Sediment catchment canal established during land preparation (Engr. Djolly Ma. P. Dinamling (Bureau of Soils and Water Management))

Sediment Traps (Philippines)

Catch basin, silt traps, cascading canals, trenches, ditches

DESCRIPTION

Sediment traps are structures built in the area which includes cascading catchment canal, silt traps and catch basin along perimeter, between pineapple fields and along diversion ditches to collect runoff during rains, preventing and minimizing the eroded soils cascading into natural bodies of water.

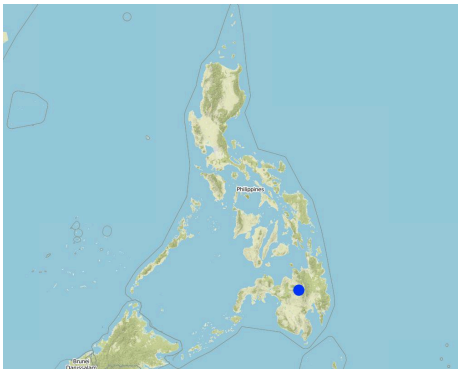
Strategic construction of water catchment in and around existing pineapple fields to collect runoff during rains, aim to minimize eroded soil cascading into natural bodies of water. Sediment trap structures are earth canals designed to reduce soil erosion. The cascading catchment canal length depends on the slope, a length of five meters or longer is excavated when the slope of the area is less than 2%. The higher the slope percentage, the shorter the length of the canal. Silt traps are built along diversion ditches by stacking bamboo pegs or planting pineapple. Catch basin are bigger canals than the cascading canals which trap sediments that are not trapped in the silt traps and cascading canals. Weeds in this structures are not uprooted to further trap eroded soils or silts.

Purpose of the Technology: The technology aims to: (1) control of dispersed runoff; (2) serves as water harvesting facility; and (3) serves as sediment retention / trapping.

Establishment / maintenance activities and inputs: In the establishment of sediment trap structures, the following activities are undertaken in the area: (1) Depending on the slope, sediment trap structure locations are identified; (2) Excavation of catch basin and cascading canals using back hoe; (3) Establishment of raised beds which are used for pineapple production; and (4) Construction of trenches with silt traps using bamboo pegs and pineapple plants. Cascading canals, trenches and diversion ditches are re-established every cropping season.

Natural / human environment: The area is under humid agro-climate condition with a topography ranging from 1-10% slope. It receives an average annual rainfall of approximately 3072 mm/year. The elevation ranges from 370-890 meter above sea level.
Mt. Kitanglad and Agri Development Corporation (MKADC) operates the area where the technology are being practiced. Farmers living within the area are the laborers of the company.

LOCATION



Location: Bukidnon, Valencia City, Philippines

No. of Technology sites analysed:

Geo-reference of selected sites
- 125.05258, 7.97587

Spread of the Technology: evenly spread over an area (2.6066 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

Pineapple plants serve as silt traps built along trenches (Baldwin M. Pine)

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

- Perennial (non-woody) cropping: pineapple

Water supply

- 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, Wo: offsite degradation effects

SLM group

- water harvesting
- irrigation management (incl. water supply, drainage)

SLM measures

structural measures - S11: Others

TECHNICAL DRAWING

Technical specifications

Sediment traps are established to collect silts.

Location: Barangay Lurogan. Valencia City, Bukidnon

Technical knowledge required for field staff / advisors: high

Technical knowledge required for land users: high

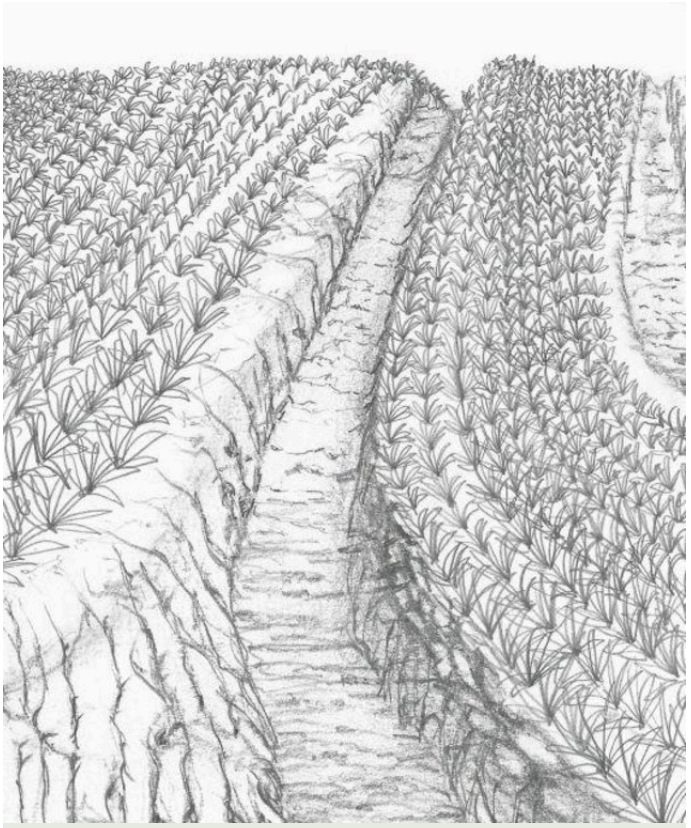
Main technical functions: control of dispersed runoff: retain / trap, control of dispersed runoff: impede / retard, control of concentrated runoff: retain / trap, control of concentrated runoff: impede / retard, control of concentrated runoff: drain / divert, sediment retention / trapping, sediment harvesting

Secondary technical functions: reduction of slope angle, reduction of slope length, water harvesting / increase water supply

Structural measure: Cascading canal
Depth of ditches/pits/dams (m): 1m
Width of ditches/pits/dams (m): 1m
Length of ditches/pits/dams (m): 5m

Structural measure: Catch basin
Depth of ditches/pits/dams (m): 1.5 m
Width of ditches/pits/dams (m): 1m
Length of ditches/pits/dams (m): 1m

Structural measure: Silt traps
Depth of ditches/pits/dams (m): 0.3m
Width of ditches/pits/dams (m): 0.75m
Length of ditches/pits/dams (m): 0.5m



Author: Mr. Patricio A. Yambot, Bureau of Soils and Water Management

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 = 46.0 Philippine Peso
- Average wage cost of hired labour per day: n.a

Most important factors affecting the costs

n.a.

Establishment activities

1. Excavation of canal using back hoe (Timing/ frequency: Before land preparation)
2. Construction of bed (Timing/ frequency: Once, before planting)
3. Construction of trenches (Timing/ frequency: None)

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			100.0
Equipment					
Machine use	ha	1.0			100.0

Maintenance activities

1. Desilting (Timing/ frequency: Once in three months, but depends on the needs)

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			100.0

NATURAL ENVIRONMENT

Average annual rainfall

- ☐ < 250 mm
- ☐ 251-500 mm
- ☐ 501-750 mm
- ☐ 751-1,000 mm
- ☐ 1,001-1,500 mm

Agro-climatic zone

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

Specifications on climate

Thermal climate class: tropics

- [ ] 1,501-2,000 mm
- [ ] 2,001-3,000 mm
- [x] 3,001-4,000 mm
- [ ] > 4,000 mm

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

Landforms
- [ ] plateau/plains
- [ ] ridges
- [ ] mountain slopes
- [x] hill slopes
- [ ] footslopes
- [x] valley floors

Altitude
- [ ] 0-100 m a.s.l.
- [x] 101-500 m a.s.l.
- [x] 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
- [ ] very shallow (0-20 cm)
- [ ] shallow (21-50 cm)
- [x] 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)
- [x] medium (loamy, silty)
- [x] fine/ heavy (clay)

Topsoil organic matter content
- [ ] high (>3%)
- [x] medium (1-3%)
- [ ] low (<1%)

Groundwater table
- [ ] on surface
- [ ] < 5 m
- [x] 5-50 m
- [ ] > 50 m

Availability of surface water
- [ ] excess
- [ ] good
- [x] medium
- [ ] poor/ none

Water quality (untreated)
- [x] good drinking water
- [ ] poor drinking water (treatment required)
- [ ] for agricultural use only (irrigation)
- [ ] unusable

Water quality refers to:

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)
- [ ] commercial/ market

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

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

Level of mechanization
- [x] manual work
- [ ] animal traction
- [x] mechanized/ motorized

Sedentary or nomadic
- [ ] Sedentary
- [ ] Semi-nomadic
- [ ] Nomadic

Individuals or groups
- [ ] individual/ household
- [ ] groups/ community
- [ ] cooperative
- [x] employee (company, government)

Gender
- [x] women
- [x] men

Age
- [ ] children
- [ ] youth
- [ ] middle-aged
- [ ] elderly

Area used per household
- [ ] < 0.5 ha
- [ ] 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
- [x] large-scale

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

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

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

Access to services and infrastructure

health	poor	✓	good
education	poor	✓	good
technical assistance	poor	✓	good
employment (e.g. off-farm)	poor	✓	good
markets	poor	✓	good
energy	poor	✓	good
roads and transport	poor	✓	good
drinking water and sanitation	poor	✓	good
financial services	poor	✓	good

IMPACTS

Socio-economic impacts

Crop production	decreased	increased	
production area (new land under cultivation/ use)	decreased	increased	
land management	hindered	simplified	
irrigation water availability	decreased	increased	little (5-20%)

Socio-cultural impacts

conflict mitigation	worsened	improved	

Ecological impacts

harvesting/ collection of water (runoff, dew, snow, etc)	reduced	improved	
surface runoff	increased	decreased	
groundwater table/ aquifer	lowered	recharge	
soil loss	increased	decreased	
Has the Technology contributed to improve livelihoods and human well-being (eg education, health)?	decreased	increased	yes, little

Off-site impacts

downstream flooding (undesired)	increased	reduced	
downstream siltation	increased	decreased	
groundwater/ river pollution	increased	reduced	
damage on neighbours' fields	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

Climate-related extremes (disasters)

local rainstorm	not well at all	very well	
local windstorm	not well at all	very well	Answer: not known
drought	not well at all	very well	
general (river) flood	not well at all	very well	

Other climate-related consequences

reduced growing period	not well at all	very well	Answer: not known

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%
- [x] 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

- Land user's view agree with experts opinion.

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

- Land user's view agree with experts opinion.

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

- Sediment traps are effective in minimizing soil erosion and preserving the top soil.
- Negative off-site effects are lessened i.e siltation of natural water bodies

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

- Established sediment traps are not permanent, designs are changed per cropping season, this activity disturb soil biological and physical properties which might cause soil fertility decline and on-site erosion. Further, altering or modifying canal designs per cropping would entail more cost just for the establishment of sediment traps. Design location of other sediment traps that could be used for more than one cropping to minimize cost. A research must be done to address this issue.

REFERENCES

Compiler
Philippine Overview of Conservation Approaches and Technologies

Editors

Reviewer
Fabian Ottiger
Alexandra Gavilano

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Resource persons
Jerry Manubag - SLM specialist

Full description in the WOCAT database
https://qcat.wocat.net/af/wocat/technologies/view/technologies_1712/

Linked SLM data
Approaches: Integrated Soil and Water Conservation Approach in Improving Biophysical Condition of Mt. Kitanglad Agri-Development Corporation (MKADC) Pineapple Production https://qcat.wocat.net/af/wocat/approaches/view/approaches_1970/

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- n.a.