Rockwall Terracing

Philippines

Rockwall terracing refers to the piling of stones or rocks along contour lines to reduce soil erosion in hilly areas.

Rockwall terracing technology is widely practiced by farmers in hilly area of Barangay Nasunggan, La Libertad, Negros Oriental.Rocks piled along contours are indigenous to the area. The terrace bed is cultivated and planted with corn, watermelon, and vegetables. In some areas, livestock like cattle and native pigs are being raised. The technology is a traditional practice in the Philippines and one of the conservation techniques in the Conservation Farming Village (CFV) approach.
Rockwall terraces are built to reduce soil erosion and provide ease in land preparation through the removal of naturally present rocks in the cultivated area.It also contributes to the partial arrangement and diversification of land use. Before the implementation of the technology, the physical condition of the area is not recommended for farming practices due to the presence of racoks cattered all over the area.Dispersed and concentrated runoff are controlled in this technology. Raindrop splash is also restrained. Moreover, water storage is maintained in the soil.
With the aid of an A-Frame, contours are determined. Rocks and/or stones are gathered from the area and piled along contours to form walls 1.10 m wide and 1.50 m high. It requires 14 person-day for a month to construct a 50-meter rockwall with a cost of 800 USD. Maintenance of the structure is done three times a year by repiling of dislodged rocks.
The area is classified under a humid agro-climate condition where an average annual rainfall of 1000-1500 mm per year are observed.The average cropland size of land user ranges from 0.5-1 hectare with a slope of 18-25%.Majority of their income are derived from on-farm activities. Crops planted in the terraced bed are sold in the town market and is also utilized for consumption.

left: Piled rocks serve as pathway (Photo: Engr. Djolly Ma. P. Dinamling)
right: Rocks piled along contours. (Photo: Engr. Djolly Ma. P. Dinamling)

Location: La Libertad
Region: Negros Oriental
Technology area: 0.278 km^2
Conservation measure: structural
Stage of intervention: rehabilitation / reclamation of denuded land
Origin: Developed through land user`s initiative, recent (<10 years ago)
Land use type:
Cropland: Annual cropping
Mixed: Other
Land use:
Cropland: Annual cropping (before),
Mixed: Other (after)
Climate: humid, tropics
WOCAT database reference: T_PHI049en
Related approach: Conservation Farming Village (A_PHI008en)
Compiled by: Philippine Overview of Conservation Approaches and Technologies, Bureau of Soils and Water Management
Date: 2015-05-28
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Classification

Land use problems:

- The area is prone to soil erosion and land degradation due to absence of vegetation. (expert's point of view)
Not suitable for crop production because of the rocks or stones scattered in the area. (land user's point of view)

Land use

Annual cropping
Other
Cropland: Annual cropping (before)
Mixed: Other (after)
rainfed, mixed rainfed - irrigated
mixed grazing land
rainfed

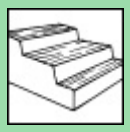
Climate

humid

Degradation

Soil erosion by water: loss of topsoil / surface erosion

Conservation measure



Structural: Walls / barriers / palisades

Stage of intervention

- Prevention
- Mitigation / Reduction
- Rehabilitation

Origin

- Land users initiative: recent (<10 years ago)
- Experiments / Research
- Externally introduced: recent (<10 years ago)

Level of technical knowledge

- Agricultural advisor
- Land user

Main causes of land degradation:
Direct causes - Human induced: soil management

Main technical functions:
- control of dispersed runoff: retain / trap
- control of concentrated runoff: retain / trap
- control soil erosion

Secondary technical functions:
- control of raindrop splash
- reduction of slope angle
- reduction of slope length
- increase / maintain water stored in soil
- promotion of vegetation species and varieties (quality, eg palatable fodder)
- spatial arrangement and diversification of land use
- serve as access road

Environment

Natural Environment

Average annual rainfall (mm)

- > 4000 mm
- 3000-4000 mm
- 2000-3000 mm
- 1500-2000 mm
- 1000-1500 mm
- 750-1000 mm
- 500-750 mm
- 250-500 mm
- < 250 mm

Altitude (m a.s.l.)

- > 4000
- 3000-4000
- 2500-3000
- 2000-2500
- 1500-2000
- 1000-1500
- 500-1000
- 100-500
- <100

Landform

- plateau / plains
- ridges
- mountain slopes
- hill slopes
- footslopes
- valley floors

Slope (%)

- flat
- gentle
- moderate
- rolling
- hilly
- steep
- very steep

Soil depth (cm)

- 0-20
- 20-50
- 50-80
- 80-120
- >120

Soil texture: medium (loam)
Soil fertility: medium
Topsoil organic matter: medium (1-3%)
Soil drainage/infiltration: good

Soil water storage capacity: medium
Water quality: good drinking water
Biodiversity: low

Tolerant of climatic extremes: temperature increase, seasonal rainfall increase, seasonal rainfall decrease
Sensitive to climatic extremes: heavy rainfall events (intensities and amount)

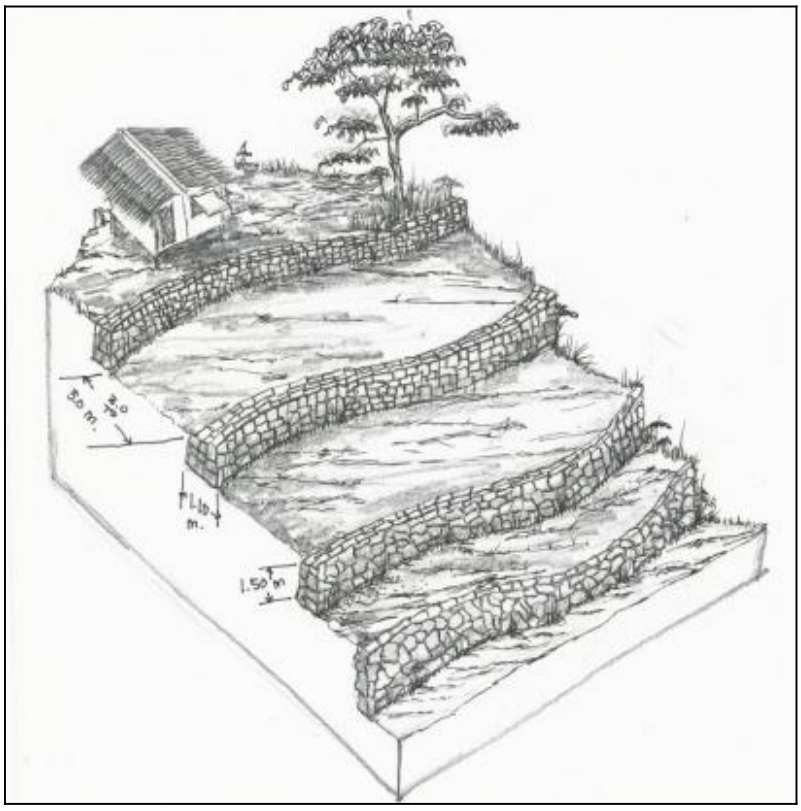
Human Environment

Cropland per household (ha)

- <0.5
- 0.5-1
- 1-2
- 2-5
- 5-15
- 15-50
- 50-100
- 100-500
- 500-1,000
- 1,000-10,000
- >10,000

Land user: Individual / household, Small scale land users, disadvantaged land users, men and women
Population density: 10-50 persons/km2
Annual population growth: 1% - 2%
Land ownership: individual, not titled
Land use rights: individual
Water use rights: individual
(Sharing of water from spring during summer)
Relative level of wealth: poor, which represents 70% of the land users; 70% of the total area is owned by poor land users

Importance of off-farm income: less than 10% of all income:
Access to service and infrastructure: low: health, education, employment (eg off-farm), market, roads & transport, financial services; moderate: energy; high: technical assistance, drinking water and sanitation
Market orientation: mixed (subsistence and commercial)
Mechanization: manual labour, animal traction
Livestock grazing on cropland: yes little



Technical drawing

Rockwall terrace built to utilize the rocks in the area. (Patricio A. Yambot)

Implementation activities, inputs and costs

Establishment activities

- Contouring
- Digging along contour, Gathering and piling of stones along contours

Establishment inputs and costs per unit

Inputs	Costs (US$)	% met by land user
Labour	804.44	100%
Equipment		
- tools	22.22	100%
TOTAL	**826.66**	**100.00%**

Maintenance/recurrent activities

- Repiling of stones and rocks that were dislodged

Maintenance/recurrent inputs and costs per unit per year

Inputs	Costs (US$)	% met by land user
Labour	13.33	100%
TOTAL	**13.33**	**100.00%**

Remarks:

Assessment

Impacts of the Technology

Production and socio-economic benefits

+++ increased crop yield
+++ reduced expenses on agricultural inputs
+++ increased farm income
+++ diversification of income sources
+++ increased production area
+++ increased product diversification
++ increased fodder production
++ increased fodder quality

Production and socio-economic disadvantages

++ reduced crop production area

Socio-cultural benefits

+++ community institution strengthening
+++ national institution strengthening
+++ improved conservation / erosion knowledge
+++ improved food security / self sufficiency
++ improved cultural opportunities
++ improved situation of disadvantaged groups

Socio-cultural disadvantages

Ecological benefits

++ reduced soil loss

Ecological disadvantages

Off-site benefits

++ reduced downstream siltation
++ reduced damage on neighbours fields
+ improved buffering / filtering capacity

Off-site disadvantages

Contribution to human well-being / livelihoods

+++ Landusers were able to built their houses, send their children to school, and acquire additional lands to till and animals from their income in the farm.

Benefits /costs according to land user

Benefits compared with costs	short-term:	long-term:
Establishment	positive	positive
Maintenance / recurrent	positive	positive

Acceptance / adoption:

63% of land user families have implemented the technology with external material support.
37% of land user families have implemented the technology voluntary.
There is moderate trend towards (growing) spontaneous adoption of the technology. Even without LGU assistance, rockwall technology will continue since most of the landusers in the area were trained on how to construct with the use of A-frame.

Concluding statements

Strengths and → how to sustain/improve	Weaknesses and → how to overcome
The technology involves indigenous material such as rocks and stones from the area. → Improvement of piling rocks/stones	Durability of the technology. → This could be improved by cementing the gaps between rocks (riprapping) to enhance durability, thus reducing maintenance cost.
Rockwall terraces prevent downstream siltation thus preserving the topsoil in the upper part of the area. →	Production area is reduced due to the rock wall structure. →
Easement of land preparation since rocks are not scattered in the field.It improves the soil condition for crop establishment. →	