Left: Urine collection channel (Kiran Ghising)
Right: Collected urine in a plastic vessel (Juerg Merz)

Improved cattleshed for urine collection

Nepal: मूत्र संकलनका लागि सुधारिएको गोठ

Collection of cattle urine in improved cattle sheds for use as liquid manure and organic pesticide

Nitrogen is the most important macronutrient for plants, and high crop productivity can only be achieved by making sufficient nitrogen available to crops. Nitrogen is also the most limiting nutrient in farms across Nepal's midhills. Traditionally farmers applied farmyard manure to fertilise their needs. In many places this is being supplemented or even entirely replaced by inorganic fertiliser – mainly urea. The price of inorganic fertiliser has increased continuously in recent years and it is only available in limited quantities in areas far from the roadheads. On the other hand, cultivation practices are intensifying with increased cropping intensities and more nutrient-demanding crops as, for example, local varieties are replaced by hybrids and new crops are grown. This can easily lead to declining soil fertility and nutrient mining if it is not compensated for by an equivalent increase in organic or mineral fertilisation.

Cattle urine is a viable alternative to mineral fertiliser. Of the nitrogen excreted by cattle, 60% is found in the urine and only 40% in dung. In traditional sheds, urine is left to be absorbed in the bedding material, while excess urine is channelled out of the shed and disposed of. The technology described here – improved cattle sheds – are designed for collecting the urine in a pit or drum. This pit is generally located in the shed itself or just outside connected to the drainage channel through a pipe and protected from rain and runoff. Where urine is collected for incorporation in farmyard manure, the pit may be directly connected to the manure pit or heap. Urine that is going to be used as liquid manure or organic pesticide has to be stored in a drum for fermentation.

A household with two cattle can save the equivalent of purchasing about 100 kg of urea over one year by applying urine either directly as liquid fertiliser or as a component in improved farmyard manure.

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 NEP1
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: collection of urine, rather than its disposal

Technical function/impact

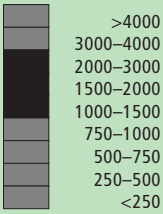
Main: - organic manure
- increase in soil fertility
- increase in soil productivity
- pest control

Secondary: - supplementary irrigation

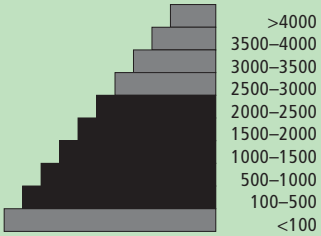
Environment

Natural environment

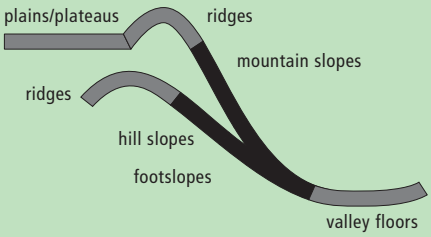
Average annual rainfall (mm)



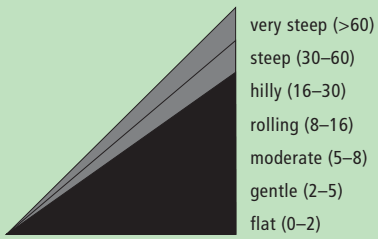
Altitude (masl)



Landform



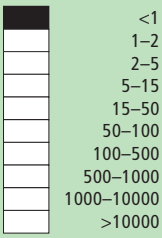
Slope (%)



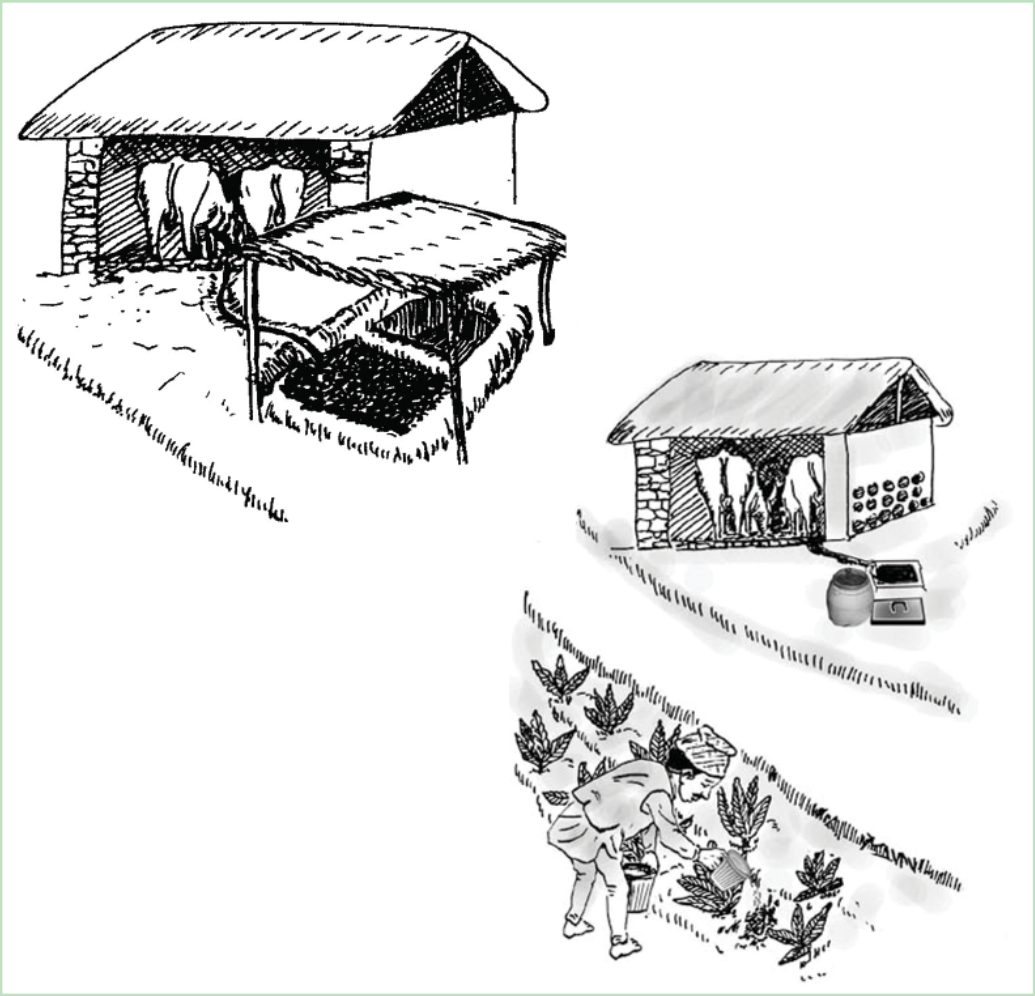
Applied Potential

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) Urine collection and direct incorporation in covered farmyard manure pit.

b) Urine collection for later application as liquid manure or organic pesticide.

Implementation activities, inputs and costs

Establishment activities

1. Provide slight slope to the cattle shed floor
2. Dig a draining ditch and a collection pit, if possible at the lowest point inside the shed. If this is not possible, an outside pit should be dug, protected from rain and runoff, and connected with the draining ditch through a pipe or a channel.
3. Make the floor as impermeable as possible; e.g. with cement (expensive and durable), stone slabs, soil compaction, or clay (cheap but not durable). The more impermeable the floor, the more urine can be collected.
4. Provide a jug/'decapitated' plastic bottle/cup/etc. to scoop the urine out of the collection pit into the fermentation drum.

Duration of establishment: < 1 week

Establishment inputs and costs per shed (average)

Inputs	Cost (US$)[1)]	% met by land user
Labour (3 days)	6	100%
- Plastic drum	6	0-100%
TOTAL	**12**	**0-100%**
	(~ about 30 kg urea)[2)]	

[1)] Exchange rate US$1 = NRs 67 in January 2007 [2)] At the rate of NRs 1400 per 50 kg urea

Maintenance/recurrent activities

1. When the collection pit is full, the collected urine has to be removed from the pit and stored in a plastic drum for fermentation.
2. The urine is applied as liquid fertiliser by jug or through drip irrigation.

Maintenance/recurrent inputs and costs per system per year (2006)

Inputs	Cost (US$)	% met by land user
Labour (10 minutes/ day)	negligible	100%
TOTAL	**negligible**	**100%**

Remarks: It is clear that cattle or buffaloes are required for urine production. To help farmers to use their own resources, it is suggested to start with the cheapest and simplest form of urine collection and a compacted sloping floor and a collection pit within the shed. This allows the farmer to see the benefits of collecting the urine and will encourage them to invest in more expensive materials to improve the efficiency of urine collection.

Assessment

Acceptance/adoption

Setting up a system for collecting urine is generally linked with the relatively costly job of making improvements to a cattle shed. Approximately 30% of farmers who had participated in SSMP-supported programmes and were questioned during an impact assessment had adopted the technology. At the same time about 15% of farmers who were not members of SSMP-supported groups had also adopted the technology.

Drivers for adoption

- local resource, reduced costs for fertilisers
- simplicity of method
- impact on crop productivity
- pest control

Constraints to adoption

- cost of materials, plastic drum, cement, etc.; note that the provision of a plastic drum by the programme proved to be a disincentive for wider adoption as farmers outside the supported groups waited for a free drum before adopting the technology
- where resident housing was in a state of disrepair, owners wanted first to repair their houses before improving their cattle sheds (mainly in the Far Western Development Region)
- high establishment costs if cement is used

Benefits/costs according to land users

The high cost of mineral fertiliser means that the establishment costs are soon recovered. In the long-term, the major reduction in fertiliser cost leads to increased 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 for agrochemicals (fertilisers, pesticides)
+	Easier shed management and cleaning
+	Improved animal health
+ +	Allows organic crop production

Production and socioeconomic disadvantages

- - -	High establishment costs if cement is used

Socio-cultural benefits

+	Social prestige as seen as progressive farmer

Socio-cultural disadvantages

-	Requires handling of dung and urine

Ecological benefits

+ + +	Reduced application of agrochemicals (fertilisers, pesticides), reduced eutrophication and nitrification of water bodies due to controlled outflow of urine

Ecological disadvantages

none

Off-site benefit

+ +	Reduction of dependence on outside 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 urine collected on-farm reduced the requirement for mineral fertiliser which reduced production costs and outside dependency ➔ Further promotion of the technology will increase this impact	The initial costs incurred whilst improving a durable shed using cement may hinder adoption ➔Simpler methods such as using clay soil, compacting the floor, and using stone slates may, however lead to less urine being collected
Human urine can also be used to fertilise crops, but needs to be fermented longer and may be socially less accepted ➔ Promote the use of urine further and show there is no problem with using human urine	Project incentives (cement, plastic drum) have hindered adoption in some places ➔ No incentives should be provided, rather very simple methods should be demonstrated and adapted to local conditions
Applying urine as a liquid manure also irrigates the crops (fertigation) ➔ The link between urine application and drip irrigation, or other forms of small-scale irrigation, should be promoted. It has been tested and applied successfully by farmers related to SSMP in Syangja and Surkhet in western Nepal	Urine collection is feasible for subsistence farm households or small scale commercial producers. It may, however, not be applicable for larger scale commercial vegetable producers as a balance between area needed for livestock and growing the crops is needed ➔ Urine could become a tradeable commodity which would see large-scale livestock producers selling their urine to large-scale vegetable producers.

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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