



## Organic pest management

Nepal: जैविक रोगकीरा व्यवस्थापन

### Promotion of botanical pesticides for organic pest management and liquid manure

Production of fresh vegetable is often hampered by pests which may reduce production and badly affect farmers' income. Chemical pesticides are available and are used, sometimes excessively, to combat these pests in parts of Nepal's midhills. Botanical pesticides prepared from a variety of plant ingredients soaked and fermented in cattle urine provide a suitable alternative to chemical pesticides, at least for subsistence and semi-commercial vegetable producers. These pesticides are based on farmer's traditional knowledge and are emerging as alternatives to the application of chemical pesticides.

All the ingredients for these pesticides are available locally; in some cases the plants are considered as weeds. Crofton weed (banmara) grows in abundance along roads and paths, and on forest floors and suppresses the growth of other more valuable species. It is believed to have pesticidal effects and is often used in botanical pesticides. The Nepali names of other plants commonly used in the tonics are asuro (malabara tree), titepati (mugwort), bakaino (Persian lilac), timur (Nepali pepper), patina (field mint), tulsi (sweet basil), neem, sisnu (stinging nettle), ketuke (century plant), and khiro (tallow tree). In general it is said that herbs and plants that are bitter, pungent, or 'hot' or that produce a strong odour are most effective in botanical pesticides.

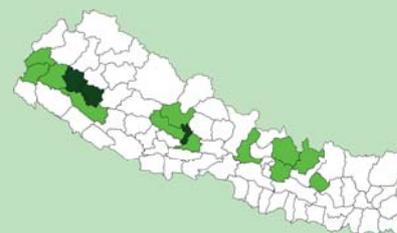
The botanical pesticide is diluted with water before applying to vegetable crops. The dilution ratio depends on the age and type of the plant being treated with a higher dilution for seedlings in nurseries than for mature plants. While botanical pesticides do not kill all pests, they do combat soft-bodied insects such as aphids and act as a repellent against larger insects like cutworms, various larvae, and red ants. They are not usually effective against plant diseases.

In some places innovative farmers have started to produce and sell botanical pesticides for pest management and as a liquid manure for foliar application.

**Left:** Crop sprayed exclusively with botanical pesticides (Juerg Merz)

**Right:** Different plants soaked in cattle urine for later use as a botanical pesticide (Juerg Merz)

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 NEP4

**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)

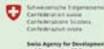
**Compiled by:** SSMP

**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](http://www.wocat.org)) tool.



helvetas Nepal



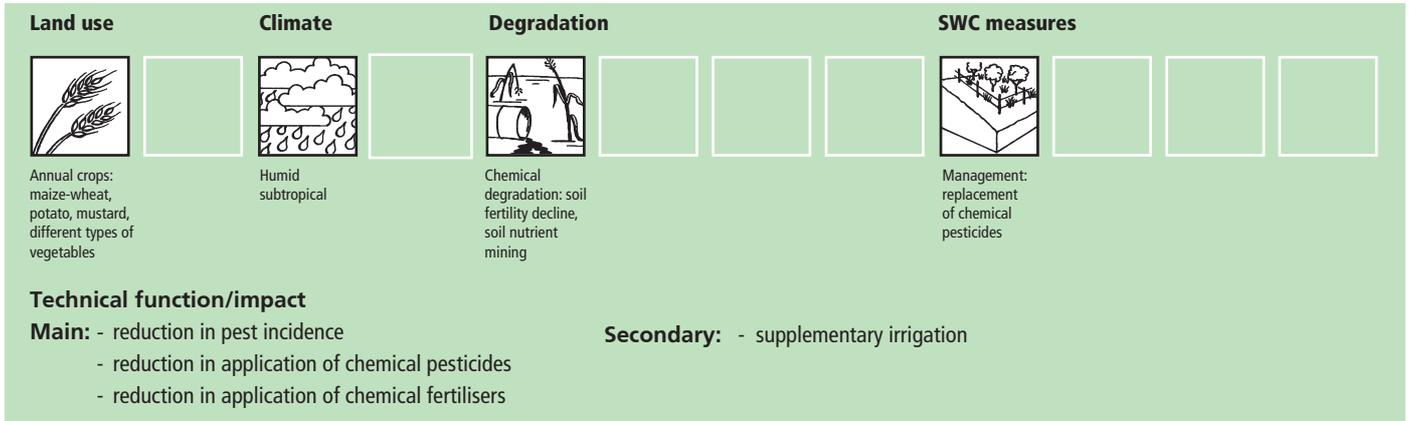
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WOCAT

## Classification

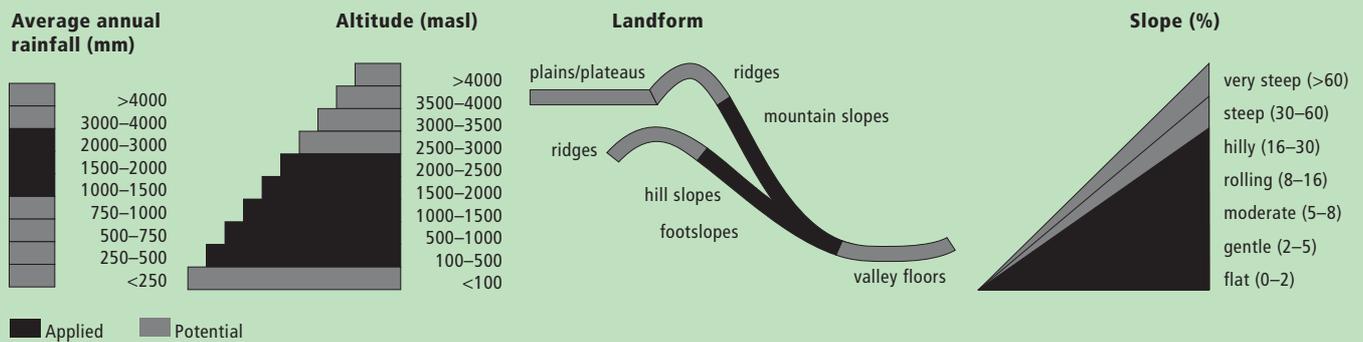
### Crop cultivation problems

Intensifying cultivation practices and the increasing demand for fresh and off-season vegetables have increased the incidence of pests. These pests are controlled mainly by chemical pesticides where available, and where they are not available entire crops can be destroyed and farmers' livelihoods endangered.



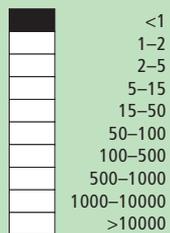
## Environment

### Natural environment



### 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 generally have some goats and a cow or buffalo. Rich 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

The following plants are amongst many reported to have pesticidal value (from top left corner to lower right corner)

- sisnu (*Urtica dioica*)
- timur (*Zanthoxylum oxyphyllum*)
- titepati (*Artemisia vulgaris*)
- ketuke (*Agave americana*)
- banmara (*Eupatorium odoratum*)
- kantakari (*Solanum xanthocarpus*)
- bakaino (*Melia azedarach*)

A comprehensive list can be found in Neupane (2056 BS).

## Implementation activities, inputs and costs

### Establishment activities

1. Different plants with pesticidal properties are collected and chopped into small pieces. Only tender parts should be used to facilitate decomposition.
  2. Other materials like ginger powder, green chilli, ash, and mustard cake are mixed with the chopped plant material.
  3. The material is placed in a plastic drum or earthen pot and soaked in cattle urine at the rate of about one kilogramme of solid material per 2 litres of cattle urine.
  4. The drum is closed as air-tight as possible and put in a shady place.
- Preparation and set-up time: < 2 days

### Establishment inputs and costs

Inputs	Cost (US\$) <sup>1)</sup>	% met by land user
Drum (20 l)	6	100%
Labour (2 days)	4	100%
<b>TOTAL</b>	<b>10</b>	<b>100%</b>

(~ gives equivalent to 650 ml of systematic poison to control aphids<sup>2)</sup>)

<sup>1)</sup> Exchange rate as of January 2007, US\$1 = NRs 67, <sup>2)</sup> at the rate of 1.5 US\$ per 100 ml

### Maintenance/recurrent activities

1. The botanical pesticide needs to be stirred with a wooden stick about every 15 days.
2. The prepared pesticide is normally ready for field application after about 35-40 days of fermentation/preservation.
3. The pesticide is diluted with water 1:4 (1 part pesticide solution: 4 parts water) for mature plants and 1:8 for nurseries and applied with a jug, sprayer, or broom.

### Maintenance/recurrent inputs and costs per ha per year

Inputs	Cost (US\$)	% met by land user
Labour	negligible	100%
<b>TOTAL</b>	<b>negligible</b>	<b>100%</b>

## Assessment

### Acceptance/adoption

The preparation and use of botanical pesticides has mainly been adopted by small to medium scale producers of fresh vegetables. A survey of farmers trained in preparing and applying botanical pesticides by SSMP found that 50% of them were producing and applying the pesticides themselves. Only 10% of local farmers from outside the SSMP groups were using the technology.

#### Drivers for adoption

- Inexpensive and simple technology based on locally available materials
- Based on traditional knowledge from local farmers
- Reduces expense of chemical pesticides
- Very effective against aphids

#### Constraints to adoption

- Time consuming preparation process
- Not effective for all kinds of pests – especially large insects – and not effective against plant diseases
- Variability of mixtures, not standardised, efficiency not guaranteed

### Benefits/costs according to land users

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

### Impacts of the technology\*

#### Production and socioeconomic benefits

- +++ Reduced expenditure on agrochemicals (fertilisers, pesticides)
- ++ Decreased pest incidence and destruction of crops
- ++ Improved crop health due to additional fertiliser
- ++ Allows organic production of crops

#### Socio-cultural benefits

- ++ Increased social prestige as use shows user to be a progressive farmer

#### Ecological benefits

- +++ Reduced application of agrochemicals (fertilisers, pesticides)
- +++ Improved soil biology health

#### Off-site benefit

- ++ Reduction of dependence on costly external inputs
- ++ Reduction of chemical pesticide contamination of water bodies

#### Production and socioeconomic disadvantages

- Labour-intensive preparation of botanical pesticides
- Need to be prepared fresh for each crop, therefore demanding labour often at inconvenient times

#### Socio-cultural disadvantages

- May not be accepted due to urine in the mixture (especially if human urine is used)

#### Ecological disadvantages

- May acidify the soil if not decomposed well

#### 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

Organic pest management using botanical pesticides reduce the expense of pest control → Further promote the benefits of organic pest management

Organic pest management reduces the negative impact of chemical pesticides → Further promote the benefits of organic pest management

### Weaknesses and →how to overcome

Labour intensive preparation often at inconvenient times as the botanical pesticide has to be prepared fresh for each crop and can only be stored for a limited amount of time → Develop methods that reduce labour requirements and highlight possibilities for bulk production and adequate storage without losing effectiveness

The reagents that are effective in the botanical pesticides have not been identified → Carry out applied research into the different reagents and their effect on different pests

The botanical pesticides are not effective against all pests → Carry out applied research into and document the effects of different botanical pesticides on different pests

**Key reference(s):** Neupane, F.P. (2056 BS - 1999/2000) *Insect Control by Herbs*. Kathmandu: Sajha Publications ■ Several pamphlets on different tonal tonic compositions are available in Nepali from SSMP

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