Left: Farmyard manure heap (Juerg Merz)
Right: Farmyard manure semi-pit (Juerg Merz)

Better quality farmyard manure through improved decomposition

Nepal: उपयुक्त विघटन प्रक्रियाद्वारा राम्रो गुणस्तरको गोठेमल

Collection and proper storage of farmyard manure in heaps or pits

Farmyard manure – a varying mixture of animal manure, urine, bedding material, fodder residues, and other components – is the most common form of organic manure applied in the midhills of Nepal. Farmyard manure has a high proportion of organic material which nurtures soil organisms and is essential in maintaining an active soil life. Only about half of the nutrient content of farmyard manure becomes available for crop growth during the first year after it has been applied to the soil – the rest is channelled through soil biotic processes and the nutrients are released in the following years. The high organic matter content and the active soil life improve or maintain friable soil structures, increase the cation exchange capacity, water holding capacity, and infiltration rate, and reducing the risk of soil pests building up.

Indigenous methods of preparing and using farmyard manure vary widely depending on the ecological zone, access to bedding material from crop or forest land, access to crop residues and fodder, labour availability, and other factors. A prerequisite for the manure having a positive impact on soil fertility is that it is properly decomposed. The application of partially decomposed manure can increase the number of white grubs, red ants and other soil pests.

Decomposition is enhanced and the time it takes to happen is reduced if the manure is kept warm and moist (but not wet) at all times. Heaping the manure up or storing it in a pit helps. Whether it is best to heap up the manure or put it in a pit depends on the local climate. Heaping has the advantage of being less costly, while the pit method reduces runoff and the loss of nutrient rich fluids. Adding nitrogen in the form of urine (N) improves the carbon to nitrogen ratio.

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 NEP8
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) inadequate application of fertilisers leading to a decline in soil fertility and the mining of soil nutrients or 2) 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	Climate	Degradation	SWC measures
			
Annual crops: maize-wheat, potato, mustard, different types of vegetables	Humid subtropical	Chemical degradation: soil fertility decline, soil nutrient mining	Management: heaping or storage in pits

Technical function/impact

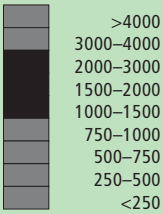
Main: - increase in soil fertility
- increase in soil productivity
- increase in organic matter

Secondary: - increased infiltration rate and water holding capacity
- improved soil physical properties

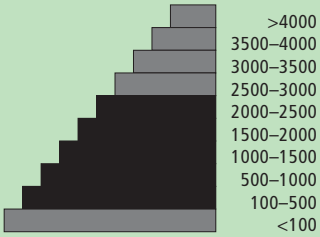
Environment

Natural environment

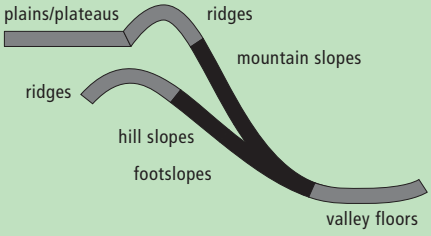
Average annual rainfall (mm)



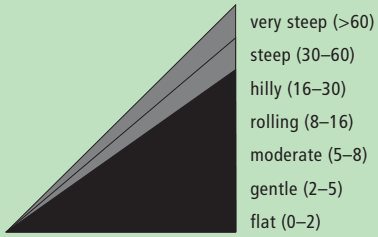
Altitude (masl)



Landform



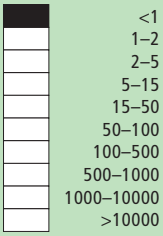
Slope (%)



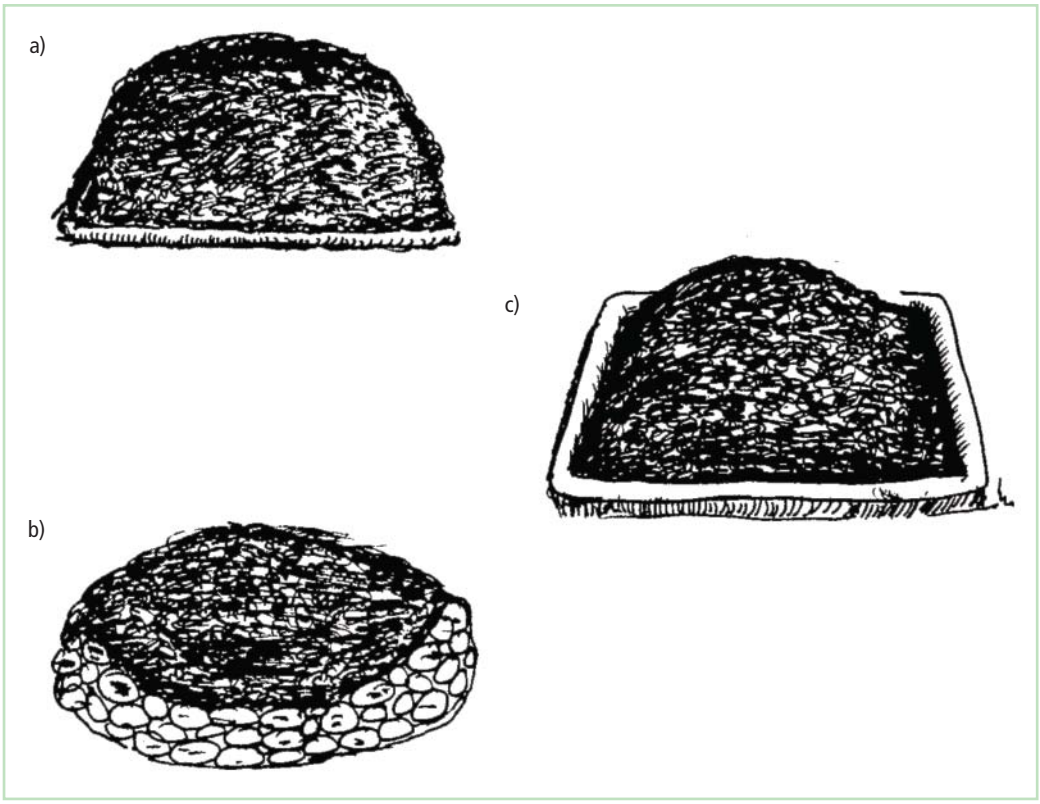
Applied Potential

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

a) Heap method
b) Pit method
c) Semi-pit method

The method should be chosen that is most convenient and provides the most favourable environment for decomposition of the manure. Generally heaps and pits are about 1 to 2m in diameter depending on the amount of manure produced and required.

Implementation activities, inputs and costs

Establishment activities (pit method)[1)]

1. Dig a 1m deep and 2m diameter pit using a shovel or spade.
2. Put dung mixed with leaf litter, bedding material and fodder residues in the pit until it is full.
3. Apply urine directly over the manure heap using a plastic pipe or jug.
4. Cover the heap with a fine layer of straw, mud, soil or plastic sheet or any other suitable local materials to protect it from direct sunlight and excessive water.

Duration of establishment: ~ 1 day

Establishment inputs and costs per pit

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

[1)] The heap method is cheaper, as no digging is involved [2)] Exchange rate as of January 2007, US$1 = NRs 67

Maintenance/recurrent activities

1. About one month after beginning to collect and pile up the material, turn the heap over manually using a spade or shovel.
2. Depending on the location, it takes about 3-4 months to prepare fully decomposed farmyard manure.

Maintenance/recurrent inputs and costs year

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

[1)] Exchange rate as of January 2007, US$1 = NRs 67

Assessment

Acceptance/adoption

The heap and pit methods have been very well accepted and adopted widely among participants in SSMP. The collaborating institutions report that 60-70% of participating farmers have adopted the method. The semi-pit method is not as accepted as the other methods due to its high initial establishment costs.

Drivers for adoption

- Simple technology close to and derived from traditional practices and based on local materials.
- Improvement of the traditional practices
- Moderately fast visible impact (mainly through better physical conditions of the soil).
- Reduced soil pest incidence due to well decomposed farmyard manure)
- Inexpensive (except semi-pit method because of the cost of the stone masonry wall around the pit)

Constraints to adoption

- Expensive initial establishment cost in the case of semi-pit method
- Livestock required (compost is the best alternative for farmers without livestock)

Benefits/costs according to land users

The high costs of mineral fertiliser mean that the establishment costs are recovered quarterly. Over the long-term, the 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 cash expenses on agrochemicals (fertilisers, pesticides) (substituted by labour)
+ Increased yields
+ Reduced incidence of soil pests (white grub, red ant)

Production and socioeconomic disadvantages

none

Socio-cultural benefits

+ + Cleaner environment around houses if manure heap or pit is well maintained

Socio-cultural disadvantages

none

Ecological benefits

+ + + Reduced application of mineral fertilisers

Ecological disadvantages

none

Off-site benefit

+ + Reduced dependence on outside inputs
+ + Reduced influx of nutrients 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 improved and well-decomposed farmyard manure reduced the need for mineral fertiliser and pesticides thereby reducing production costs, cash expenditure, and outside dependency → Further promote the technology to increase this impact	The initial establishment costs for building a semi-pit may hamper adoption →Promote alternative methods of building a semi-pit without using cement and using local resources
The use of fully decomposed farmyard manure reduces pest incidence, especially attacks of red ants and white grubs	

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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