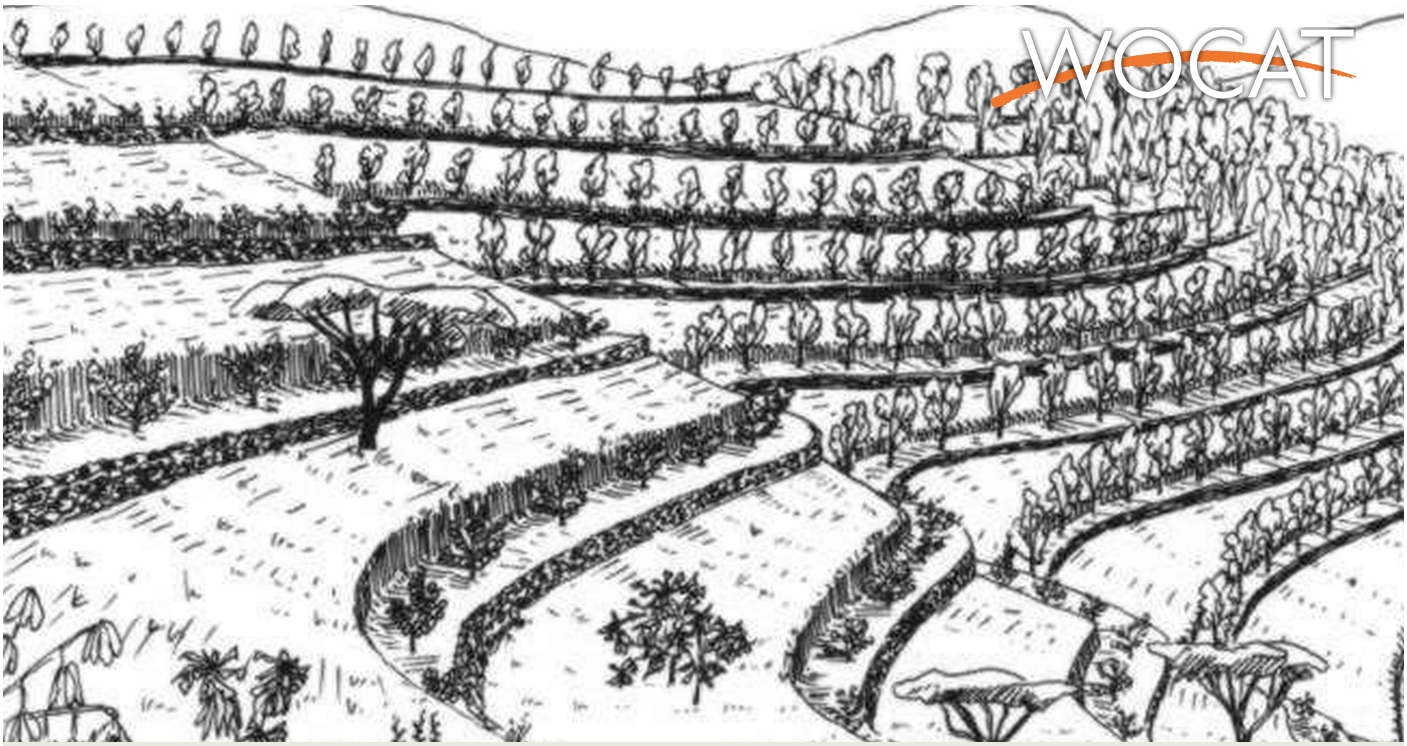


Hillside terraces.Spacing between trees is 2m, and the vertical interval between terraces also 2 m. The area between two terraces is undisturbed and used for forage production. (In: Soil conservation in Ethiopia, CFSCDD 1986) (Joerg Wetzel, SCRP)

Hillside Terracing (Ethiopia)

Yegara irken (Amharic), Kenetawi metrebawi zala (Tigrigna)

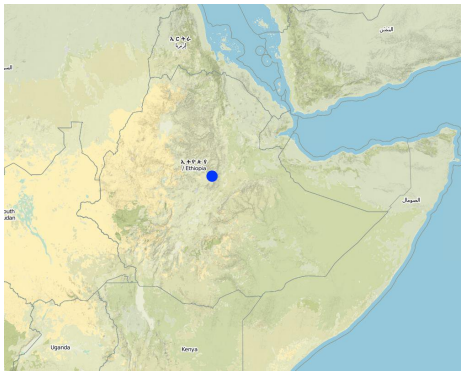
DESCRIPTION

A hillside terrace is a structure along the contour, where a strip of land is levelled for tree planting.

Hillside terraces are up to 1 metre wide and constructed at about 2-5 m vertical inteals. Hillside terraces should only be applied if there is a strong necessity of erosion control and/or water conservation justifying their construction. In Ethiopia and Eritrea, they have been mainly applied in the highlands, although the area of their applicability would be rather in the drier and lower lying agroclimatic zones. Slope range is 50-100%, soil range particularly on eavily degraded land. Hillside terraces are mainly used to prevent damage of flooding the area below steep slopes.

Hillside terraces help retain runoff and sediment on steep sloping land and to accommodate tree seedlings to be planted on them. They are also effective on badlands and in areas with low rainfall to conserve water. Hillside terraces are usually combined with area closure (against grazing). Little materials are needed for their construction: Line levels, digging instruments, stones, and other materials as needed for combined measures. Little management is needed for their maintenance, except for taking care of the tees planted, and for correcting damage that may be caused by livestock grazing.

LOCATION



Location: Harerge, Shewa, Wello, Tigray, Gonder, Sidamo, and Hamasien (Eritrea), Ethiopia

No. of Technology sites analysed:

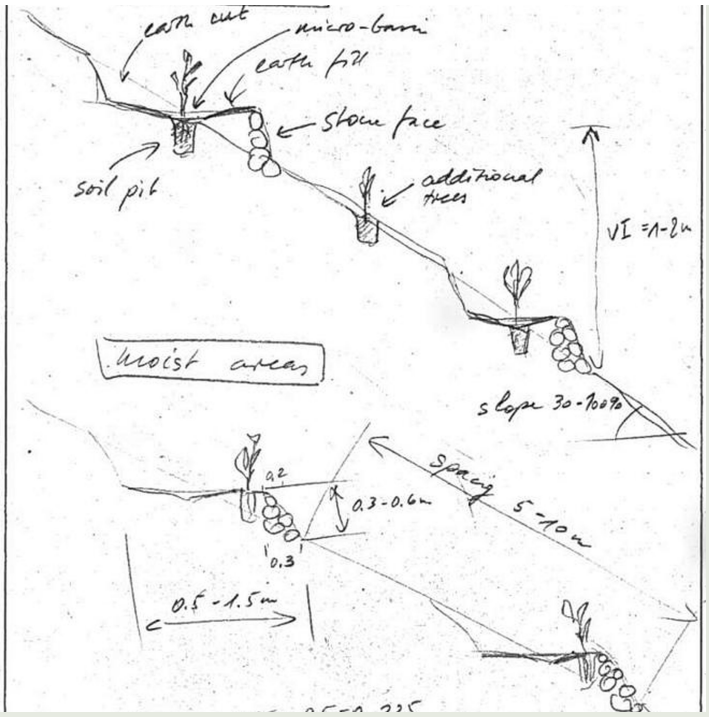
Geo-reference of selected sites
- 39.5007, 9.6857

Spread of the Technology: evenly spread over an area (approx. 1,000-10,000 km2)

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



Cross section (Hans Hurni (Berne, Switzerland))

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
- [ ] 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

- Tree and shrub cropping

Grazing land

Forest/ woodlands Products and services: Fuelwood, Other forest products, Grazing/ browsing, Nature conservation/ protection

Water supply

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

Purpose related to land degradation

- [ ] prevent land degradation
- [ ] 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

SLM group

- cross-slope measure

SLM measures

structural measures - S1: Terraces

TECHNICAL DRAWING

Technical specifications

Hillside terrace cross-section. Linied out along the contour, vertical interval between two terraces 2-5 m. (In: Soil Conservation in Ethiopia. CFSCDD, 1986)

Technical knowledge required for field staff / advisors: moderate

Technical knowledge required for land users: low

Main technical functions: reduction of slope angle, increase of infiltration, water harvesting / increase water supply

Secondary technical functions: reduction of slope length, improvement of ground cover, increase of surface roughness, increase / maintain water stored in soil

Trees/ shrubs species: Eucalyptus, Cupressus, Juniperus

Construction material (stone): Cut and fill with stone wall in front

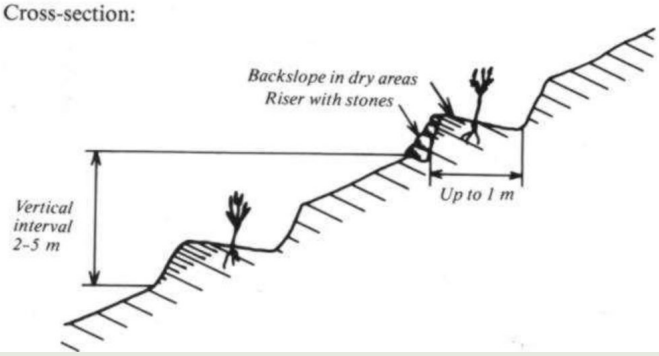
Lateral gradient along the structure: 0%

For water harvesting: the ratio between the area where the harvested water is applied and the total area from which water is collected is: 1:10

Change of land use type: closed area

Other type of management: livestock management - prevention of grazing, cut and ary system

– Cross-section:



Author: Joerg Wetzel, SCRP

ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS

Calculation of inputs and costs
- Costs are calculated:
- Currency used for cost calculation: **Ethiopan Birr**
- Exchange rate (to USD): 1 USD = 7.0 Ethiopan Birr
- Average wage cost of hired labour per day: 1.00

Most important factors affecting the costs
Slope, soil condition, length of terrace per hectare.

Establishment activities
1. Transplanting (Timing/ frequency: beginning of rainy season)
2. Seeding (Timing/ frequency: nurseries)
3. Construction (Timing/ frequency: dry season)
4. Planting (Timing/ frequency: beginning of rainy season)
5. Community guarding of closed areas (Timing/ frequency: annual)

Maintenance activities
1. Weeding (Timing/ frequency: rainy season /each cropping season)
2. Control of grazing (Timing/ frequency: always/annual)
3. Care taking of seedlings (Timing/ frequency: rainy season/each cropping season)
4. communty guarding of closed areas (Timing/ frequency: continuos / annual)

NATURAL ENVIRONMENT

Average annual rainfall
- [ ] < 250 mm
- [ ] 251-500 mm
- [x] 501-750 mm
- [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

Agro-climatic zone
- [x] humid
- [x] sub-humid
- [x] semi-arid
- [x] arid

Specifications on climate
Annual rainfall: Also 1000-1500 mm
Semi arid: Too little rainfall

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

Landforms
- [ ] plateau/plains
- [ ] ridges
- [x] 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.
- [ ] 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
- [x] very shallow (0-20 cm)

Soil texture (topsoil)
- [x] coarse/ light (sandy)

Soil texture (> 20 cm below surface)

Topsoil organic matter content
- [ ] high (>3%)

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

- [x] medium (loamy, silty)
- [ ] fine/ heavy (clay)

- [ ] coarse/ light (sandy)
- [ ] medium (loamy, silty)
- [ ] fine/ heavy (clay)

- [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
- [ ] 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
- [x] very poor
- [x] poor
- [ ] 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
- [ ] 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
- [x] state
- [ ] company
- [ ] communal/ village
- [ ] group
- [ ] 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

surface runoff: increased — ✓ — decreased
Quantity before SLM: 60
Quantity after SLM: 40

soil loss: increased — ✓ — decreased
Quantity before SLM: 55
Quantity after SLM: 30

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%

Number of households and/ or area covered

30600

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?

- 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
Hans Hurni

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Resource persons
Hans Hurni - SLM specialist

Full description in the WOCAT database
https://qcat.wocat.net/en/wocat/technologies/view/technologies_1388/

Linked SLM data
n.a.

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Project
- n.a.

Key references

- Hurni H. : Soil Conservation in Ethiopia. Guidelines for Development Agents.. 1986.: SCRP Addis Abeba