Shillings**
- Exchange rate (to USD): 1 USD = 1000.0 Uganda Shillings
- Average wage cost of hired labour per day: 1.00

Most important factors affecting the costs

Labour, need to collect and heap the trashlines material in lines above the slope

Establishment activities

n.a.

Establishment inputs and costs

Specify input	Unit	Quantity	Costs per Unit (Uganda Shillings)	Total costs per input (Uganda Shillings)	% of costs borne by land users
Labour					
Labour	ha	1.0	25.0	25.0	100.0
Equipment					
Tools	ha	1.0	5.0	5.0	100.0
Total costs for establishment of the Technology				**30.0**	
Total costs for establishment of the Technology in USD				*0.03*	

Maintenance activities

1. During land cultivation, existing (old) trash lines are dug. 2. New trash lines are then created exactly between the (cross-slope) (Timing/ frequency: Dry season / each cropping season)
2. The size of the trash lines depends on the amount of trash available, (Timing/ frequency: Dry season)
3. Weeds are added to the trash lines, and, in preparation for the second (Timing/ frequency: Second season)
4. Trash lines are kept free of growing weeds and built up with more (Timing/ frequency: Third and fourth seasons)
5. Trash lines are kept free of growing weeds and built up with moretrash. Full cycle for improved trash lines: 4 seasons (2 years) (Timing/ frequency: None)

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
- ☐ > 4,000 mm

Agro-climatic zone

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

Specifications on climate

Average annual rainfall in mm: 800.0
Thermal climate class: tropics

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
- [x] 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
- [ ] not relevant

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

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

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

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

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

Is salinity a problem?
- [ ] Ja
- [ ] Nee

Occurrence of flooding
- [ ] Ja
- [ ] Nee

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

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

CHARACTERISTICS OF LAND USERS APPLYING THE TECHNOLOGY

Market orientation
- [x] 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
- [x] poor
- [x] average
- [ ] rich
- [ ] very rich

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

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

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

Gender
- [ ] women
- [ ] men

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

Area used per household
- [ ] < 0.5 ha
- [x] 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
- [ ] 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)
- [x] communal (organized)
- [ ] leased
- [x] individual

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

Access to services and infrastructure

IMPACTS

Socio-economic impacts

Socio-cultural impacts

Ecological impacts

Off-site impacts

COST-BENEFIT ANALYSIS

Benefits compared with establishment costs

Benefits compared with maintenance costs

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

CLIMATE CHANGE

-

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?

- Ja
- Nee

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

- Improved trash lines have small but significant advantages over the traditional trash lines (which are beneficial themselves) in terms of (a) less labour (b) improved crop performance

  How can they be sustained / enhanced? Continue with farmer-to-farmer visits for this to be explained.

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

- The technology is very simple and uses locally available material. It is easy to understand, being a modification of an existing tradition

  How can they be sustained / enhanced? Continue with farmer-to-farmer visits for first hand learning.
- Multiple ecological and SWC benefits: improves soil fertility, reduces erosion, increases infiltration etc

  How can they be sustained / enhanced? Continue to encourage adoption of (and further farmer experimentation with) the improved trash lines.

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

- Source of weeds Pull out weeds before they set seed and don't use stoloniferous or rhizome-forming (creeping) grasses in trash lines (see picture).
- trash line harbours pest and diseases use entirely dry grass or material

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

- Where land is limiting, agricultural land which would be used, is lost uses it as a crop rotation basis
- The trash lines are not enough on their own to control erosion on the steeper slopes Introduce/promote supplementary structural remedies such as earth bunds.
- Competition for crop residues which have an alternative use as livestock fodder and, especially, mulch in banana plantations Grow hedgerows of shrubs/grasses to increase availability of material for fodder, trash lines and mulching.

REFERENCES

Compiler
Unknown User

Editors

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Resource persons
Henry Dan Miiro - SLM specialist

Full description in the WOCAT database
https://qcat.wocat.net/af/wocat/technologies/view/technologies_990/

Linked SLM data
Approaches: Promoting farmer innovation https://qcat.wocat.net/af/wocat/approaches/view/approaches_2418/

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