Earth and stone bunds for erosion control in a hilly area. (Jose D. Rondal (Quezon City, Philippines))

Stone bunds and small basins (Philippines)

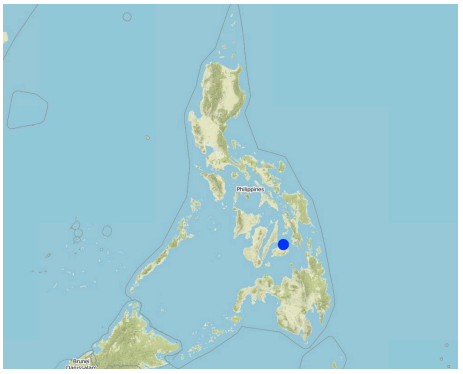
Pamugong sa yuta (Cebuano)

DESCRIPTION

Piling of stones and rocks along the contour to control run-off and soil erosion. It is also about the creation of small basins by removing stones and using them as barriers.

This is a low-cost erosion control technology by piling stones/rocks along the contour. The spacing of the piles depends on the slope and the availability/abundance of surface rocks. The stone bunds, usually 0.4 meter wide is intended to slow down run-off and catch/impound soil that moves downslope, etiher by water or by gravity. The technology is also about the creation of small basins by removing rocks and using them as barrier. In these small basins, water is impounded and allow to infiltrate. Soil carried with the run-off is deposited in these basins for the raising of high value crops. The technology is most especially applicable in areas where limestone and other rock outcrops and where the soil is commonly shallow and skeletal. With time, natural terraces can form. Limestone/rock outcrops are also used in the construction of check dams along small waterways. These check dams will result in the formation of flat-bottom valleys where transplanted rice is usually grown. Series of check dams will form terraces along valley floor in the long run.

LOCATION



Location: Siquijor, Cebu, Bohol, Negros Oriental, Philippines

No. of Technology sites analysed:

Geo-reference of selected sites
- 124.3207, 10.1444

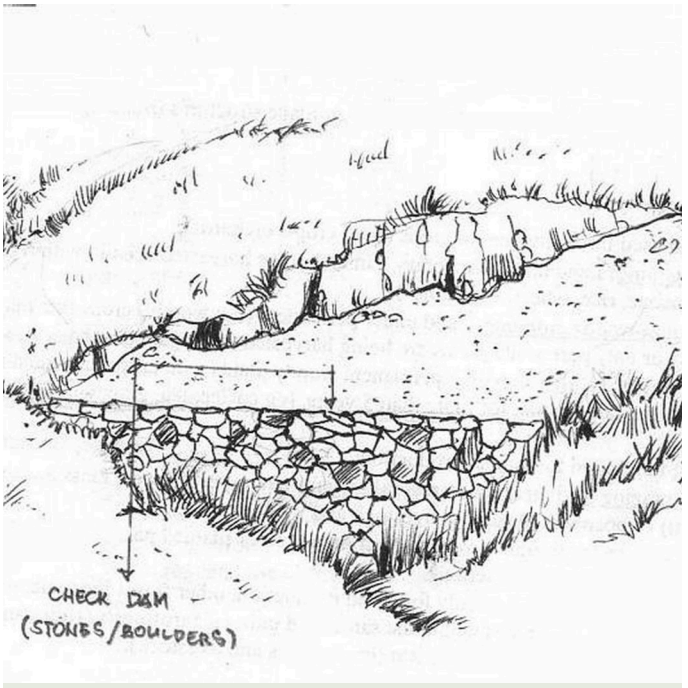
Spread of the Technology: evenly spread over an area (31.0 km^2)

In a permanently protected area?:

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

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

Stone walls/small basin (Jose D. Rondal (Quezon City, Philippines))



Construction of check dam along small waterway. (Lorenzo Co)

CLASSIFICATION OF THE TECHNOLOGY

Main purpose

- [ ] 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
- [ ] create beneficial economic impact
- [ ] create beneficial social impact

Land use

Cropland

- Annual cropping: cereals - maize, vegetables - root vegetables (carrots, onions, beet, other)

Number of growing seasons per year: 2

Water supply

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

Purpose related to land degradation

- [ ] prevent land degradation
- [ ] reduce land degradation
- [x] 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

water degradation - Ha: aridification

SLM group

- cross-slope measure

SLM measures

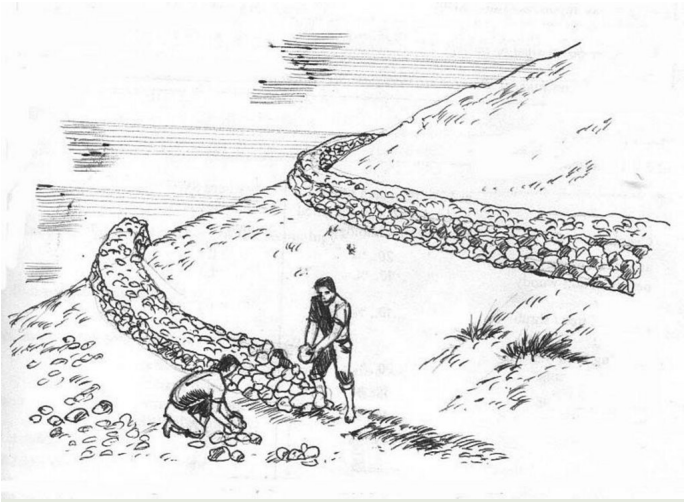
structural measures - S2: Bunds, banks

TECHNICAL DRAWING

Technical specifications

Construction of stone bunds along the contour for run-off and erosion control
Date: 8-22-2002

Technical knowledge required for field staff / advisors: moderate
Technical knowledge required for land users: moderate
Main technical functions: control of concentrated runoff: retain / trap
Secondary technical functions: reduction of slope length, increase / maintain water stored in soil



Author: Lorenzo Co

ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS

Calculation of inputs and costs

- Costs are calculated:
- Currency used for cost calculation: **Philippine peso**
- Exchange rate (to USD): 1 USD = 50.0 Philippine peso
- Average wage cost of hired labour per day: 4.00

Most important factors affecting the costs

Labor for the removal and collection of stones for piling.

Establishment activities

n.a.

Establishment inputs and costs

Specify input	Unit	Quantity	Costs per Unit (Philippine peso)	Total costs per input (Philippine peso)	% of costs borne by land users
Labour					
labour	ha	1.0	1000.0	1000.0	100.0
Equipment					
tools	ha	1.0	20.0	20.0	100.0
Total costs for establishment of the Technology				**1'020.0**	
Total costs for establishment of the Technology in USD				*20.4*	

Maintenance activities

n.a.

Maintenance inputs and costs

Specify input	Unit	Quantity	Costs per Unit (Philippine peso)	Total costs per input (Philippine peso)	% of costs borne by land users
Labour					
labour	ha	1.0	40.0	40.0	100.0
Total costs for maintenance of the Technology				**40.0**	
Total costs for maintenance of the Technology in USD				*0.8*	

NATURAL ENVIRONMENT

Average annual rainfall

- ☐ < 250 mm
- ☐ 251-500 mm
- ☐ 501-750 mm
- ☐ 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

- ☑ humid
- ☑ sub-humid
- ☐ semi-arid
- ☐ arid

Specifications on climate

Thermal climate class: tropics

Slope

- ☐ flat (0-2%)
- ☐ gentle (3-5%)
- ☐ moderate (6-10%)
- ☐ rolling (11-15%)
- ☑ hilly (16-30%)

Landforms

- ☐ plateau/plains
- ☐ ridges
- ☑ mountain slopes
- ☑ hill slopes
- ☐ footslopes

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.

Technology is applied in

- ☐ convex situations
- ☐ concave situations
- ☐ not relevant

- [ ] steep (31-60%)
- [ ] very steep (>60%)

- [ ] valley floors

- [ ] 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.

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)
- [ ] 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%)
- [ ] 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)
- [x] mixed (subsistence/ commercial)
- [x] commercial/ market

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

Access to services and infrastructure

IMPACTS

Socio-economic impacts

Crop production — decreased — increased ✓ — from nothing to something

production area (new land under cultivation/ use) — decreased ✓ — increased — area occupied by stone wall

land management — hindered ✓ — simplified — stone wall is also on obstruction

farm income — decreased — increased ✓ — from nothing to something

Socio-cultural impacts

conflict mitigation — worsened — improved ✓

Ecological impacts

soil moisture	decreased	increased	Better infiltration
soil cover	reduced	improved	Better crop growth
soil loss	increased	decreased	Almost zero soil loss
Soil fertility	decreased	increased	Build-up of nutrients

Off-site impacts

downstream flooding (undesired)	increased	reduced
groundwater/ river pollution	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

-

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?

- ☐ 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

- Permanent
- Clears the land for cultivation

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

- Once established, it becomes permanent
- Very effective in trapping sediment

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

- Sancturies for pests Cleanliness of the surroundings
- Laborious during establishment labor sharing

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

- Stone wall serve as sanctuary for pests like rats and snakes Cleanliness of the surroundings
- Stone wall can be an obstruction in cultivation and mobility

REFERENCES

Compiler
Philippine Overview of Conservation Approaches and Technologies

Editors

Reviewer
Deborah Niggli
Alexandra Gavilano

Date of documentation: Maart 16, 2011

Last update: Junie 14, 2019

Resource persons
Jose Rondal - SLM specialist

Full description in the WOCAT database
https://qcat.wocat.net/af/wocat/technologies/view/technologies_1424/

Linked SLM data
n.a.

Documentation was faciliated by

Institution
- n.a.

Project
- n.a.