A constructed retention ditch in lower Mbeere South District (Paul Kahiga (P.O.Box 8444-00300 Nairobi))

Retention ditches (Kenya)

Mitaro ya ruji (Mbeere)

DESCRIPTION

Retention ditches, also called infiltration ditches, are larger ditches designed to catch and retain all incoming runoff for infiltration into the soil.

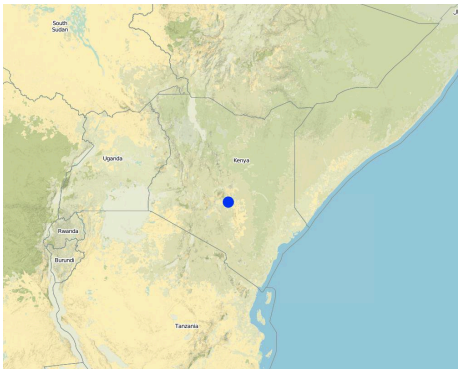
Retention ditches, also called infiltration ditches, are larger ditches designed to catch and retain all incoming runoff for infiltration into the soil. They operate like contour furrows, increasing the supply of water made available to crops planted in and adjacent the ditch, while also reducing soil erosion. However, they handle much more water. Retention ditches are in essence water harvesting and conservation structures

Purpose of the Technology: They are commonly used as an alternative to diversion ditches if there is no places to discharge runoff or if there is a need , as in semi –arid areas , to harvest water , e.g. for bananas.

Establishment / maintenance activities and inputs: When constructing the ditches, the soil is thrown to the lower side to form an embankment that prevents soil from falling back in. This structure can be stabilized further by planting grass on it. On soils with lower infiltration rate, or on slopes, the ends can be left open to allow excess water to drain out.

Natural / human environment: Retention ditches are normally constructed on relatively flat areas with closed ends and wide and deep enough to hold all the runoff expected. They are often found on steep slopes in humid area under small scale farming where there is no opportunity to discharge runoff to a waterway. Retentions ditches can be useful where soils are permeable, deep and stable. However, retention ditches are not recommended for areas with shallow soil, those prone to land slides or where soil salinity is a possibility.

LOCATION



Location: Mbeere, Eastern, Kenya

No. of Technology sites analysed:

Geo-reference of selected sites
- 37.79303, -0.57942

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

In a permanently protected area?:

Date of implementation: 10-50 years ago

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

A portrait view of a retention ditch showing replenished bananas (Paul Kahiga (8444-00300 Nairobi))

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
- [ ] mitigate climate change and its impacts
- [x] create beneficial economic impact
- [ ] create beneficial social impact

Land use

Cropland

- Annual cropping
- Perennial (non-woody) cropping: banana/plantain/abaca

Water supply

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

Purpose related to land degradation

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

Degradation addressed

water degradation - Hs: change in quantity of surface water

SLM group

- water harvesting
- irrigation management (incl. water supply, drainage)
- water diversion and drainage

SLM measures

structural measures - S4: Level ditches, pits

TECHNICAL DRAWING

Technical specifications

A technical drawing showing a retention ditch. The run-off ponds within the ditch giving it time to infiltrate.

Location: Ntharawe. Eastern Province
Date: 27/10/2012

Technical knowledge required for field staff / advisors: moderate (In implement this technology the farmers collaborates with an Agriculture extension officer in order to assist in making the retention ditches.)
Technical knowledge required for land users: low (Water scarcity triggers farmers to look for better means of soil conservation and retention ditch plays an important role to satisfy crop water requirement.)

Main technical functions: control of concentrated runoff: retain / trap, increase of infiltration
Secondary technical functions: control of concentrated runoff: impede / retard, reduction of slope angle

Retention/infiltration ditch/pit, sediment/sand trap
Vertical interval between structures (m): 6
Spacing between structures (m): 30
Depth of ditches/pits/dams (m): 0.5
Width of ditches/pits/dams (m): 0.5
Length of ditches/pits/dams (m): 50
Height of bunds/banks/others (m): 0.5
Width of bunds/banks/others (m): 0.5
Length of bunds/banks/others (m): 50

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ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS

Calculation of inputs and costs
- Costs are calculated:
- Currency used for cost calculation: **Kshs**
- Exchange rate (to USD): 1 USD = 100.0 Kshs
- Average wage cost of hired labour per day: 5.00

Most important factors affecting the costs
slope of the land, labour and availability of a technical person to assist in laying down of the contours

Establishment activities
1. Clearing of vegetation (Timing/ frequency: before the rain starts)
2. Marking contours (Timing/ frequency: After vegetation clearance)
3. Digging the ditches (Timing/ frequency: after marking the contours)

Establishment inputs and costs

Specify input	Unit	Quantity	Costs per Unit (Kshs)	Total costs per input (Kshs)	% of costs borne by land users
Labour					
Labour	ha	1.0	80.0	80.0	100.0
Equipment					
Tools	ha	1.0	50.0	50.0	100.0
Total costs for establishment of the Technology				**130.0**	
Total costs for establishment of the Technology in USD				*1.3*	

Maintenance activities
1. Removal of excess sediments (Timing/ frequency: once after rainy season)

Maintenance inputs and costs

Specify input	Unit	Quantity	Costs per Unit (Kshs)	Total costs per input (Kshs)	% of costs borne by land users
Labour					
Labour	ha	1.0	45.0	45.0	100.0
Equipment					
Tools	ha	1.0	35.0	35.0	100.0
Total costs for maintenance of the Technology				**80.0**	
Total costs for maintenance of the Technology in USD				*0.8*	

NATURAL ENVIRONMENT

Average annual rainfall
- ☐ < 250 mm
- ☐ 251-500 mm
- ☐ 501-750 mm

Agro-climatic zone
- ☐ humid
- ☐ sub-humid
- ☑ semi-arid

Specifications on climate
Thermal climate class: tropics

- [x] 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
- [ ] arid

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
- [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.
- [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
- [ ] 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%)
- [ ] medium (1-3%)
- [x] low (<1%)

Groundwater table
- [ ] on surface
- [ ] < 5 m
- [x] 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
- [ ] No

Occurrence of flooding
- [ ] Yes
- [ ] No

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

Habitat diversity
- [ ] high
- [ ] medium
- [ ] 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
- [ ] 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
- [x] individual/ household
- [ ] groups/ community
- [ ] cooperative
- [ ] employee (company, government)

Gender
- [ ] women
- [x] 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
- [x] small-scale
- [ ] medium-scale
- [ ] large-scale

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

IMPACTS

Socio-economic impacts

Crop production	decreased	✓	increased
risk of production failure	increased	✓	decreased
land management	hindered	✓	simplified

farm income — decreased ... increased

Socio-cultural impacts

food security/ self-sufficiency — reduced ... improved

SLM/ land degradation knowledge — reduced ... improved

Improved livelihoods and human well-being — decreased ... increased

Ecological impacts

harvesting/ collection of water (runoff, dew, snow, etc) — reduced ... improved

soil moisture — decreased ... increased

pest/ disease control — decreased ... increased

waterborne pests

Off-site impacts

damage on neighbours' fields — 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

annual temperature 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%

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

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

- Retains runoff and improves soil moisture
- It is a water harvesting technology for crops in dry areas
- Reduces soil erosion by wind

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

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

- Prevents movement of machinery within the farms leave some passages that can allow movement of machinery within the farm.
- The retained water can habour mosquitoes and other water borne pests Spraying with appropriate insecticides.
- labour intensive to construct and to maintain
- Regular maintenance of the ditches.

REFERENCES

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Full description in the WOCAT database
https://qcat.wocat.net/en/wocat/technologies/view/technologies_1244/

Linked SLM data
n.a.

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