Stone-faced Soil Bund Stablized with Grass (Ethiopia)

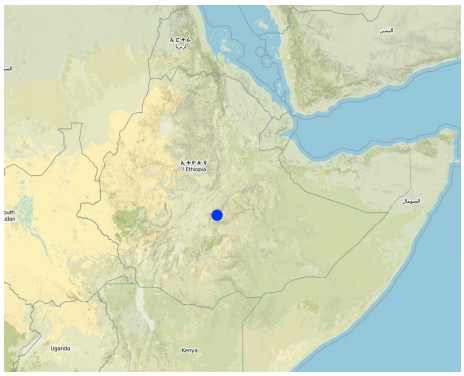
Dhaga (oromifa)

DESCRIPTION

Stone faced terraces are commonly constructed on cultivated lands. These are structural measural measures placed along the contour to control soil erosion and trap runoff.

Stone-faced soil bund is constructed during the dry period when the field is free from crops (after crop harvest). Soils in the woreda are light and are easily eroded. A contour line is marked on the ground first and a foundation placing stones is dug. The stone wall is placed in the foundation and the wall is raised until it attains a height of 0.50m at minimum. Then earth is dug on the upslope side by removing soil from it and make an embankment of soil on the upper side to support the stone wall. In the same way the stone is supported by the soil from the upper side. The embanked soil is lightly compacted to avoid collapse. The objective is to control concentrated runoff from causing soil erosion and to retain as much rainwater as possible in the soil for mazimizing crop production. Livestock are not let on the terraced land. Most land users feed their animals tethered. The bund is then stablized by planting grass. The most commonly used grasses for stablizing bunds in the area are phalaris and elephant grass. The purpose is to control runoff and soil erosion from cultivated lands. Grass is planted to stablize the bund and also help in providing fodder for animals. Some land users stablize the stone-faced bunds by planting fruit trees. Fruit trees are often planted at the homesteads for better management and protection. The income obtaoned from fruit trees is high. Sorghum fields are predominantly treated by stone-faced bunds while chat and coffee fields are treated by ridges and basins. Frequent maintenance and upgrading is required until bench is formed. Currently most of the fields in the woreda have a properly stablized terraces and as a result loss of soil and water by erosion is decreasing. Maintenance is done continuously until the structure stablizes well and inparticular after heavy rains, every time after tillage and cropping. The technology is suitable in areas where stones are avialable and soils are light.

LOCATION



Location: Tullo, Oromia National Regional State, Ethiopia

No. of Technology sites analysed:

Geo-reference of selected sites
- 39.75, 7.89

Spread of the Technology: evenly spread over an area (approx. 100-1,000 km2)

In a permanently protected area?:

Date of implementation: 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

CLASSIFICATION OF THE TECHNOLOGY

Main purpose
- ☑ improve production
- ☑ reduce, prevent, restore land degradation
- ☐ conserve ecosystem
- ☐ protect a watershed/ downstream areas – in combination with other Technologies
- ☐ preserve/ improve biodiversity
- ☐ reduce risk of disasters

Land use

Cropland
- Annual cropping: cereals - maize, cereals - sorghum, legumes and pulses - beans, teff
- Perennial (non-woody) cropping
- Tree and shrub cropping: avocado, coffee, open grown, fruits, other, mango, mangosteen, guava, grevillea, cordia

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

Number of growing seasons per year: 2
Is intercropping practiced? Yes

Grazing land
- Cut-and-carry/ zero grazing

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)

SLM group
- cross-slope measure

SLM measures

TECHNICAL DRAWING

Technical specifications

ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS

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

Most important factors affecting the costs
Slope: In steep slopes terraces get closer and the length of terrace per unit area /hectar/ increases and this increases the cost of construction. On soils of shallow soils digging becomes tough and this leads to increased costs

Establishment activities
1. seed collection (Timing/ frequency: dry season)
2. seedling production (Timing/ frequency: dry season)
3. seedling planting (Timing/ frequency: during rains)
4. weeding and cultivation (Timing/ frequency: during rains)

Establishment inputs and costs

Specify input	Unit	Quantity	Costs per Unit (n.a.)	Total costs per input (n.a.)	% of costs borne by land users
Labour					
Labour	ha	1.0	125.0	125.0	
Equipment					
Animal traction	ha	1.0	46.6	46.6	
Tools	ha	1.0	5.5	5.5	
Plant material					
Seeds	ha	1.0	2.8	2.8	
Seedlings	ha	1.0	30.0	30.0	
Fertilizers and biocides					
Fetilizer	ha	1.0	33.3	33.3	
Total costs for establishment of the Technology				**243.2**	
Total costs for establishment of the Technology in USD				*243.2*	

Maintenance activities
1. primary tillage (Timing/ frequency: onset of rains)
2. secondary tillage and seed bed preparation (Timing/ frequency: in the middle of early rains and main rains)
3. weeding and cultivation (Timing/ frequency: after germination)
4. thinning (Timing/ frequency: after rains)

Maintenance inputs and costs

Specify input	Unit	Quantity	Costs per Unit (n.a.)	Total costs per input (n.a.)	% of costs borne by land users
Labour					
Labour	ha	1.0	12.5	12.5	
Equipment					
Tools	ha	1.0	0.5	0.5	
Plant material					

Seedlings	ha	1.0	3.0	3.0	
Fertilizers and biocides					
Fertilizer	ha	1.0	33.3	33.3	
Total costs for maintenance of the Technology				**49.3**	
Total costs for maintenance of the Technology in USD				*49.3*	

NATURAL ENVIRONMENT

Average annual rainfall
- [ ] < 250 mm
- [ ] 251-500 mm
- [ ] 501-750 mm
- [x] 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
Almost over 65% of the SWC area

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
- [x] mountain slopes
- [ ] 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.
- [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)
- [ ] moderately deep (51-80 cm)
- [ ] deep (81-120 cm)
- [ ] very deep (> 120 cm)

Soil texture (topsoil)
- [x] coarse/ light (sandy)
- [ ] 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?
- [ ] Yes
- [ ] No

Occurrence of flooding
- [ ] Yes
- [ ] No

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

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

CHARACTERISTICS OF LAND USERS APPLYING THE TECHNOLOGY

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

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

Relative level of wealth
- [ ] very poor
- [ ] poor
- [x] average
- [x] rich
- [ ] very rich

Level of mechanization
- [x] manual work
- [x] 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
- [x] 1-2 ha
- [ ] 2-5 ha
- [ ] 5-15 ha
- [ ] 15-50 ha
- [ ] 50-100 ha
- [ ] 100-500 ha
- [ ] 500-1,000 ha

Scale
- [ ] small-scale
- [ ] medium-scale
- [ ] large-scale

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

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

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

- 1,000-10,000 ha
- > 10,000 ha

Access to services and infrastructure

IMPACTS

Socio-economic impacts

Crop production

decreased — increased ✓

due to increase in soil misture and erosion control due to measures

fodder production

decreased — increased ✓

planataion on the hillsides and on bunds

fodder quality

decreased — increased ✓

planataion on the hillsides and on bunds

wood production

decreased — increased ✓

area closures and hillside planataions

farm income

decreased — increased ✓

crop production increased

Socio-cultural impacts

community institutions

weakened — strengthened ✓

farmers get organized in groups for conservation activities

SLM/ land degradation knowledge

reduced — improved ✓

land users appreciating conservation interventions increasing

Ecological impacts

surface runoff

increased — decreased ✓

Quantity before SLM: 50
Quantity after SLM: 0

soil moisture

decreased — increased ✓

ruinoff trapped

soil loss

increased — decreased ✓

Quantity before SLM: 60
Quantity after SLM: 4
because of measures

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 ✓

CLIMATE CHANGE

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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

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

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

REFERENCES

Compiler
Daniel Danano

Editors

Reviewer
Fabian Ottiger
Alexandra Gavilano

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Resource persons
Daniel Danano - SLM specialist

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https://qcat.wocat.net/en/wocat/technologies/view/technologies_1077/

Linked SLM data
n.a.

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- n.a.