The eruption of Mt. Pinatubo volcano caused the deposition of sand technically called lahar ranging in depth of 6-10 meters (Jose D. Rondal)

Resoiling (Pit with manure) (Philippines)

DESCRIPTION

Replacing the sand in the planting hole with soil for the proper nourishment of newly planted trees and for better moisture retention and storage.

The technology is used in two contrasting geological environment: 1) sand dunes formed through the action of wind, and 2) lahar flows caused by the eruption of Mt. Pinatubo volcano in 1991. Lahars are the pyroclastic materials deposited in the lowland through the action of water, usually several meters in thickness. Both landscape have the same characteristics: some climatic type characterized by long dry season (7 months), high silica content, high erodibility and low water holding capacity, hence, droughty. The total annual rainfall is about 2,000 mm which occur from May to October. Sand dunes and crop establishment (mango) is done by digging a hole usually 1 x 1 x 1 meter. The sand is replaced by true soil mixed with organic fertilizer. Planting is done at the onset of the rainy season, usually June. Frequent fertilization is done. Manual irrigation is necessary during the dry season. The fruit tree crops suitable in the area are mango and cashew. Afforestations species include Casuarina equisentifolia and Acacia auricoliformis. Gliricidia sepium which is a very valuable fuelwood thrives well also. Grasses particularly Sacharum spontaneum can spontaneously colorize the area, especially that of lahar.

LOCATION

Location: Ilocos Norte; Pampanga, Ilocos Norte; Pampanga and Tarlac, Philippines

No. of Technology sites analysed:

Geo-reference of selected sites
- n.a.

Spread of the Technology: evenly spread over an area (3.0 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)
- [x] during experiments/ research
- [ ] through projects/ external interventions

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

Number of growing seasons per year: 2

Grazing land

Water supply
- [ ] 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

soil erosion by wind - Et: loss of topsoil

chemical soil deterioration - Cn: fertility decline and reduced organic matter content (not caused by erosion)

SLM group
- n.a.

SLM measures

agronomic measures

vegetative measures -

TECHNICAL DRAWING

Technical specifications

ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS

Calculation of inputs and costs
- Costs are calculated:
- Currency used for cost calculation: **Peso**
- Exchange rate (to USD): 1 USD = 50.0 Peso
- Average wage cost of hired labour per day: 3.00

Most important factors affecting the costs
Soil texture is the most crucial factor affecting costs. High labor is required in hauling filling materials to replace the sand in the planting hole. Also because of low water holding capacity, the plants have to be watered at least once a week during the dry season.

Establishment activities
1. Digging of holes (Timing/ frequency: beginning of rainy season)
2. Hauling of fill materials (for resoiling) (Timing/ frequency: beginning of rainy season)
3. Transplanting of fruit tree seedlings (Timing/ frequency: beginning of rainy season)

Maintenance activities
1. Fertilization (Timing/ frequency: every 6 months from planting /)
2. Watering (Timing/ frequency: weekly during dry season /)

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%)
- ☐ steep (31-60%)
- ☐ very steep (>60%)

Landforms
- ☑ plateau/plains
- ☑ ridges
- ☐ mountain slopes
- ☐ 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
- ☐ very shallow (0-20 cm)
- ☐ shallow (21-50 cm)
- ☐ moderately deep (51-80 cm)
- ☑ deep (81-120 cm)
- ☑ very deep (> 120 cm)

Soil texture (topsoil)
- ☑ coarse/ light (sandy)
- ☐ medium (loamy, silty)
- ☐ fine/ heavy (clay)

Soil texture (> 20 cm below surface)
- ☐ coarse/ light (sandy)
- ☐ medium (loamy, silty)
- ☐ fine/ heavy (clay)

Topsoil organic matter content
- ☐ high (>3%)
- ☐ 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?
- ☐ 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
- [x] subsistence (self-supply)
- [ ] 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
- [ ] poor
- [x] average
- [x] 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
- [ ] 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
- [x] state
- [ ] company
- [ ] communal/ village
- [ ] group
- [ ] individual, not titled
- [x] individual, titled

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

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

Access to services and infrastructure

IMPACTS

Socio-economic impacts

Crop production	decreased	increased
fodder production	decreased	increased
fodder quality	decreased	increased
wood production	decreased	increased
farm income	decreased	increased

Socio-cultural impacts

conflict mitigation	worsened	improved

Ecological impacts

soil cover	reduced	improved
wind velocity	increased	decreased
None	None	None

Off-site impacts

reliable and stable stream flows in dry season (incl. low flows)	reduced	increased
downstream flooding (undesired)	increased	reduced
downstream siltation	increased	decreased
groundwater/ river pollution	increased	reduced
wind transported sediments	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

Of all those who have adopted the Technology, how many have done so without receiving material incentives?

- [ ] single cases/ experimental
- [ ] 1-10%
- [ ] 11-50%
- [ ] > 50%

- [ ] 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

- It allows the utilization of "useless" barren land

  How can they be sustained / enhanced? Government support like inputs/credits

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

- It can make fertile-poor and degraded areas productive

  How can they be sustained / enhanced? Sustained information, education campaign (IEC)
- It increases the water retention capacity of sandy soils.

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

- Laborious (hauling of fill materials) Labor-sharing
- High maintenance cost (irrigation, fertilizer)

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

- Laborious (hauling of fill materials) Labor-sharing

REFERENCES

Compiler
Unknown User

Editors

Reviewer
Alexandra Gavilano

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Resource persons

Full description in the WOCAT database
https://qcat.wocat.net/en/wocat/technologies/view/technologies_1575/

Linked SLM data
n.a.

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Institution

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- Mariano Marcos State University (MMSU) - Philippines

Project

- n.a.

Key references

- 2000 Annual Report, MMSU: Mariano Marcos State University (MMSU), Batac, Ilocos Norte