Left: Farmer collecting slashed materials for the construction of contour bunds (BB Tamang)
Right: Contour bunds constructed with dry slashed materials (BB Tamang)

Contour bunding

Nepal: भाँजो राख्ने

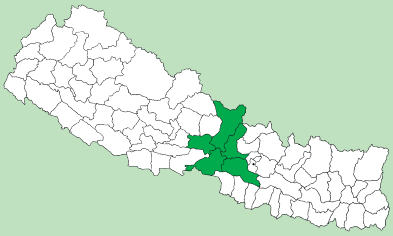
A traditional low-cost method of soil conservation suitable for sloping land; it promotes water retention and helps prevent erosion.

Contour bunding is a proven sustainable land management practice for marginal, sloping, and hilly land where the soil productivity is very low. It is widely adopted by the ethnic minorities of Nepal who practice the shifting cultivation system of farming. Over generations, they have successfully used this technology to control soil erosion, promote water retention, and increase crop production. It has a high probability of replication because it is simple to implement, is low cost, and makes the maximum use of local resources.

Farmers use a multi-step process to promote the formation of rough terraces along contour lines on sloping land. First the vegetation on the shifting cultivation plot (mostly fodder and forage trees and bushes) is cut down and the leaves and small twigs removed from the branches by slashing. All the material is left on the surface to dry. The leaves and twigs gradually decompose. After a few weeks, the remaining dry material is rolled into bundles and arranged along contour lines. The material is anchored with pegs, stones, and (where possible) tree stumps. This is the beginning of the contour bund. The farmers then incorporate the remaining leaf litter and decomposed organic matter into the soil between the bunds and plant crops. Over time, as the soil gradually deposits above each bund and is eroded below, rough terraces are formed. The process is labour intensive and farmers need to regularly check and maintain the bunds to allow the soil to collect.

Contour bunding is relatively easy to establish and maintain since it does not require external inputs and local unskilled labourers can make them using locally available woody materials. It is also both sustainable and ecofriendly since there are no external inputs and no organic matter is burned in the process.

The use of contour bunding is limited by the fact that it is labour intensive and that bunding cannot be implemented during the fallow period of the shifting cultivation cycle, thus it can only be applied on a plot for two years (the cultivation period of the shifting cultivation cycle).



WOCAT database reference: QT NEP 26
Location: Chitwan, Tanahun, Gorkha, Dhading and Makawanpur Districts, Nepal
Technology area: 1–10 km^2
Conservation measure(s): Structural
Land use: Mixed land: agroforestry
Stage of intervention: Mitigation/ reduction of land degradation
Origin: Initiated by the land users
Climate: Subhumid/subtropical
Other related technology: Improved terraces (QT NEP 2)
Compiled by: Bir Bahadur Tamang, LI-BIRD
Date: March 2010, updated March 2013

The technology was documented using the WOCAT (www.wocat.org) tool.

ICIMOD LI-BIRD WOCAT

Classification

Land use problems

Shifting cultivation is a traditional farming system practice used by the ethnic minorities who farm marginal, hilly, and sloping land. Erratic rainfall and improper land use practices all contribute to land Rock phosphate is not always available ➔ crushed stone dust can be substituted. degradation.

Land use

Agroforestry: crops and trees on rainfed land

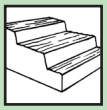
Climate

Subhumid/ subtropical

Degradation

Water erosion: topsoil is lost during rainfall

Conservation measures



Structural measure: barriers

Stage of intervention

- Prevention
- Mitigation/reduction
- Rehabilitation

Origin

- Land users' initiative
- Experiments/research
- Externally introduced
- Other (specify)

Level of technical knowledge

- Low
- Medium: land users
- High

Main causes of land degradation: over exploitation of the land, degradation by natural erosion, population pressures are forcing the farmers to overexploit these marginal lands

Technical function/impact

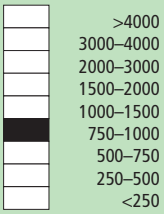
Main: Traps dispersed runoff

Secondary:
- Increases organic matter in the soil
- Increases water retention

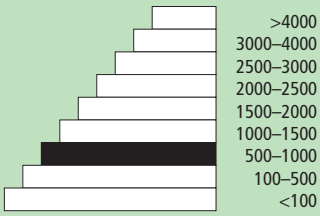
Environment

Natural environment

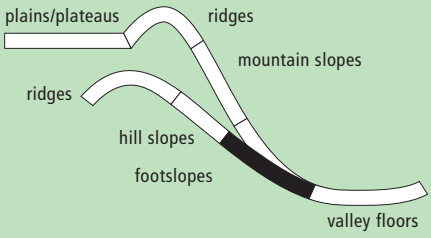
Average annual rainfall (mm)



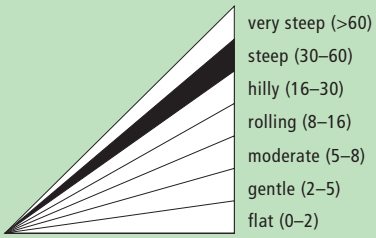
Altitude (masl)



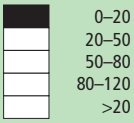
Landform



Landform Slope (%)



Soil depth (cm)

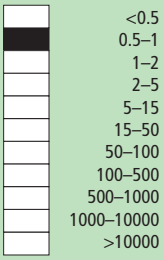


Growing season(s): two
Soil texture: coarse/light, sandy soil
Soil fertility: low
Topsoil organic matter: medium (1–3%)
Tolerant of climatic extremes: such as droughts

Sensitive to climatic extremes: yes
Soil water storage capacity: very low
Ground water table: <50 m
Availability of surface water: poor to none
Water quality: NA

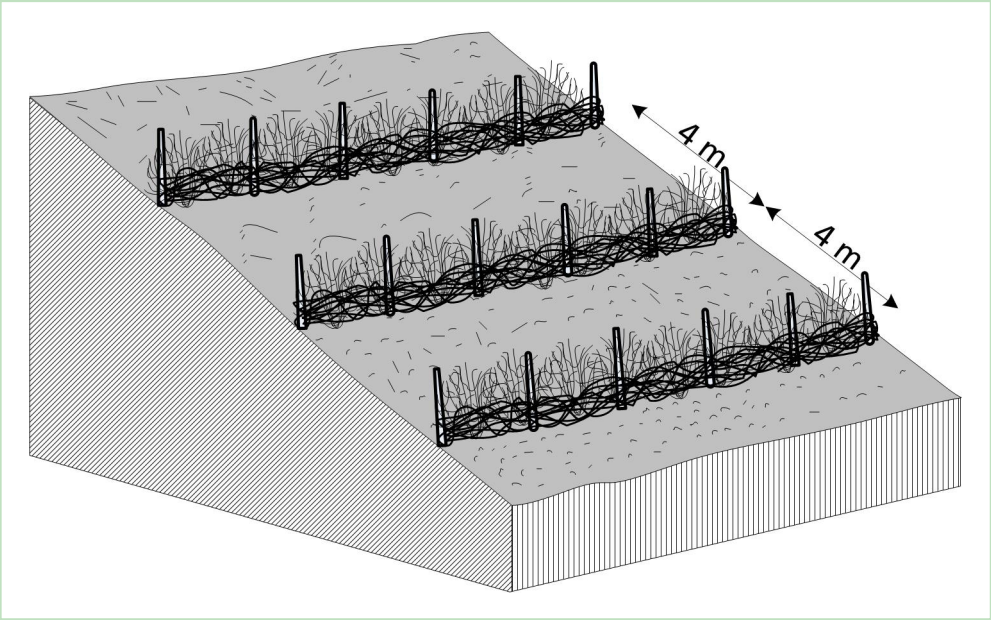
Human environment

Crop land per household (ha)



Land user: individual or household
Population density: 10–50 persons per km^2
Annual population growth: 2–3%
Land ownership: individual, not titled
Land/water use rights: customary rights: water-open access
Relative level of wealth: poor
Importance of off-farm income: 10–50% of all income is off-farm

Access to services and infrastructure: moderate
Market orientation: subsistence
Mechanization: manual labour
Livestock grazing on cropland: yes
Livestock density: not applicable
Purpose of forest/woodland use: not applicable
Types of other land: not applicable



Technical drawing
Contour bunding on sloping land; after leafy matter is slashed and allowed to dry it is gathered into bunds and anchored into place using locally available materials such as twigs and stones; note that the bunds are typically spaced about 4 m apart.
(BB Tamang and AK Thaku)

Implementation activities, inputs and costs

Establishment activities

- The vegetation on the plots (leafy fodder and others) is slashed and allowed to dry on the sloping land.
- The dried, slashed materials are chopped and allowed to partially decompose naturally on the soil.
- The dry materials are collected along contour lines and anchored into place using locally available materials.
- The land between the bund lines is enriched with the leaf litter and crops are planted.

Establishment inputs and costs per ha (average)

Inputs	Cost (USD)	% met by land user
Labour (16 person days)	43	100%
TOTAL	**43**	**100%**

Maintenance/recurrent activities

The bunding is periodically checked and lapsed areas are repaired as needed.

Maintenance/recurrent inputs and costs per ha per year

Inputs	Cost (USD)	% met by land user
Labour (4 person days)	11	100%
TOTAL	**11**	**100%**

Remarks:

- The cost of implementing this technology is dependent on the gradient of the slope (and other geographical features) and the availability of labour.
- All costs and amounts are rough estimates by the technicians and authors. Exchange rate USD 1 = NPR 73 in March 2010

Impacts of the technology*

Production and socioeconomic benefits

+ + + Simplified farm operations
+ + Increased crop yield
+ + Diversified income sources
+ + Increased farm income
+ Reduced expenses on agricultural inputs
Increased product diversification

Production and socioeconomic disadvantages

− − Reduced wood production
− Increased labour constraints

Socio-cultural benefits

+ + Improved knowledge of conservation/erosion
+ + Improved food security/self-sufficiency (reduced dependence on external inputs)
+ Improved health
+ Strengthened community institutions

Socio-cultural disadvantages

− Introducing this practice into areas where it is not a customary practice may upset traditional norms

Ecological benefits

+ + Increased organic matter in the soil
+ + Increased nutrient cycling/recharge
+ Improved soil cover
+ Increased soil moisture
+ Reduced soil loss

Ecological disadvantages

− Increased competition (water, sunlight, nutrients)
− Increased habitat fragmentation
− Increased niches for pests (birds, slugs, rodents, etc.)

Off-site benefit

+ + Reduced downstream flooding
+ + Reduced downstream siltation
+ Reduced amount of sediments transported by wind
+ Improved buffering/filtering capacity (by soil, vegetation, wetlands)

Off-site disadvantages

none

Contribution to human wellbeing/livelihood

+ Increase crop production, with associated increase in income and improved human health

Benefits/costs according to the land user

Average cost required to establish and maintain this technology is low and the long-term benefits are high.

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

Acceptance/adoption:
About 200 land user families have voluntarily adopted this technology in Tanahun, Chitawan, Gorkha, Dhading, and Makawanpur Districts of Nepal.

Concluding statements

Strengths and →how to sustain/improve	**Weaknesses** and →how to overcome
Decreased soil erosion and increased productivity of the soil → Formation of permanent bunds and terraces; adds organic matter to the soil	Slashing contributes to the risk of forest fires → After drying, the slashed materials should be rolled out within a week
Natural terrace formation and decreasing slope gradient → Over time, as more soil deposits on the bunds, the gradient is naturally decreased	When too many trees are slashed it can promote landslides → Grow trees along the bunds; fodder trees are especially beneficial
As the organic matter content increases, humus soil is formed and the soil fertility increases → Continue to accumulate crop residues on the surface; these will decompose and increase the organic matter content of the soil	Bunds may harbour biological pests such as rodents → Regular maintenance and pest control can help to limit unwanted wildlife

Key reference(s): Regmi, BR; Aryal, KP; Subedi, A; Shrestha, PK; Tamang, BB (2001) *Indigenous knowledge of farmers in the shifting cultivation areas of Western Nepal.* Pokhara, Nepal: LI-BIRD

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