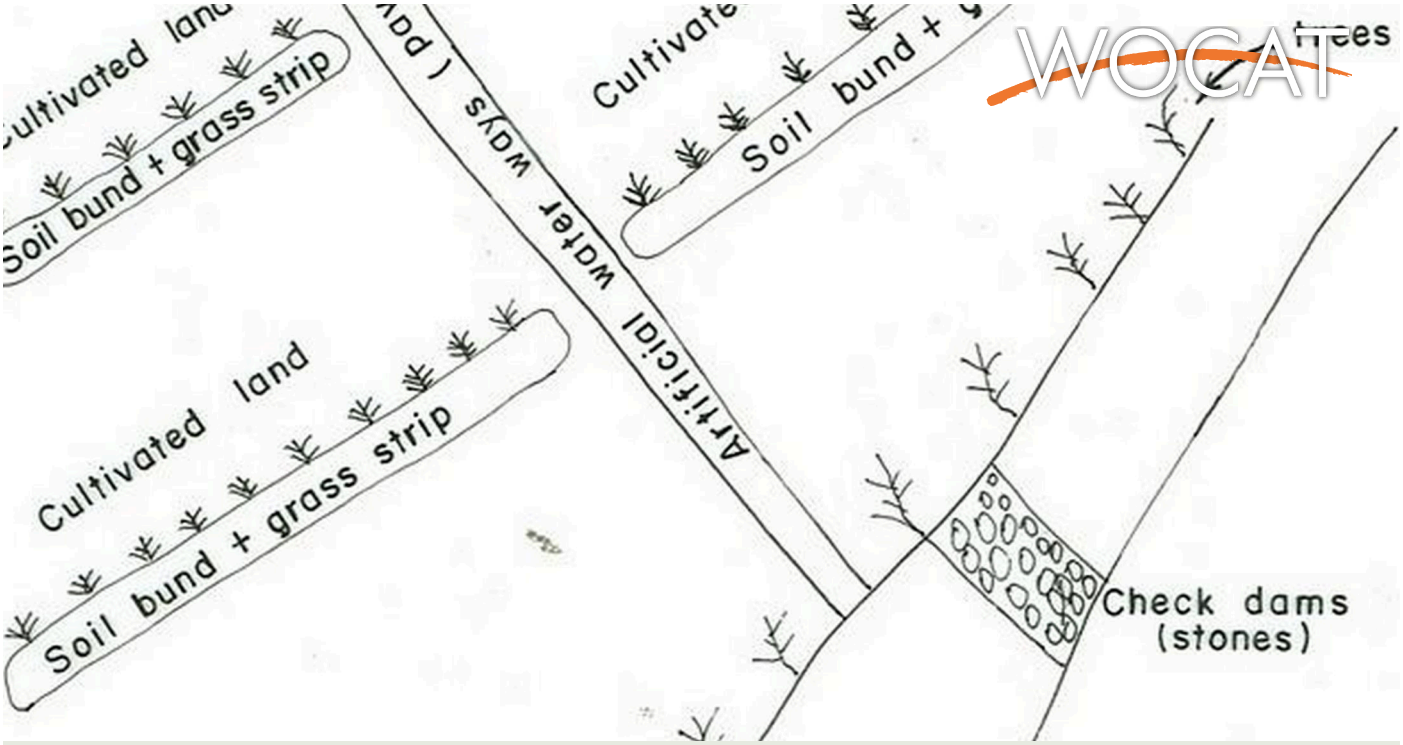

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Soil Bund with Contour Cultivation (Ethiopia)

Ditchira, Kab (Amharic)

DESCRIPTION

It is a structural measure with an embankment of soil or stones or soil and stones, constructed along the contour and stablized with vegetative measures (grass and fodder trees).

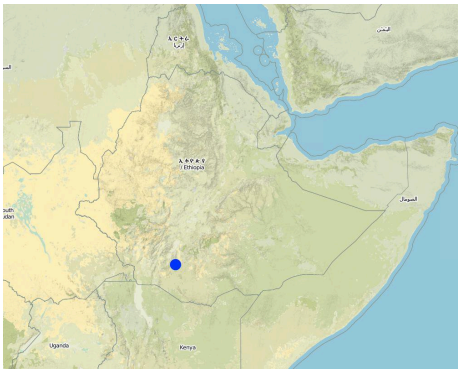
Applied on different land uses on slope of more than 3%. This practice is widely used by farmers in the area. Stone and stone faced bunds height depends on the availability of stones. On the average the width is 1-1.2m and hieght is 0.6-0.7m.

Purpose of the Technology: Bunds reduce the velocity of runoff and soil erosion, retains water behind the bund and let it infiltrate. It further helps in ground water recharging.

Establishment / maintenance activities and inputs: Planning is made by community/group and individual discussion and reach a consensus on layout, spacing, implementation modalities and management requirments is reached before implementation.

Natural / human environment: The technology is applicable in areas where soil is moderately deep and stones are available

LOCATION



Location: Lemo, SNNPR/Hadiya/Lemo, Ethiopia

No. of Technology sites analysed:

Geo-reference of selected sites
- 37.8333, 5.4167

Spread of the Technology:

In a permanently protected area?:

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

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 - other, cereals - sorghum, legumes and pulses - other, root/tuber crops - potatoes, vegetables - leafy vegetables (salads, cabbage, spinach, other), wheat, haricot beans
- Perennial (non-woody) cropping: sugar cane, Enset, Desho, Phalaris

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

- Tree and shrub cropping: avocado, coffee, open grown, mango, mangosteen, guava, papaya, Cordia, Croton, Ficus, Casmir

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

Forest/ woodlands

- Tree plantation, afforestation

Products and services: Timber, Fuelwood, Grazing/ browsing

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

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

SLM group

- cross-slope measure

SLM measures

agronomic measures - A2: Organic matter/ soil fertility, A3: Soil surface treatment

TECHNICAL DRAWING

Technical specifications

SNNPR

Technical knowledge required for field staff / advisors: high

Technical knowledge required for land users: moderate

Main technical functions: control of dispersed runoff: retain / trap, control of dispersed runoff: impede / retard, increase of infiltration

Secondary technical functions: reduction of slope angle, reduction of slope length, increase / maintain water stored in soil

Early planting
Material/ species: maize, potato
Remarks: row and broad casting

Mixed cropping / intercropping
Material/ species: sorghum + haricot beans
Remarks: row planting

Agronomic measure: mixed cropping / intercropping
Material/ species: maize + haricot beans
Remarks: row planting

Agronomic measure: mixed cropping / intercropping
Material/ species: coffee + cabbage
Remarks: row planting

Legume inter-planting
Remarks: row and broad casting

Manure / compost / residues
Material/ species: animal dung
Remarks: broad casting

Breaking compacted topsoil
Remarks: once, along the contour

Contour tillage
Remarks: 3-6 times, along the contour

Aligned: -contour
Vegetative material: G : grass
Vertical interval between rows / strips / blocks (m): 1m
Vertical interval within rows / strips / blocks (m): 0.3
Width within rows / strips / blocks (m): 1

Scattered / dispersed
Vegetative material: T : trees / shrubs
Number of plants per (ha): 10-15

Vegetative measure: scattered/dispersed
Vegetative material: F : fruit trees / shrubs
Number of plants per (ha): 40-60

Vegetative measure: Vegetative material: F : fruit trees / shrubs

Vegetative measure: Vegetative material: F : fruit trees / shrubs

Vegetative measure: Vegetative material: F : fruit trees / shrubs

Trees/ shrubs species: Cordia, Croton, Ficus

Fruit trees / shrubs species: Casmir, Avocado, Mango

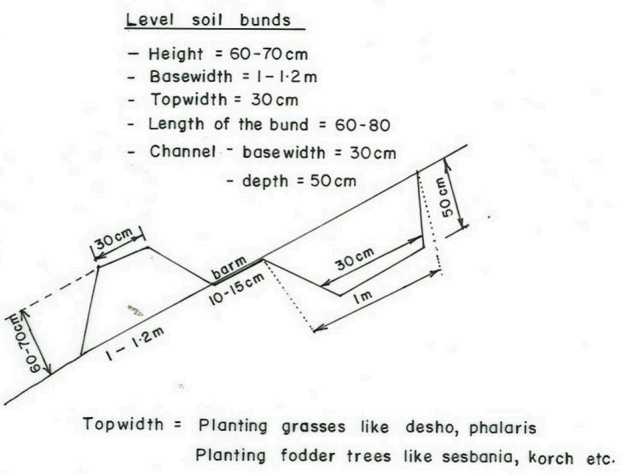
Perennial crops species: Chat, Coffee, Sugar cane, Papaya

Grass species: Desho, Phalaris

Slope (which determines the spacing indicated above): 15.00%

If the original slope has changed as a result of the Technology, the slope today is (see figure below): 10.00%

Gradient along the rows / strips: 0.00%



Terrace: bench level
Vertical interval between structures (m): 1
Spacing between structures (m): 10
Depth of ditches/pits/dams (m): 0.5
Width of ditches/pits/dams (m): 0.3
Length of ditches/pits/dams (m): 1
Height of bunds/banks/others (m): 0.6-0.7
Width of bunds/banks/others (m): 1-1.2
Length of bunds/banks/others (m): 60-80

Construction material (earth): Soils excavated from the ditches is used to make the embankment.

Construction material (stone): Stones collected to construct stone/stone faced bunds.

Slope (which determines the spacing indicated above): 15%

If the original slope has changed as a result of the Technology, the slope today is: 10%

Lateral gradient along the structure: 0%

Vegetation is used for stabilisation of structures.

Change of land use type: cut and carry system practiced

Other type of management: change of management / intensity level - Follow up and evaluating the performance

ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS

Calculation of inputs and costs

- Costs are calculated:
- Currency used for cost calculation: **Birr**
- Exchange rate (to USD): 1 USD = 8.6 Birr
- Average wage cost of hired labour per day: 0.70

Most important factors affecting the costs

Type of hand tools, Slope of the land and soil depth.

Establishment activities

1. Production of planting materials (Timing/ frequency: beginning of rains)
2. Planting on the bund (Timing/ frequency: during rains)
3. Survey (Timing/ frequency: dry season)
4. Excavating the ditches and constructing the enbankment (Timing/ frequency: dry season)
5. desho grass transportation (Timing/ frequency: during rains)
6. Planting Desho grass on the bund (Timing/ frequency: during rains)
7. Group formation (Timing/ frequency: dry season)
8. Follow up and evaluating the activities (Timing/ frequency: throughout the year)

Establishment inputs and costs

Specify input	Unit	Quantity	Costs per Unit (Birr)	Total costs per input (Birr)	% of costs borne by land users
Labour					
Labour	ha	1.0	156.0	156.0	5.0
Equipment					
Machine use	ha	1.0	27.8	27.8	
Tools	ha	1.0	32.1	32.1	70.0
Plant material					
Seeds	ha	1.0	27.0	27.0	100.0
Seedlings	ha	1.0	29.0	29.0	100.0
Other					
Grass	ha	1.0	306.0	306.0	100.0
Total costs for establishment of the Technology				**577.9**	
Total costs for establishment of the Technology in USD				*67.2*	

Maintenance activities

1. Contour tillage (Timing/ frequency: dry season / annual)
2. Contour tillage (Timing/ frequency: dry season / two to three times)
3. Sawing (Timing/ frequency: during rains / annual)
4. Weeding (Timing/ frequency: during rains / one or twice a year)
5. Harvesting (Timing/ frequency: dry season / annual)
6. Replanting (Timing/ frequency: during rains /once)
7. Reconstruction (Timing/ frequency: dry season/annual)
8. Replanting (Timing/ frequency: rainy season/annual)

Maintenance inputs and costs

Specify input	Unit	Quantity	Costs per Unit (Birr)	Total costs per input (Birr)	% of costs borne by land users
Labour					
Labour	ha	1.0	18.84	18.84	100.0
Equipment					
Machine use	ha	1.0	81.39	81.39	100.0
Total costs for maintenance of the Technology				**100.23**	
Total costs for maintenance of the Technology in USD				*11.65*	

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
1001-1500 mm (Ranked 1): 900-1400 mm, rains are tremendously variable.
751-1000 mm (Ranked 2): 900 mm, Parts of the SWC area receives on an average 900 mm.
Very suitable to agricultural activities with variety crops grown.

Slope
- [ ] flat (0-2%)
- [ ] gentle (3-5%)
- [ ] moderate (6-10%)
- [x] 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.
- [ ] 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
- [ ] not relevant

Soil depth
- [ ] very shallow (0-20 cm)
- [ ] shallow (21-50 cm)
- [ ] moderately deep (51-80 cm)
- [x] deep (81-120 cm)
- [ ] very deep (> 120 cm)

Soil texture (topsoil)
- [ ] coarse/ light (sandy)
- [x] medium (loamy, silty)
- [x] 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
- [ ] subsistence (self-supply)
- [ ] 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
- [x] average
- [ ] 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
- [ ] 1-2 ha

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

Land ownership
- [x] state
- [ ] company
- [ ] communal/ village

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

- [ ] 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

- [ ] group
- [ ] individual, not titled
- [ ] individual, titled

- [x] individual

Water use rights

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

Access to services and infrastructure

IMPACTS

Socio-economic impacts

Crop production	decreased	increased	soil loss reduced, fertilizers loss controlled
fodder production	decreased	increased	bund stablization increased feed availability
fodder quality	decreased	increased	bund stablization increased feed availability
wood production	decreased	increased	tree plantation
production area (new land under cultivation/ use)	decreased	increased	area occupied by the bund
farm income	decreased	increased	production per unit area increased

Socio-cultural impacts

community institutions	weakened	strengthened	SWC activities organized and planned by communities
national institutions	weakened	strengthened	government & NGOs involvement increased
SLM/ land degradation knowledge	reduced	improved	more land users acquired knowledge on SWC

Ecological impacts

excess water drainage	reduced	improved	
soil moisture	decreased	increased	
soil cover	reduced	improved	uphills planted with forest trees
soil loss	increased	decreased	Quantity before SLM: 82 Quantity after SLM: 8 integrated 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

-

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?

- [x] 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

- increased crop production

  How can they be sustained / enhanced? use high yielding varities and better farming systems.
- soil erosion reduced

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

- soils protected from erosion

  How can they be sustained / enhanced? more awarness creation and strengthening maintenance
- sources of income diversified

  How can they be sustained / enhanced? introduce more productive multipurposive activities

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
Unknown User

Editors

Reviewer
Fabian Ottiger
Alexandra Gavilano

Date of documentation: Mei 30, 2011

Last update: Sept. 10, 2019

Resource persons
Berhanu Tafese - SLM specialist
Adibacho Watchiso - SLM specialist

Full description in the WOCAT database
https://qcat.wocat.net/af/wocat/technologies/view/technologies_1073/

Linked SLM data
n.a.

Documentation was faciliated by

Institution
- n.a.

Project
- n.a.