Left: Compost pit covered to protect from rain and direct sunlight (Juerg Merz)
Right: Simple compost pit covered with a plastic sheet and leaf litter (Juerg Merz)

Improved compost preparation

Nepal: सुधारिएको कम्पोष्टमल निर्माण

Improved compost preparation using a range of biomass and waste to produce high value fertiliser

Compost can be prepared from a wide range of organic materials including dead plant material such as crop residues, weeds, forest litter, and kitchen waste. Compost making is an efficient way of converting all kinds of biomass into high value fertiliser that serves as a good alternative to farmyard manure, especially for crop-growing households without livestock. The compost is often mixed with forest soil, ripe compost from the previous batch, or even a small amount of animal dung as a starter for the decomposition process. The mix of materials determines the quality of the final compost as much as the management of the composting process. Nitrogen-rich fresh materials such as legume residues and many types of weeds and shrubs are mixed with carbon-rich forest litter and cereal residues. Small amounts of wood ash, lime, or mineral fertiliser can help increase or balance the overall nutrient content of the compost.

The compost needs to be turned every 30-50 days depending on the mix and the outside temperature. It should be protected from direct sunlight, rainfall and runoff so as to reduce volatilisation and leaching of nutrients. The material must remain moist at all times to avoid slowing down decomposition and hindering the efficiency of the micro and macro-organisms involved in decomposition. Heaping the compost or collecting the material in a pit helps the compost to reach the temperatures needed (70^{0}C) to destroy pests and weeds.

Once the compost is well decomposed and has an earthy smell, it can be applied directly or stored for later application. It can be applied as a crop fertiliser in rows or to individual plants for improving general soil fertility and organic matter content, thus improving the soil structure and its water holding capacity.

The Sustainable Soil Management Programme (SSMP) implements its projects in several midhills districts of Nepal
(dark green: previous working districts;
light green: districts in 2007)

WOCAT database reference: QT NEP7
Location: Nepal midhills
SWC measure: Management
Land use: Annual cropping on rainfed agricultural land
Climate: Humid subtropical
Related approach: Farmer- to-farmer diffusion (QA NEP1); Farmer-led experimentation (QA NEP3); Farmer field school on integrated plant nutrient systems (QA NEP4)
Compiled by: SSMP
Date: January 2007

The Sustainable Soil Management Programme is implemented by Helvetas Nepal and Intercooperation in collaboration with the Government of Nepal and civil society actors. It is financed by the Swiss Agency for Development and Cooperation. The technology was documented using the WOCAT (www.wocat.org) tool.

Classification

Land use problems

Intensifying cultivation practices with either 1) the inadequate application of fertilisers leading to a decline in soil fertility and the mining of soil nutrients or 2) the application of too much fertiliser causing environmental problems through excessive leaching, and losses of fertiliser in surface runoff and consequent eutrophication or nitrification of streams, ponds or groundwater.

Land use

Annual crops: maize-wheat, potato, mustard, different types of vegetables

Climate

Humid subtropical

Degradation

Chemical degradation: soil fertility decline, soil nutrient mining

SWC measures

Management: compost quality improvement

Technical function/impact

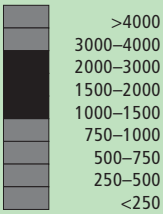
Main: - increase in soil fertility and productivity
- increase in soil organic matter content
- improvement in physical soil conditions
- increase in soil water holding capacity

Secondary:

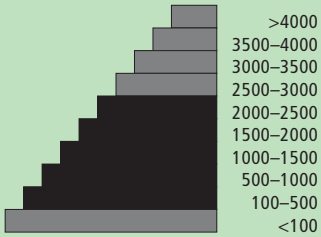
Environment

Natural environment

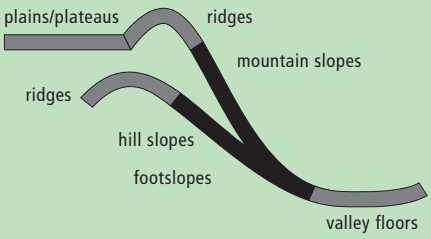
Average annual rainfall (mm)



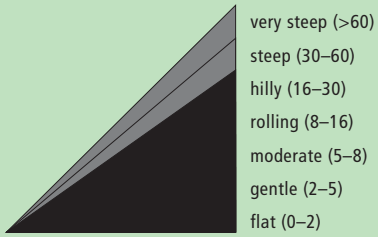
Altitude (masl)



Landform



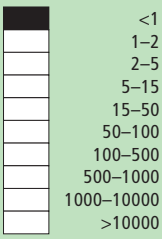
Slope (%)



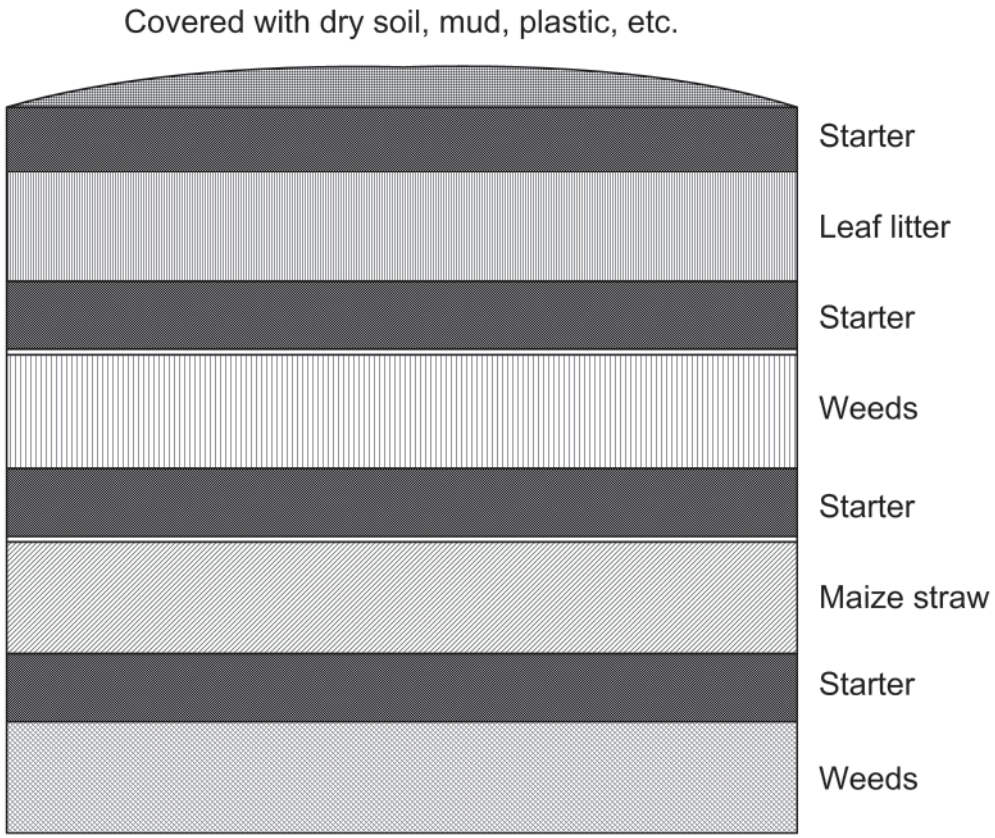
Applied Potential

Human environment

Cultivated land per household (ha)



Land use rights: individual, leased (sharecropping between owner and tenant)
Land ownership: individually owned, titled and not titled
Market orientation: subsistence, commercial, and mixed (subsistence/commercial)
Level of technical knowledge required: low
Number of livestock: poor households usually have some goats and one cow or buffalo, wealthier households often own several cattle, buffaloes, and a pair of oxen for ploughing
Importance of off-farm income: in most farm households, off-farm income plays at least a minor and increasingly a major role. Occasional opportunities for off-farm income present themselves in the form of daily labour wages. Some households' members receive regular salaries, whilst an increasing number of Nepalis are working in India, the Middle East, Malaysia, and elsewhere and sending remittance incomes home.



Technical drawing
Layering of the different materials in a compost pit

Note: This is just an example and need not be followed exactly. The important aspects are:

- the need for a starter such as forest soil or manure
- place weeds in the centre of the pit so that they are fully decomposed
- cover dry materials with moist material and material that only decays slowly with easily decaying material.

The pit can be 1 to 2m in diameter and about 1m deep.
The size depends on the available biomass for composting and the amount of compost required.

Implementation activities, inputs and costs

Establishment activities

1. Dig a 1-2m diameter and 1m deep pit using a spade or shovel
2. Collect crop residues, grass, tree leaves, ash, lime, and animal urine
3. Put a layer of ash at the bottom of the pit followed by tree leaves, grass, crop residues, and a layer of forest soil (as it contains the necessary microorganisms – bacteria, fungi, etc. – and quickens the decomposition process)
4. Add more tree leaves, crop residues, and grass until the pit is full and contains a healthy mixture of dry and fresh/moist materials
5. Cover the compost heap with a fine layer of ash or mud and a cap of grass or straw or plastic sheet

Duration of establishment: 1-2 days

Establishment inputs and costs

Inputs	Cost (US$)[1)]	% met by land user
Labour (1-2 days)	4	100%
TOTAL	**4**	**100%**

[1)] Exchange rate US$ 1 = NRs 67 in January 2007

Maintenance/recurrent activities

1. Dispose of domestic and household wastewater and cattle urine in the pit to keep it moist (but not saturated/soaked) until it is fully decomposed.
2. The compost needs to be turned every 30-50 days depending on the mix and the outside temperature.
3. Depending on the location, it takes about 3-6 months for the compost to be fully decomposed.

Maintenance/recurrent inputs and costs year

Inputs	Cost (US$)[1)]	% met by land user
Labour (~ 1 day)	2	100%
TOTAL	**2**	**100%**

[1)] Exchange rate US$ 1 = NRs 67 in January 2007

Assessment

Acceptance/adoption

About 30% of the participants of SSMP activities related to compost making adopted improved compost production. About 20% of farmers that were not part of the programme but came into contact with this technology, also adopted it. The semi-compost pit (a shallow pit with stone masonry wall around) was not well adopted due to high initial establishment costs.

Drivers for adoption

- Simple technology close to and derived from traditional practices and using locally available materials
- Compatible with traditional practices
- Moderately fast impact is visible (mainly through better physical conditions of the soil)
- Reduced pest incidence in the soil due to well decomposed compost
- No need for livestock
- Inexpensive (except semi-pit method)

Constraints to adoption

- Not suitable for large and commercial scale agriculture (except for nurseries and seed beds)
- Labour intensive

Benefits/costs according to land users

The high cost of mineral fertilisers means that the establishment costs are soon recovered. In the long-term, a major reduction in costs leads to large benefits.

Benefits compared with costs	short-term	long-term
establishment	positive	positive
maintenance/recurrent	positive	positive

Impacts of the technology*

Production and socioeconomic benefits

+ + + Reduced expenses on chemical fertilisers
+ + + Improved soil fertility
+ + + Allows organic crop production

Production and socioeconomic disadvantages

- - Preparation of compost is labour intensive

Socio-cultural benefits

none

Socio-cultural disadvantages

none

Ecological benefits

+ + + Reduced application of fertilisers

Ecological disadvantages

- If forest litter is removed for composting material it impoverishes the forest soil

Off-site benefit

+ + Reduction of dependence on external inputs
+ + Reduction of nutrient influx into water bodies

Off-site disadvantages

none

* All changes in technology may have gender and equity implications and potentially affect the members of disadvantaged groups differently. This has not been assessed here but should be considered when recommending technology use.

Concluding statements

Strengths and ➔how to sustain/improve	**Weaknesses** and ➔how to overcome
The use of compost reduced the need for mineral fertiliser thus reducing production costs and outside dependence ➔ Further promote the technology to increase this impact	The preparation of compost is not appropriate for commercial use (except in nurseries)
Compost making does not require any livestock ➔ Its low cost and use of local materials makes it the fertiliser of choice for poor households	Compost requires a large amount of biomass which may otherwise be needed for fuel, fodder, or animal bedding ➔Compost improvement should go hand-in-hand with promoting alternatives for the other requirements
In-situ composting saves labour involved in transporting compost to the fields	

Key reference(s): STSS; SSMP (2001) *Farmyard Manure and Compost Management* (in Nepali). Kathmandu: Soil Testing Services Section, Department of Agriculture and Sustainable Soil Management Programme

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