Percolation pit with water (Kenneth Twinamasiko)

Percolation pits (Uganda)

Ebyina

DESCRIPTION

A percolation pit is an excavation in the ground in the pathway of water runoff to intercept the flow of the water and thereby reduce erosion and destruction of crops, settlements and other infrastructure downstream

The technology is applied in already existing degraded farmlands, which are individually owned. An average farm size is less than half an acre.

A typical percolation pit is 2m wide, 2m long and 1m deep planted with a hedge row on its lower side

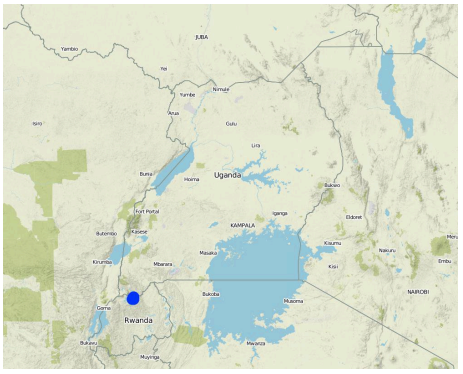
This technology reduces the speed of water running down the slope during a downpour and traps the water and soil that is being washed thereby reducing soil erosion and increasing water retention

Areas which are prone to degradation by erosion are identified and later, the farmers are trained on benefits of this technology, how to construct the pit and how to maintain them by periodic de-silting and planting grasses and shrubs on the lower side

This technology helps maintain the good top soil, which would have otherwise been washed down the water course into the valley and increases water retention.

The land users like this technology because their soil is not lost by erosion. In addition it is localized, not like a conservation channel which runs along the whole contour. Percolation pits consume less land because they are located in an already existing waterway. What land users don't like about this technology is that it has a huge sediment load and requires frequent de-silting

LOCATION



Location: Rubaya Sub County, Kabale District, South Western Region, Uganda

No. of Technology sites analysed: 100-1000 sites

Geo-reference of selected sites

- 29.9428, -1.4612
- 29.9429, -1.4611
- 29.9438, -1.4608
- 29.949, -1.4039
- 29.9442, -1.4608
- 29.9441, -1.4507
- 29.941, -1.4577
- 29.9394, -1.4418
- 29.9392, -1.4418
- 29.9409, -1.4187
- 29.9409, -1.4186
- 29.9404, -1.4185
- 29.9401, -1.4184
- 29.9399, -1.4185
- 29.9403, -1.4184
- 29.9422, -1.4607
- 29.9426, -1.4607
- 29.9417, -1.4603
- 29.9412, -1.4602
- 29.9416, -1.4601
- 29.941, -1.4598
- 29.9411, -1.46
- 29.9385, -1.4577
- 29.9386, -1.4577
- 29.9411, -1.4659
- 29.9397, -1.4656
- 29.941, -1.4653
- 29.9397, -1.4658
- 29.9396, -1.4655
- 29.9411, -1.4657

- 29.9411, -1.465
- 29.9427, -1.4609
- 29.9402, -1.4632
- 29.93677, -1.4547
- 29.9306, -1.4311
- 29.93678, -1.4546
- 29.9368, -1.4546
- 29.9299, -1.4328
- 29.9306, -1.4527
- 29.9321, -1.4534
- 29.932, -1.4533
- 29.9281, -1.4327
- 29.9337, -1.4643
- 29.9332, -1.4637
- 29.933, -1.4636
- 29.9329, -1.4635
- 29.9168, -1.4632
- 29.9333, -1.463
- 29.938, -1.46
- 29.935, -1.4591
- 29.9368, -1.4547
- 29.933, -1.4656
- 29.9332, -1.4656
- 29.933, -1.4656
- 29.9329, -1.4655
- 29.933, -1.4654
- 29.9328, -1.4648
- 29.93275, -1.4648
- 29.9332, -1.4645
- 29.9334, -1.4644

Spread of the Technology: applied at specific points/ concentrated on a small area

In a permanently protected area?:

Date of implementation: 2015

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

A percolation pit being excavated by hand (Kenneth Twinamasiko)

Excavation of percolation pit (Kenneth Twinamasiko)

CLASSIFICATION OF THE TECHNOLOGY

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

Land use
Land use mixed within the same land unit: Ja - Agroforestry

CroplandNumber of growing seasons per year: 2

Grazing land

Mines, extractive industries -

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

Purpose related to land degradation
- [ ] 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, Wm: mass movements/ landslides

SLM group
- water harvesting
- water diversion and drainage
- ground water management

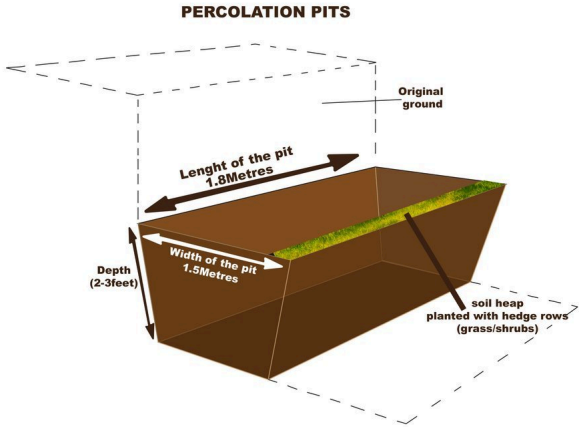
SLM measures


vegetative measures - V1: Tree and shrub cover, V2: Grasses and perennial herbaceous plants

structural measures - S3: Graded ditches, channels, waterways

TECHNICAL DRAWING

Technical specifications
Dimensions indicated on drawing above



Author: Kigezi Diocese Water and Sanitation Programme

ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS

Calculation of inputs and costs
- Costs are calculated: per Technology unit (unit: **Per pit** volume, length: **4 cubic meters**)
- Currency used for cost calculation: **USD**
- Exchange rate (to USD): 1 USD = 3300.0
- Average wage cost of hired labour per day: USD 2.12

Most important factors affecting the costs
The costs have been calculated basing on depth of top soil of 51 – 80cm. When the depth of the top soil is shallow, then the costs of breaking the underlying sub-surface layers, which are usually rock, are much higher. Also during the rainy season, the soil is more workable The costs of maintenance will be less where the rest of the landscape also has other percolation pits, conservation channels, good vegetative cover and where the hill slope is gentle.

Establishment activities
1. Excavation of the percolation pit (Timing/ frequency: During the dry season)
2. Planting hedge rows (Timing/ frequency: Onset of rains)

Establishment inputs and costs (per Per pit)

Specify input	Unit	Quantity	Costs per Unit (USD)	Total costs per input (USD)	% of costs borne by land users
Labour					
Excavation of pit	person days	4.0	2.12	8.48	100.0
Equipment					
Forked hoes (1 piece can excavate 50 pits)	pieces	0.02	4.55	0.09	
Pick axes (1 piece can excavate 50 pits)	pieces	0.02	4.55	0.09	
Spades (1 piece can be used on 50 pits)	pieces	0.02	4.55	0.09	
Plant material					
Starria grass (1 sack for 5 pits)	per pit	1.0	1.21	1.21	
Total costs for establishment of the Technology				**9.96**	

Maintenance activities

1. De-silting the pits (Timing/ frequency: When half full)
2. Maintenance of the hedge rows by triming and replanting empty spaces (Timing/ frequency: Continous)

Maintenance inputs and costs (per Per pit)

Specify input	Unit	Quantity	Costs per Unit (USD)	Total costs per input (USD)	% of costs borne by land users
Labour					
Desilting the pits when half full	person days	1.0	2.12	2.12	100.0
Trimming of hedge rows (on 25 pits per day)	person days	0.04	2.12	0.08	
Total costs for maintenance of the Technology				**2.2**	

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: 1200.0
Bi-modal rainfall pattern with long rainy season from September to December then March to May
Name of the meteorological station: Kabale District Meterological Department

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

Landforms
- [ ] plateau/plains
- [ ] ridges
- [ ] mountain slopes
- [x] hill slopes
- [ ] 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.
- [x] 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)
- [x] 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
- [ ] 5-50 m
- [x] > 50 m

Availability of surface water
- [ ] excess
- [x] good
- [ ] 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?
- [ ] Ja
- [x] Nee

Occurrence of flooding
- [x] Ja
- [ ] Nee

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

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

CHARACTERISTICS OF LAND USERS APPLYING THE TECHNOLOGY

Market orientation
- [x] 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
- [ ] women
- [x] men

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

Area used per household
- [x] < 0.5 ha
- [ ] 0.5-1 ha

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

Land ownership
- [ ] state
- [ ] company

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

- 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

- large-scale

- communal/ village group
- individual, not titled
- individual, titled

- leased
- individual

Water use rights

- open access (unorganized)
- communal (organized)
- leased
- 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

Crop production	decreased	increased	The impacts are visible even after the first crop
crop quality	decreased	increased	
fodder production	decreased	increased	
fodder quality	decreased	increased	
risk of production failure	increased	decreased	
product diversity	decreased	increased	
production area (new land under cultivation/ use)	decreased	increased	
land management	hindered	simplified	
expenses on agricultural inputs	increased	decreased	
farm income	decreased	increased	
diversity of income sources	decreased	increased	
workload	increased	decreased	

Socio-cultural impacts

food security/ self-sufficiency	reduced	improved	It is expected to improve in the long term
health situation	worsened	improved	
community institutions	weakened	strengthened	
SLM/ land degradation knowledge	reduced	improved	
conflict mitigation	worsened	improved	

Ecological impacts

surface runoff	increased	decreased	
groundwater table/ aquifer	lowered	recharge	Recharge is hoped to increase in the long term as more farmers adapt the technology
soil moisture	decreased	increased	
soil cover	reduced	improved	
soil loss	increased	decreased	
soil accumulation	decreased	increased	
soil organic matter/ below ground C	decreased	increased	By use of manure
flood impacts	increased	decreased	Flooding in the valley bottoms due to runoff reduces significantly

Off-site impacts

water availability (groundwater, springs)	decreased	increased	As more people adopt the technology this is expected to increase
downstream flooding (undesired)	increased	reduced	
damage on neighbours' fields	increased	reduced	The runoff which causes damage is trapped in the percolation pits

damage on public/ private infrastructure — increased ✓ reduced — Especially on roads and water systems

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

annual temperature increase	not well at all	very well	Answer: not known
seasonal temperature increase	not well at all	very well	Season: wet/ rainy season Answer: not known
seasonal temperature increase	not well at all	very well	Season: dry season Answer: not known
annual rainfall decrease	not well at all	very well	Answer: not known
seasonal rainfall decrease	not well at all	very well	Season: wet/ rainy season Answer: not known

Climate-related extremes (disasters)

local rainstorm	not well at all ✓	very well
local thunderstorm	not well at all ✓	very well
local hailstorm	not well at all ✓	very well
land fire	not well at all ✓	very well
general (river) flood	not well at all ✓	very well
flash flood	not well at all ✓	very well
landslide	not well at all ✓	very well

ADOPTION AND ADAPTATION

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

- [x] 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%
- [x] 91-100%

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

- [ ] Ja
- [x] 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

- It controls soil loss from the land users gardens
- It provides silt which is spread in their garden
- Hedge rows are used as fodder and as mulching material
- The conserved water is used to benefit the plants in the same garden

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

- The percolation pits prevent development of gullies
- It improves water percolation in the soil which increases soil moisture content and increases ground water recharge
- They prevent silt deposition in the valley bottoms and siltation of water bodies
- It is a simple technology which uses simple hand tools

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

- This technology requires a lot of hard labour The land users were encouraged to form small groups which work together to ease the work and share knowledge and skill

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

- This technology is dependent on land users continued efforts in de-silting it. When this is not done the technology fails Land users are encouraged to periodically de-silt the pits
- The effectiveness of this technology is dependent on the compliance of other land users in the landscape. For example if it is done downhill and not uphill, then the pits will be overwhelmed by the volume of the soil and water runoff All community members were sensitised on the importance and effectiveness of this technology and existing by-laws will foster members uphill to practice the technology. The benefits of the technology will encourage other land users to adopt it
- The process of maintaining and rolling out this technology requires engagement of many stakeholders Management structures, which are well linked with government structures, have been set up and trained at various levels to manage the process of maintaining and rolling out the technology

REFERENCES

Compiler
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Resource persons
- SLM specialist

Full description in the WOCAT database
https://qcat.wocat.net/af/wocat/technologies/view/technologies_619/

Linked SLM data
Approaches: Catchment Based Integrated Water Resources Management https://qcat.wocat.net/af/wocat/approaches/view/approaches_724/

Documentation was faciliated by

Institution
- Tear Fund Switzerland (Tear Fund Switzerland) - Switzerland

Project
- Book project: where people and their land are safer - A Compendium of Good Practices in Disaster Risk Reduction (DRR) (where people and their land are safer)

Key references
- Kigezi Diocese Water and Sanitation Programme, IWRM Annual Report (April 2015 - March 2016): www.kigezi-watsan.ug
- IWRM Pilot report 2013: www.kigezi-watsan.ug

Links to relevant information which is available online
- Test pits: http://gamarch.co.uk/?page_id=966
- Percolation test pits: http://www.mfkelly.ie/percolation_tests.asp