Urine collection channel (Kiran Ghising)

Improved cattleshed for urine collection (Nepal)

Mutra sankalan ka lagi sudhariyeko goth (Nepali)

DESCRIPTION

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.

LOCATION

Location: Midhill districts of Nepal, Nepal

No. of Technology sites analysed:

Geo-reference of selected sites
- 85.0, 27.0

Spread of the Technology:

In a permanently protected area?:

Date of implementation:

Type of introduction
- through land users' innovation
- as part of a traditional system (> 50 years)
- during experiments/ research
- through projects/ external interventions

CLASSIFICATION OF THE TECHNOLOGY

Main purpose
- improve production
- reduce, prevent, restore land degradation
- conserve ecosystem
- 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

Land use

Cropland
- Annual cropping

Water supply
- rainfed
- mixed rainfed-irrigated
- full irrigation

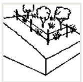
- mitigate climate change and its impacts
- create beneficial economic impact
- create beneficial social impact
- ■ Collect fertilizer

Purpose related to land degradation
- prevent land degradation
- reduce land degradation
- restore/ rehabilitate severely degraded land
- adapt to land degradation
- ■ not applicable

Degradation addressed

chemical soil deterioration - Cn: fertility decline and reduced organic matter content (not caused by erosion)

SLM group
- integrated soil fertility management

SLM measures

management measures - M6: Waste management (recycling, re-use or reduce)

TECHNICAL DRAWING

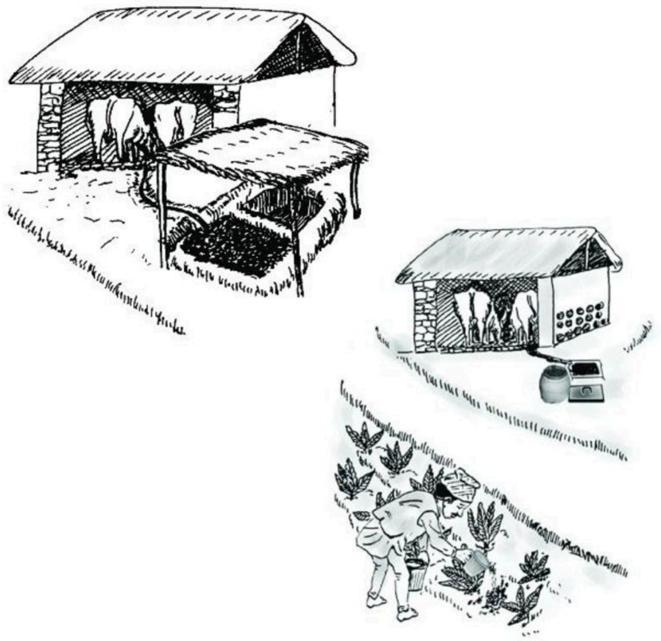
Technical specifications
a) Urine collection and direct incorporation in covered farmyard manure pit.
b) Urine collection for later application as liquid manure or organic pesticide.

Technical knowledge required for field staff / advisors: low

Technical knowledge required for land users: low

Main technical functions: increase in organic matter, increase in soil fertility, increase in soil productivity, pest control

Secondary technical functions: supplementary irrigation



ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS

Calculation of inputs and costs
- Costs are calculated: per Technology unit (unit: **Urine collection system**)
- Currency used for cost calculation: **USD**
- Exchange rate (to USD): 1 USD = n.a
- Average wage cost of hired labour per day: 2.00

Most important factors affecting the costs
n.a.

Establishment activities
1. Provide slight slope to the cattle shed floor (Timing/ frequency: None)
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. (Timing/ frequency: None)
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. (Timing/ frequency: None)
4. Provide a jug/'decapitated' plastic bottle/cup/etc. to scoop the urine out of the collection pit into the fermentation drum. (Timing/ frequency: None)

Establishment inputs and costs (per Urine collection system)

Specify input	Unit	Quantity	Costs per Unit (USD)	Total costs per input (USD)	% of costs borne by land users
Labour					
Labour	per unit	1.0	6.0	6.0	100.0
Construction material					
Plastic drum	per unit	6.0	1.0	6.0	100.0
Total costs for establishment of the Technology				**12.0**	
Total costs for establishment of the Technology in USD				*12.0*	

Maintenance 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. (Timing/ frequency: None)
2. The urine is applied as liquid fertiliser by jug or through drip irrigation. (Timing/ frequency: None)

NATURAL ENVIRONMENT

Average annual rainfall
- [ ] < 250 mm
- [ ] 251-500 mm
- [ ] 501-750 mm
- [ ] 751-1,000 mm
- [x] 1,001-1,500 mm
- [x] 1,501-2,000 mm
- [ ] 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
Annual rainfall: Also 2000-3000 mm
Thermal climate class: subtropics

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

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

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

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

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

Soil texture (> 20 cm below surface)
- [ ] coarse/ light (sandy)
- [ ] medium (loamy, silty)
- [ ] fine/ heavy (clay)

Topsoil organic matter content
- [ ] high (>3%)
- [ ] medium (1-3%)
- [ ] low (<1%)

Groundwater table
- [ ] on surface
- [ ] < 5 m
- [ ] 5-50 m
- [ ] > 50 m

Availability of surface water
- [ ] excess
- [ ] good
- [ ] medium
- [ ] poor/ none

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

Is salinity a problem?
- [ ] Ja
- [ ] Nee

Occurrence of flooding
- [ ] Ja
- [ ] Nee

Species diversity
- [ ] high
- [ ] medium
- [ ] low

Habitat diversity
- [ ] high
- [ ] medium
- [ ] low

CHARACTERISTICS OF LAND USERS APPLYING THE TECHNOLOGY

Market orientation
- [x] subsistence (self-supply)
- [ ] mixed (subsistence/ commercial)
- [x] 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
- [ ] poor
- [ ] average
- [ ] rich
- [ ] very rich

Level of mechanization
- [ ] manual work
- [ ] animal traction
- [ ] mechanized/ motorized

Sedentary or nomadic
- [ ] Sedentary
- [ ] Semi-nomadic
- [ ] Nomadic

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

Gender
- [ ] women
- [ ] men

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

Area used per household
- [x] < 0.5 ha
- [x] 0.5-1 ha
- [ ] 1-2 ha
- [ ] 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

Scale
- [ ] small-scale
- [ ] medium-scale
- [ ] large-scale

Land ownership
- [ ] state
- [ ] company
- [ ] communal/ village
- [ ] group
- [x] individual, not titled
- [x] individual, titled

Land use rights
- [ ] open access (unorganized)
- [ ] communal (organized)
- [x] leased
- [x] individual

Water use rights
- [ ] open access (unorganized)
- [ ] communal (organized)
- [ ] leased
- [ ] individual

Access to services and infrastructure

IMPACTS

Socio-economic impacts

expenses on agricultural inputs	increased	☐☐☐☐☐☐✓	decreased	Reduced expenses for agrochemicals
Shed management and cleaning	complicated	☐☐☐☐✓☐☐	simplified	
Organic crop production	disabled	☐☐☐☐☐✓☐	enabled	
Animal health	reduced	☐☐☐☐✓☐☐	improved	
Establishment costs if cement is used	increased	✓☐☐☐☐☐☐	decreased	

Socio-cultural impacts

Social prestige as seen as progressive farmer	reduced	☐☐☐☐✓☐☐	improved
Handling of dung and urine	increased	☐☐✓☐☐☐☐	decreased

Ecological impacts

Eutrophication and nitrification of waterbodies due to controlled outflow of urine	improved	☐☐☐☐☐☐✓	reduced

Off-site impacts

groundwater/ river pollution	increased	☐☐☐☐☐✓☐	reduced	Reduction of nutrient influx into water bodies
Dependence on outside inputs	improved	☐☐☐☐☐✓☐	reduced	

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

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.

CLIMATE CHANGE

-

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

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

- The use of urine collected on-farm reduced the requirement for mineral fertiliser which reduced production costs and outside dependency

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

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

- The initial costs incurred whilst improving a durable shed using cement may hinder adoption Simpler methods such as using clay

How can they be sustained / enhanced? Further promotion of the technology will increase this impact
- Human urine can also be used to fertilise crops, but needs to be fermented longer and may be socially less accepted

  How can they be sustained / enhanced? Promote the use of urine further and show there is no problem with using human urine
- Applying urine as a liquid manure also irrigates the crops (fertigation)

  How can they be sustained / enhanced? The link between urine application and drip irrigation, or other forms of smallscale irrigation, should be promoted. It has been tested and applied successfully by farmers related to SSMP in Syangja and Surkhet in western Nepal

soil, compacting the fl oor, and using stone slates may, however lead to less urine being collected
- 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
- 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.

REFERENCES

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Resource persons
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Full description in the WOCAT database
https://qcat.wocat.net/af/wocat/technologies/view/technologies_1752/

Linked SLM data
Approaches: Farmer field schools on integrated plant nutrient systems https://qcat.wocat.net/af/wocat/approaches/view/approaches_2351/
Approaches: Farmer-led experimentation https://qcat.wocat.net/af/wocat/approaches/view/approaches_2559/
Approaches: Farmer-to-farmer diffusion https://qcat.wocat.net/af/wocat/approaches/view/approaches_2558/

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Key references

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