Sediment Traps

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

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 run-off 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 run-off 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.
The technology aims to: (1) control of dispersed runoff; (2) serves as water harvesting facility; and (3) serves as sediment retention / trapping.
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 (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.
The area is under humid agro-climate condition with a topography ranging from 1-10% slope. It receives an annual average 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.

left: Sediment catchment canal established during land preparation (Photo: Engr. Djolly Ma. P. Dinamling)
right: Pineapple plants serve as silt traps built along trenches (Photo: Baldwin M. Pine)

Location: Valencia City
Region: Bukidnon
Technology area: 2.6066 km^2
Conservation measure: structural
Stage of intervention: prevention of land degradation
Origin: Developed through experiments / research, recent (<10 years ago)
Land use type:
Cropland: Perennial (non-woody) cropping
Land use:
Cropland: Perennial (non-woody) cropping (before), Other: Waterways, drainage lines, ponds, dams (after)
Climate: humid, tropics
WOCAT database reference: T_PHI048en
Related approach: Integrated Soil and Water Conservation Approach in Improving Biophysical Condition of Mt. Kitanglad and Agri Development Corporation (MKADC) Pineapple Production (A_PHI009en)
Compiled by: Philippine Overview of Conservation Approaches and Technologies, Bureau of Soils and Water Management
Date: 2015-07-15
Contact person: Jerry Manubag, Mt. Kitanglad Agri-Development Corporation, Brgy. Lurugan, Valencia, Bukidnon

Classification

Land use problems:
- Soil erosion/ or siltation (expert's point of view)

Land use

Perennial (non-woody) cropping
Cropland: Perennial (non-woody) cropping (before)
Other: Waterways, drainage lines, ponds, dams (after)

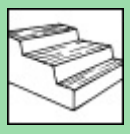
Climate

humid

Degradation

Soil erosion by water: loss of topsoil / surface erosion

Conservation measure



Structural: Others (Cascading canals, silt traps, catch basin)

Stage of intervention

- Prevention
- Mitigation / Reduction
- Rehabilitation

Origin

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

Level of technical knowledge

- Agricultural advisor
- Land user

Main causes of land degradation:
Direct causes - Natural: Heavy / extreme rainfall (intensity/amounts)

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

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: medium

Soil water storage capacity: medium
Ground water table: 5 - 50 m
Availability of surface water: medium
Water quality: good drinking water

Tolerant of climatic extremes: seasonal rainfall decrease, droughts / dry spells
Sensitive to climatic extremes: seasonal rainfall increase, heavy rainfall events (intensities and amount), floods

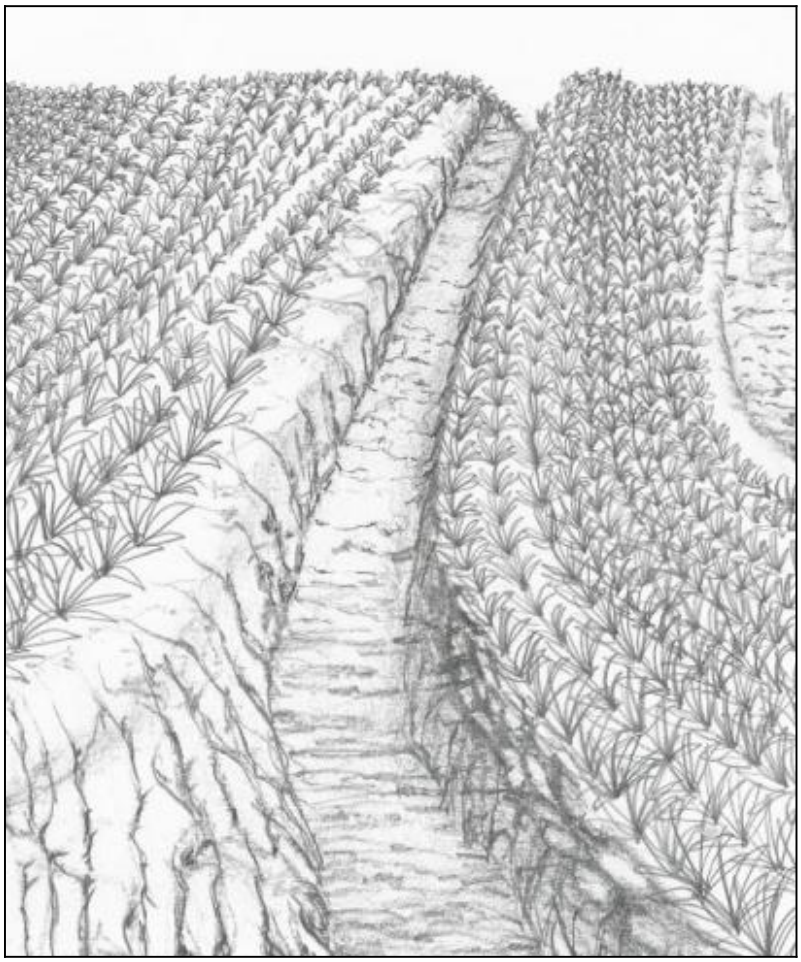
Human Environment

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: employee (company, government), large scale land users, common / average land users, men and women
Population density: < 10 persons/km2
Annual population growth: < 0.5%
Land ownership: individual, titled
Land use rights: leased
(Usually leased from individual land users 10 to 15 years upon the return of the area the company assured they will return back to the soil to its original form.)
Relative level of wealth: average

Importance of off-farm income: : The technology is more on trapping sediments, and is irrelevant with respect to additional income for the farmers
Access to service and infrastructure: low: health; moderate: education, employment (eg off-farm), energy, roads & transport, drinking water and sanitation, financial services; high: technical assistance, market
Market orientation: mixed (subsistence and commercial)
Mechanization: mechanised
Livestock grazing on cropland:



Technical drawing

Sediment traps are established to collect silts.
(Mr. Patricio A. Yambot)

Implementation activities, inputs and costs

Establishment activities

- Excavation of canal using back hoe
- Construction of bed
- Construction of trenches

Establishment inputs and costs per ha

Inputs	Costs (US$)	% met by land user
Labour	53.89	100%
Equipment		
- machine use	71.49	100%
TOTAL	**125.38**	**100.00%**

Maintenance/recurrent activities

- Desilting

Maintenance/recurrent inputs and costs per ha per year

Inputs	Costs (US$)	% met by land user
Labour	154.92	100%
TOTAL	**154.92**	**100.00%**

Remarks:

Assessment

Impacts of the Technology

Production and socio-economic benefits	Production and socio-economic disadvantages
++ simplified farm operations	+ loss of land
+ increased irrigation water availability quality	

Socio-cultural benefits	Socio-cultural disadvantages
+++ improved conservation / erosion knowledge	

Ecological benefits	Ecological disadvantages
+++ improved harvesting / collection of water	
+++ reduced surface runoff	
+++ reduced soil loss	
++ recharge of groundwater table / aquifer	

Off-site benefits	Off-site disadvantages
++ reduced downstream flooding	
++ reduced downstream siltation	
+ reduced groundwater river pollution	
+ reduced damage on neighbours fields	

Contribution to human well-being / livelihoods

\+

Benefits /costs according to land user

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

Acceptance / adoption:

100% of land user families have implemented the technology voluntary. Mt. Kitanglad and Agri Development Corporation (MKADC) operates the area where the technology are being practiced. The technology has been introduced through experiments and adoption from neighboring farms.
There is no trend towards (growing) spontaneous adoption of the technology. Other land users in the area do not adopt the technology due to the opportunity cost that will be incurred. This opportunity cost pertains to the reduction of their production area since part of it will be allotted/converted in the establishment of sediment structures.

Concluding statements

Strengths and → how to sustain/improve	Weaknesses and → how to overcome
Sediment traps are effective in minimizing soil erosion and preserving the top soil. → Thorough research must be done to determine recommended dimensions (length, width, height) of silt traps, cascading canal and catch basin depending on the slope gradient.	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.
Negative off-site effects are lessened i.e siltation of natural water bodies →	
Land user's view agree with experts opinion. →	Land user's view agree with experts opinion. →