Preparation of contour platforms in home-gardens - Central Highlands of Sri Lanka (Gamini Warusamana)

Individual platforms and contour platforms (Sri Lanka)

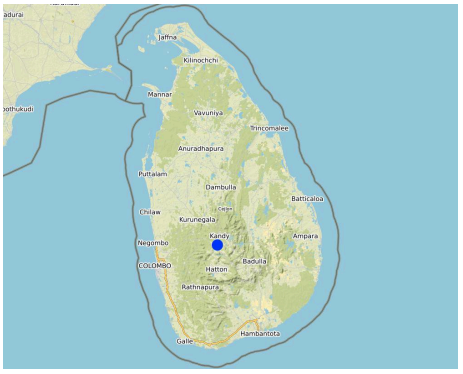
Thani wedika and samochcha wedika

DESCRIPTION

Construction of individual platforms or contour platforms to control soil erosion in the home gardens (HG) to cultivate vanilla as a cash crop

Doluwa is located in the Central Highlands of Sri Lanka. This area belongs to the Wet zone mid-country agro-ecological region according to Sri Lankan classification. The elevation of the area is 575 meters. The mean temperature of the area is about 24 °C. The area receives rainfall from two monsoons. North-east monsoon rain comes from November to January with an annual rainfall of 1800 mm. The South-west monsoon rain lasts from May to September and contributes a major portion of the annual rainfall. February, March, and July months receive lower rainfall. The Central Highlands have excellent agro-ecological conditions for tea plantations, spice crops like cloves, nutmeg and cardamom, fruit crops such as avocado, durian, coffee, banana, and black pepper. Paddy cultivation is practiced in the valleys. Areas over 50% of slope inclination are covered by protected forests. The main livelihood activity is agriculture: mainly cultivation of tea, spices, and vegetables. About 43% of the land is under tea cultivation; and around 15% is marginalized or abandoned land, due to land degradation and low productivity of soils.
The average land size of home gardens in the Central Highlands of Sri Lanka is about 0.25 – 0.5 acres. Fruits and spice trees randomly exist in these land plots. The topsoil is always disturbed due to daily human activities. Apart from run-off water from upper lands, rooftop rainwater flows in all directions causing heavy soil erosion in these home gardens. The home gardens are the least attended land plots in terms of conservation due to low-income generation.
Traditionally, home gardens with randomly planted perennial trees are usually shady. Therefore, farm families generally believe that cultivation of cash crops in their home gardens is impossible. The introduction of Individual Platforms and Contour Platforms as a soil conservation methodology, piloted in the Doluwa area by an FAO project on Rehabilitation of Degraded Agricultural in several Districts of the Central Highlands of Sri Lanka has proven the contrary, as mainly vanilla is known as a shade-preferring crop. Furhter, vanilla is economically highly valuable and has the potential to generate good income. Consequently, adequate platforms (small soil terraces) were constructed and used for vanilla cultivation. Vanilla grows particularly well where the soil organic matter content is high. Organic matter required to enrich the soil can be collected directly from the home gardens (leaves and residues) and is also coming from organic kitchen waste. These organic residues are recycled into compost and finally used for the cultivation of vanilla. Additionally, mulching is practiced to control topsoil erosion. Each vanilla plant as a tropical climbing vine grows up a previously planted two-meter-high Gliricidia stick. Gliricidia serves on the one hand as a living fixing stick and provider of shade and, as a leguminous tree (Fabaceae family) the plant has the potential to fix nitrogen in the soil.
Construction of the platforms:
The individual platforms are constructed around the planting hole and are one meter wide and two meters in length. The distance between the two platforms is the same (minimum 2 meters) as the space for the vanilla plant. The lower side of the platform (lower edge) has a shoulder bund, stabilized with coconut husk, tree logs, and stones.
The contour platforms are 1.75 meters in width and length depending on the land size and other characteristics. The platform is constructed with a slightly inverted gradient. A small drain with a suitable gradient along the length on the upper side of the platform is constructed to drain out excess water during rain. These small drains are connected to a leader drain. The edges of the platforms are well stabilized again by coconut husk, tree logs or stones (shoulder bund measure: height x width = 20cm x 30cm).
This sustainable land management (SLM) technology is highly accepted by the farm families, as the Vanilla SLM model is an economically attractive opportunity especially for women; but only where the environmental conditions are suitable for vanilla growing.

LOCATION



Location: Doluwa, Central, Sri Lanka

No. of Technology sites analysed: 10-100 sites

Geo-reference of selected sites
- 80.60557, 7.18265

Spread of the Technology: applied at specific points/ concentrated on a small area

In a permanently protected area?: Nee

Date of implementation: 2018; 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

Training on the use of A-frame (Bandara Rotawewa)

Contour terraces protected with coconut husk and old tiles (Bandara Rotawewa)

CLASSIFICATION OF THE TECHNOLOGY

Main purpose

- [x] improve production
- [x] reduce, prevent, restore land degradation
- [ ] conserve ecosystem
- [x] 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
- [x] create beneficial economic impact
- [ ] create beneficial social impact

Land use

Land use mixed within the same land unit: Ja - Agroforestry

Cropland

- Annual cropping
- Tree and shrub cropping

Water supply

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

Purpose related to land degradation

- [x] prevent land degradation
- [x] 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, Wg: gully erosion/ gullying

SLM group

- cross-slope measure
- home gardens

SLM measures

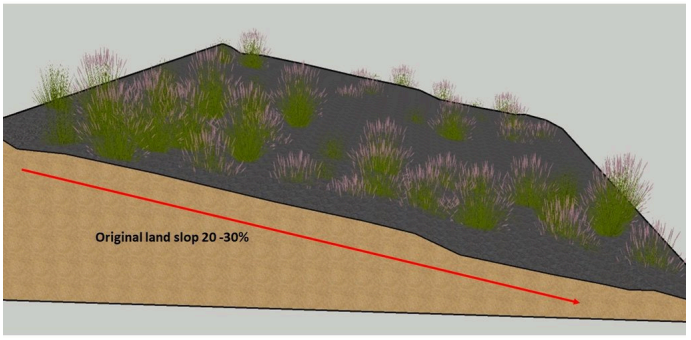
agronomic measures - A2: Organic matter/ soil fertility

structural measures - S1: Terraces

TECHNICAL DRAWING

Technical specifications

Slope gradient in home gardens before introduction of the SLM Technology.



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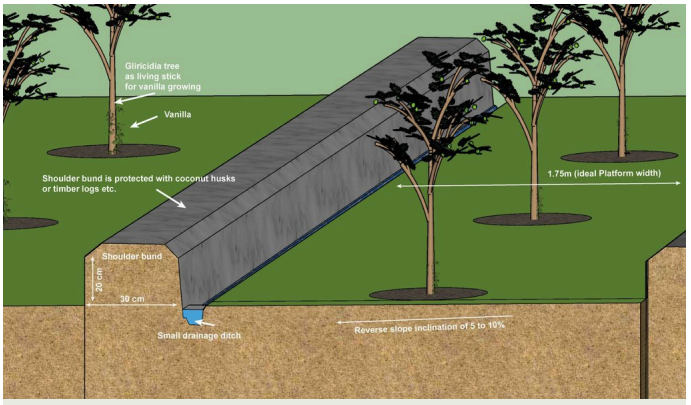
Contour platforms: the ideal platform is 175 cm wide. The length is depending on the available length of the land. The platform is constructed by cutting the upper section and fill in to the lower section to get an inverse slope of 5 to 10%. The shoulder bund is 30 cm wide and 20 cm height. The shoulder bund is protected with coconut husk/ timber logs etc.

Individual platform: The spacing between the two plants in the platforms is 1 - 1.5 meters. The individual platform size can be 100 cm wide and 200 cm in length. Coconut husks, stones, timber logs can be used to protect the edges of the platform.

Technical description: dito drawing 2.



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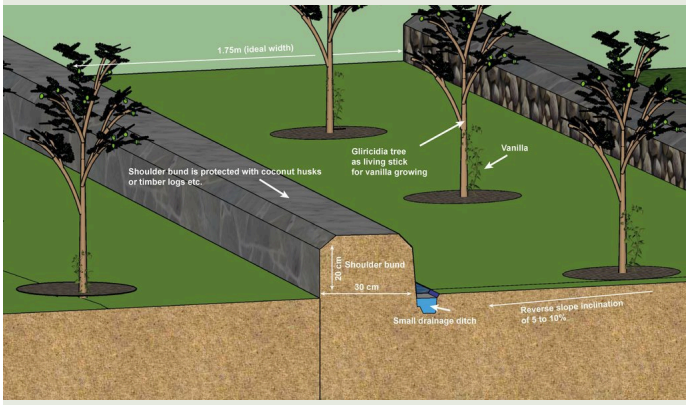

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ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS

Calculation of inputs and costs

- Costs are calculated: per Technology area (size and area unit: **0.25 acre**)
- Currency used for cost calculation: **USD**
- Exchange rate (to USD): 1 USD = n.a
- Average wage cost of hired labour per day: 840 USD per 1/4 acre of land

Most important factors affecting the costs

Steepness of the slope is greatly determining the labour cost requirement for the construction of individual platforms and contour platforms. The cost of coconut husk is another cost component for conservation. Maintenance is mostly depending on ground grass cover and periodical maintenance.

Establishment activities

1. Construction of contour or individual platform terraces (Timing/ frequency: Before establishment of the crop)
2. Reinforcement of the shoulder bunds with coconut husk/ tree logs/ etc (Timing/ frequency: After construction of contour platform or individual platforms)
3. Preparing of compost and mixing it into the top soil (Timing/ frequency: Before establishment of the crop)
4. Planting of vanilla rooted cutting (Timing/ frequency: First Live Gliricidia sticks are planted. After they rooted, vanilla cuttings are planted))

Establishment inputs and costs (per 0.25 acre)

Specify input	Unit	Quantity	Costs per Unit (USD)	Total costs per input (USD)	% of costs borne by land users
Labour					
Construction of contour platforms in a quarter of Acre	person days	40.0	15.0	600.0	100.0
Planting of vanilla rooted cutting	person days	1.0	15.0	15.0	100.0
Plant material					
Gliricidia sticks	number	200.0	0.2	40.0	100.0
Vanilla rooted cuttings	number	200.0	0.4	80.0	
Fertilizers and biocides					
Preparing of compost and mixing it into the top soil	person days	5.0	15.0	75.0	100.0
Construction material					
Coconut husk/ tree logs	pieces	4005.0	0.03	120.15	100.0
Total costs for establishment of the Technology				**930.15**	
Total costs for establishment of the Technology in USD				*930.15*	

Maintenance activities

1. Removal of overgrown grass and trimming of grass on the shoulder bunds (Timing/ frequency: Twice a year (after the rainy season))
2. Repair of the broken places of the terrace, shoulder bunds etc (Timing/ frequency: Once a year)

Maintenance inputs and costs (per 0.25 acre)

Specify input	Unit	Quantity	Costs per Unit (USD)	Total costs per input	% of costs borne by land

				(USD)	users
Labour					
Removal of overgrown grass and trimming of grass on the shoulder bunds	Person days	5.0	15.0	75.0	100.0
Repair of the broken places of the terrace, shoulder bunds etc	Person days	3.0	15.0	45.0	100.0
Total costs for maintenance of the Technology				**120.0**	
Total costs for maintenance of the Technology in USD				*120.0*	

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

Agro-climatic zone

- [x] humid
- [ ] sub-humid
- [ ] semi-arid
- [ ] arid

Specifications on climate

Average annual rainfall in mm: 2500.0
Two monsoons: North-East monsoon is from November to December with an average monthly RF of 80 – 100 mm. Southwest monsoon is from April to July with an average RF of 108 – 200. First Inter monsoon is from January to March is with 180 – 200 mm RF while second inter monsoon with 300 – 350 mm of RF. February is the driest month of a year.
The minimum mean temperature is 200 Celsius and the maximum mean temperature is 240 Celsius and the annual mean temperature is 240 Celsius.

Slope

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

Landforms

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

Altitude

- [ ] 0-100 m a.s.l.
- [ ] 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
- [x] not relevant

Soil depth

- [ ] very shallow (0-20 cm)
- [ ] shallow (21-50 cm)
- [ ] moderately deep (51-80 cm)
- [x] deep (81-120 cm)
- [ ] very deep (> 120 cm)

Soil texture (topsoil)

- [ ] coarse/ light (sandy)
- [x] medium (loamy, silty)
- [ ] fine/ heavy (clay)

Soil texture (> 20 cm below surface)

- [ ] coarse/ light (sandy)
- [x] medium (loamy, silty)
- [ ] fine/ heavy (clay)

Topsoil organic matter content

- [ ] high (>3%)
- [ ] medium (1-3%)
- [x] 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)

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

Water quality refers to: both ground and surface water

Is salinity a problem?

- [ ] Ja
- [x] Nee

Occurrence of flooding

- [ ] Ja
- [x] Nee

Species diversity

- [ ] high
- [x] medium
- [ ] low

Habitat diversity

- [ ] high
- [x] 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
- [x] poor
- [ ] average
- [ ] rich
- [ ] very rich

Level of mechanization

- [x] manual work
- [ ] animal traction
- [ ] mechanized/ motorized

Sedentary or nomadic

- [x] Sedentary
- [ ] Semi-nomadic
- [ ] Nomadic

Individuals or groups

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

Gender

- [x] women
- [ ] men

Age

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

Area used per household

- [x] < 0.5 ha
- [ ] 0.5-1 ha
- [ ] 1-2 ha

Scale

- [x] small-scale
- [ ] medium-scale
- [ ] large-scale

Land ownership

- [ ] state
- [ ] company
- [ ] communal/ village

Land use rights

- [ ] open access (unorganized)
- [ ] communal (organized)
- [ ] leased

- [ ] 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

- [ ] group
- [ ] individual, not titled
- [x] individual, titled

- [x] individual

Water use rights

- [ ] open access (unorganized)
- [ ] communal (organized)
- [ ] leased
- [x] 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

Before introducing the technology women did not think of vanilla cultivation. With technology, women realized vanilla as a cash crop, its potential for livelihood improvement.

crop quality

decreased — increased

Before introduction of the technology, vanilla growing suffered from soil erosion and poor soil quality

risk of production failure	increased	decreased
land management	hindered	simplified
drinking water quality	decreased	increased
farm income	decreased	increased
diversity of income sources	decreased	increased
economic disparities	increased	decreased
workload	increased	decreased

Socio-cultural impacts

food security/ self-sufficiency — reduced — improved

community institutions

weakened — strengthened

Women were formed as a group for training arrangements, and for marketing purposes.

SLM/ land degradation knowledge

reduced — improved

The project provided practical training on SLM.

Ecological impacts

water quality

decreased — increased

Reduced soil erosion made this possible

surface runoff

increased — decreased

contour platforms reinforced with coconut husk and tree logs reduce the runoff speed and quantity.

soil moisture

decreased — increased

reduced run off and increased organic matter content.

soil loss — increased — decreased

soil organic matter/ below ground C

decreased — increased

Addition of compost increased the soil carbon content.

Off-site impacts

downstream siltation

increased — decreased

this happened as a result of reduced runoff

groundwater/ river pollution

increased — reduced

this happened as a result of reduced runoff

damage on neighbours' fields

increased — reduced

this happened as a result of reduced runoff

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

Gradual climate change

seasonal temperature decrease not well at all ✓ very well Season: dry season

Climate-related extremes (disasters)

drought not well at all ✓ very well

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

- The home gardens that were unproductive is now used for income generation
- The aesthetic view of the land increased
- Simple technology
- Low cost and affordable

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

- Land unit production is increased
- Farmers gained knowledge in sustainable land management techniques such as use of A – Frame for contour marking.
- Use of kitchen waste and other vegetative materials for composting is increased
- Conserve top soil moisture and reduce soil erosion

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

- 1)The contour terraces may damage by thunderstorm Enforcement of edges of the (contour/individual) platforms with coconut husk, timer logs and establish leader drains

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

- The farmers' awareness of technology and its' impact is low. Therefore, adaptation/dissemination is low. Farmer motivation and exposure visits are essential activities

REFERENCES

Compiler
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Editors

Reviewer
Ursula Gaemperli
Rima Mekdaschi Studer

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Resource persons
Bandara Rotawewa - SLM specialist

Full description in the WOCAT database
https://qcat.wocat.net/af/wocat/technologies/view/technologies_5621/

Linked SLM data
Approaches: Women practices SLM through Vanilla cultivation https://qcat.wocat.net/af/wocat/approaches/view/approaches_5177/

Documentation was faciliated by

Institution
- n.a.

Project
- Rehabilitation of Degraded Agricultural Lands in Kandy, Badulla and Nuwara Eliya Districts in the Central Highlands of Sri Lanka

Key references
- Women practice SLM through Vanilla cultivation [Sri Lanka]: No cost

Links to relevant information which is available online
- WOCAT Approach: https://qcat.wocat.net/en/wocat/approaches/view/approaches_5177/