



## No-till garlic cultivation

Nepal: खनजोत नगरि लसुन खेति

**No-till is a farming system in which the seeds are planted directly into untilled soil which still contains the previous crop residues. No-till cultivation of garlic is practised in the tropical lowland districts of western Nepal where garlic is sown directly into the soil after the paddy is harvested.**

No-till\* methods minimize soil disturbance and allow crop residues or stubble to remain on the ground instead of being removed or dug into the soil. As practised in the western Terai of Nepal, the seedbed is prepared by leaving a 3–5 cm thick layer of rice paddy crop residue on the soil surface after the paddy harvest. Garlic seed is planted directly into the soil soon after the paddy is harvested at a spacing of approximately 15 cm and the entire field is then covered with a 10 cm (or more) layer of hay. The seeds germinate with the help of the ambient moisture. The frequency and timing of irrigation depends on need, but since there has been no tillage and the ground is covered with mulch, much of the ambient moisture is retained in the soil. The mature garlic is harvested in February–March. This technology is gaining in popularity because farmers can directly see the economic benefit of not having to till the soil.

No-till methods are important from the standpoint of environmental farming for a number of reasons. The fact that the soil is not tilled after the paddy is harvested and remains covered with crop residues leads to efficient erosion control (up to 90%) and increased biological activity in and on the soil. The technology helps to conserve moisture in the soil, to improve the infiltration of water (up to 60%), and to reduce soil compaction, and overall, it requires less energy for cultivation (Derpsch et al. 2010). Increasing soil organic matter also helps to sequester carbon and contributes to reducing agricultural greenhouse gas emissions; ultimately, it supports increased production and resilience to climate change. In addition to keeping carbon in the soil, in a recent study, no-till farming was found to reduce nitrous oxide (N<sub>2</sub>O) emissions by 40–70%, depending on the rotation.

\* No-till in this context means the soil is not tilled after the paddy is harvested and before the garlic seeds are planted. After the garlic is harvested, the soil is tilled before the next crop is planted. No-till is a form of conservation tillage, which refers to methods that leave at least 30% of crop residues in place.

**Left:** No-till garlic cultivation in Gadariya VDC, Kailali District, Nepal (Krishna Lamsal)  
**Right:** Well-established garlic plants grown by the no-till method. Note that the original mulch is still in place helping to retain moisture. (Krishna Lamsal)



**WOCAT database reference:** QT NEP 39  
**Location:** Gadariya VDC, Kailali District, Nepal  
**Technology area:** Approximately 1–10 km<sup>2</sup>  
**Conservation measure(s):** Agronomic  
**Land Use:** Annual cropping  
**Stage of intervention:** Mitigation  
**Origin:** Innovative; this is a local initiative started about 10 years ago  
**Climate:** Subhumid/subtropical  
**Related approach:** Learning about no-till methods through farmer-to-farmer dissemination (QA NEP 39)  
**Compiled by:** Krishna Lamsal, LI-BIRD  
**Date:** July 2011, updated March 2013

The technology was documented using the WOCAT ([www.wocat.org](http://www.wocat.org)) tool.

ICIMOD

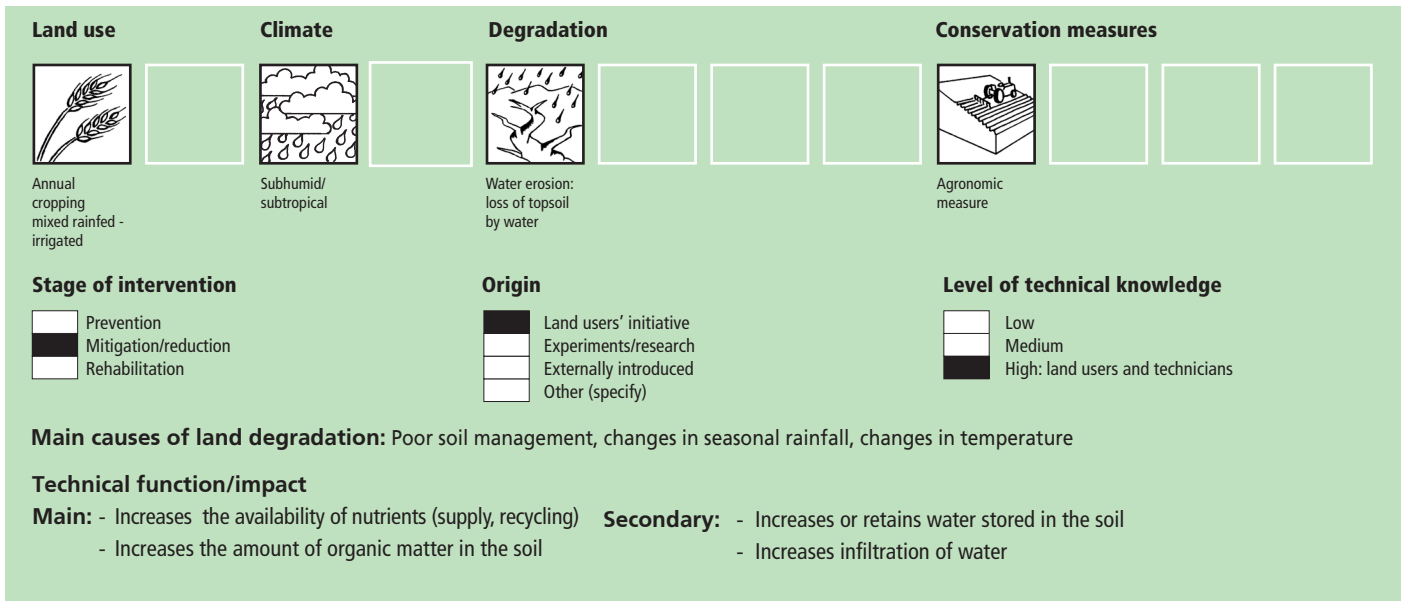


WOCAT

## Classification

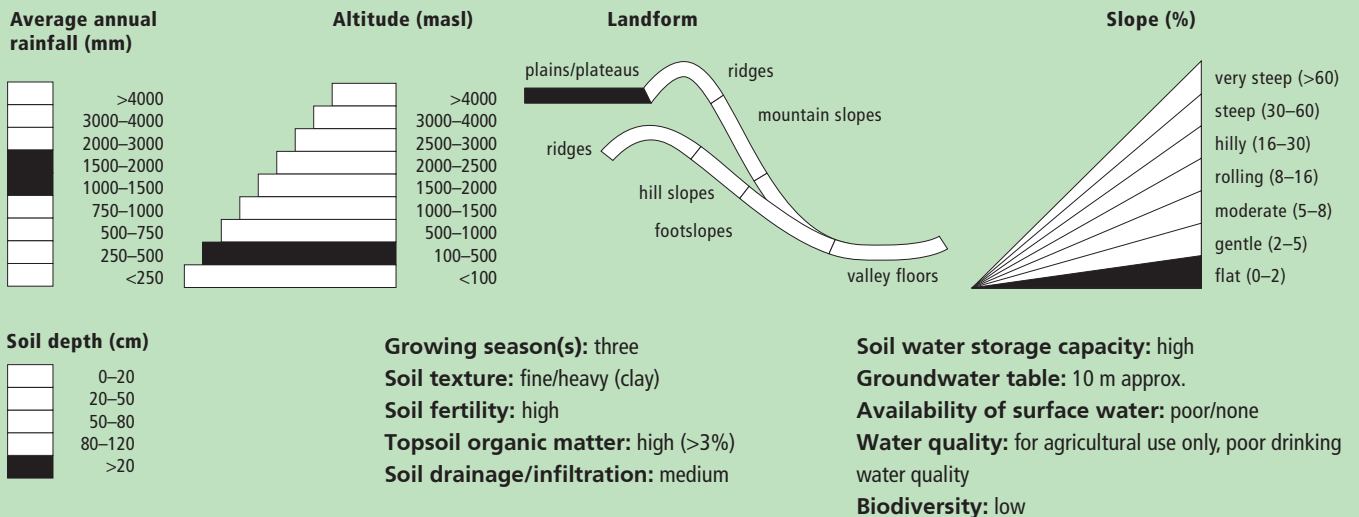
### Land use problems

Water scarcity due to drying out of water sources, irregular precipitation, and soil erosion, are the major land use problems.



## Environment

### Natural environment

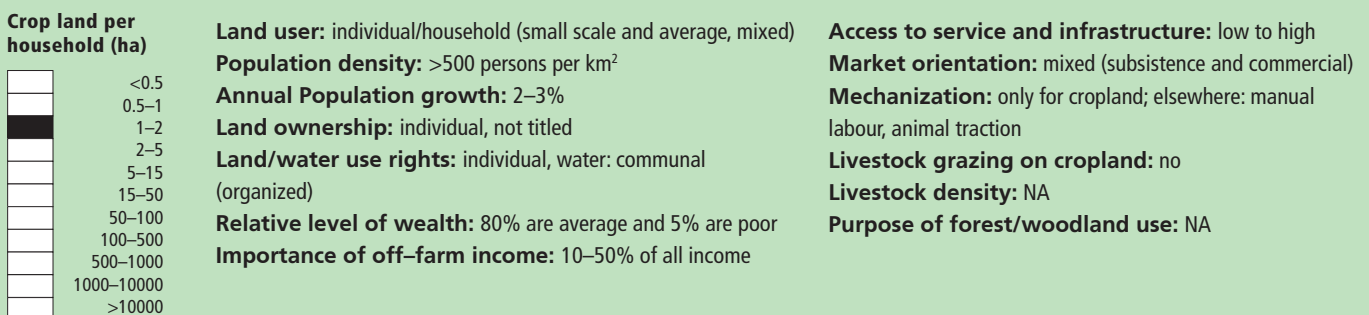


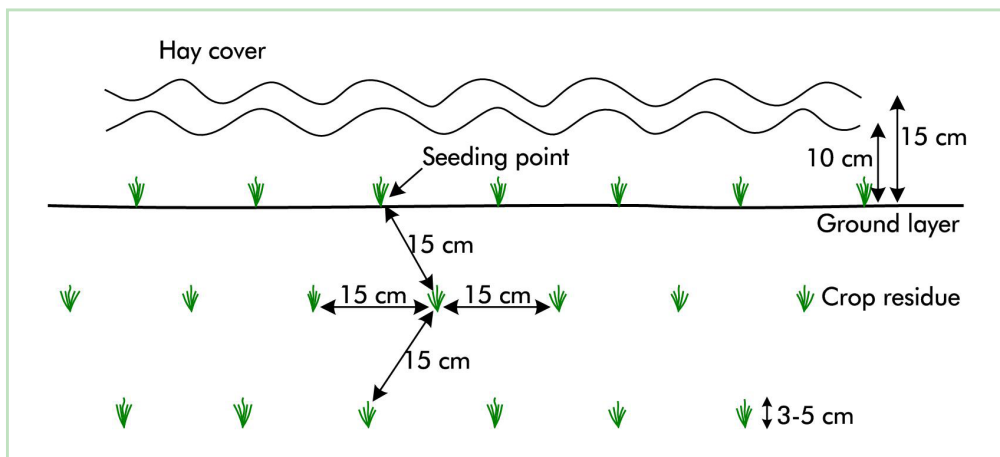
**Tolerant of climatic extremes:** decreases in seasonal rainfall

**Sensitive to climatic extremes:** increases in: temperature, seasonal rainfall, the number of heavy rainfall events (intensity and amount); windstorms, dust storms, droughts, and dry spells

**If sensitive, what modifications were made/are possible:** can be made more adaptive to the changing context by using improved varieties of seeds which are resistant (tolerant) to environmental stresses like drought, increases in temperature, or heavy precipitation.

### Human environment





**Technical drawing**  
No-till garlic cultivation in fields where paddy has just been harvested.  
(Krishna Lamsal, AK Thaku)

## Implementation activities, inputs and costs

### Establishment activities

Not applicable as the planting area was established long ago.

### Establishment inputs and costs per ha

Inputs	Cost (USD)	% met by land user
Labour (person days)		
Equipment		
Materials		
Agricultural		
<b>TOTAL</b>		

### Maintenance/recurrent activities

Maintenance and recurrent activities are minimal. The seedlings need to be watered, fertilized, and weeded.

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

Inputs	Cost (USD)	% met by land user
Labour (6 person days)	25.40	100%
Materials		
- mulch (hay) (60 kg)	14.00	100%
Agricultural		100%
- seed (10 kg)	7.00	
- manure (200 kg)	2.80	
- fertilizer (1 kg)	0.70	
- irrigation	1.40	
<b>TOTAL</b>	<b>51.30</b>	<b>100%</b>

### Remarks:

- All costs and amounts are rough estimates by the technicians and authors. Exchange rate USD 1 = NPR 71 in July 2011

## Assessment

### Impacts of the technology

#### Production and socioeconomic benefits

- + + + Increased crop yield
- + + + Decreased workload
- + + ■ Reduced risk of production failure because moisture is retained
- + + ■ Diversification of income sources; powdered garlic is considered a cash crop as it has medicinal value
- + + ■ Reduced labour costs

#### Production and socioeconomic disadvantages

none

#### Socio-cultural benefits

- + + ■ Improved conservation/erosion knowledge

#### Socio-cultural disadvantages

none

#### Ecological benefits

- + + + Increased moisture in the soil
- + + + Reduced soil loss
- + + ■ Increased nutrient cycling and recharge
- + ■ ■ Contributes to reduced emission of carbon and greenhouse gases

#### Ecological disadvantages

none Niche specific

#### Off-site benefit

none

#### Off-site disadvantages

none

#### Contribution to human wellbeing/livelihood

- + + + Increased farm income, reduced risk of crop production failure, and reduced work load

### Benefits/costs according to the land user

Benefits compared with costs	short-term	long-term
Establishment	positive	positive
Maintenance/recurrent	positive	positive

### Acceptance/adoption:

This technology is widely adopted and practised by a large percentage of the households. All the households who practise this technology do so at their own cost. This technology has become popular among the neighbouring communities and districts.

### Concluding statements

#### Strengths and →how to sustain/improve

Decreased soil erosion, diversification of income sources, and livelihood options; reduced expenses on agricultural inputs → Water needs to be available for irrigation and market linkages are needed to be able to fully profit from this cash crop.

Soil conservation, improves water infiltration, increases organic matter in the soil; saves effort and time → More awareness of the conservation value of no-till methods

Carbon sequestration, reduced agricultural greenhouse gas emissions, and climate change adaptation → Improved varieties of garlic that have stress resistant characteristics would help adaptation to climate change and would enhance environmental benefits.

#### Weaknesses and →how to overcome

**Key reference(s):** Derpsch, R; Friedrich, T; Kassam, A; Hongwen, L (2010) 'Current status of adoption of no-till farming in the world and some of its main benefits.' *Int J Agric & Biol Eng* 3 (1): 1–25. [http://www.fao.org/ag/ca/CA-Publications/China\\_IJABE.pdf](http://www.fao.org/ag/ca/CA-Publications/China_IJABE.pdf)

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