



## Treadle pump

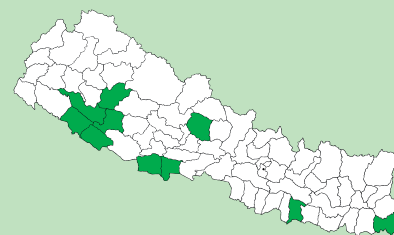
Nepal: लक्ष्मी ढिकी पम्प

**A treadle pump is a foot operated water lifting device that can be used by smallholder farmers to irrigate their land in places where the water table is high.**

A treadle pump is a simple, cheap, and effective device for lifting water. In this technology, bamboo levers are pushed repeatedly by foot to provide the driving power to lift water. This simple device is relatively easy to install and maintain and is environmentally friendly. Three types of treadle pumps are in common use; all three use the cylinder and paddle concept, but the model which uses a cylinder 8.9 cm in diameter and has bamboo paddles is the one most commonly favoured by farmers in the region. It is cheaper and can lift more water than a comparable hand pump. On average, a treadle pump can be used to lift water from about 6 m underground and one such pump can irrigate as much as 0.34 ha of land (depending on the soil type and other conditions). In addition to lifting water for irrigation, the treadle pump can also be used for a variety of domestic purposes. In the Terai areas of Nepal, it is also widely used as a means of generating income. When farmers consider installing a treadle pump, they first need to verify whether there is sufficient groundwater to merit the expense. Treadle pumps should be installed by trained technicians and properly maintained throughout their lifetime. If possible, an extra set of spare parts should always be kept on hand and a trained technician should be consulted for major repairs.

**Left:** Man operating a treadle pump (Purusottam Gupta).

**Right:** A woman using a treadle pump to irrigate a paddy field. (Purusottam Gupta).



**WOCAT database reference:** QT NEP 32

**Location:** Banke, Bardiya, Dailekh, Surkhet, Kaski, Dhanusha, Kapilbastu, Rupandehi, Jhapa, and Salyan Districts, Nepal.

**Technology area:** >1,000 km<sup>2</sup>

**Conservation measure(s):** Structural

**Land Use:** Annual cropping

**Stage of intervention:** Prevention of land degradation

**Origin:** Experiment/research

**Climate:** Subhumid/subtropical

**Related approach:** Not described

**Compiled by:** Purusottam Gupta, IDE-Nepal

**Date:** May 2011, updated March 2013

**General comments:** This technology is used by more than one and half million people in different countries including Bangladesh, Cambodia, India, and Nepal. More than thirty thousand people have treadle pumps in Nepal. Treadle pumps are also a useful means of generating income for smallholder farmers in the Terai area of Nepal.

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

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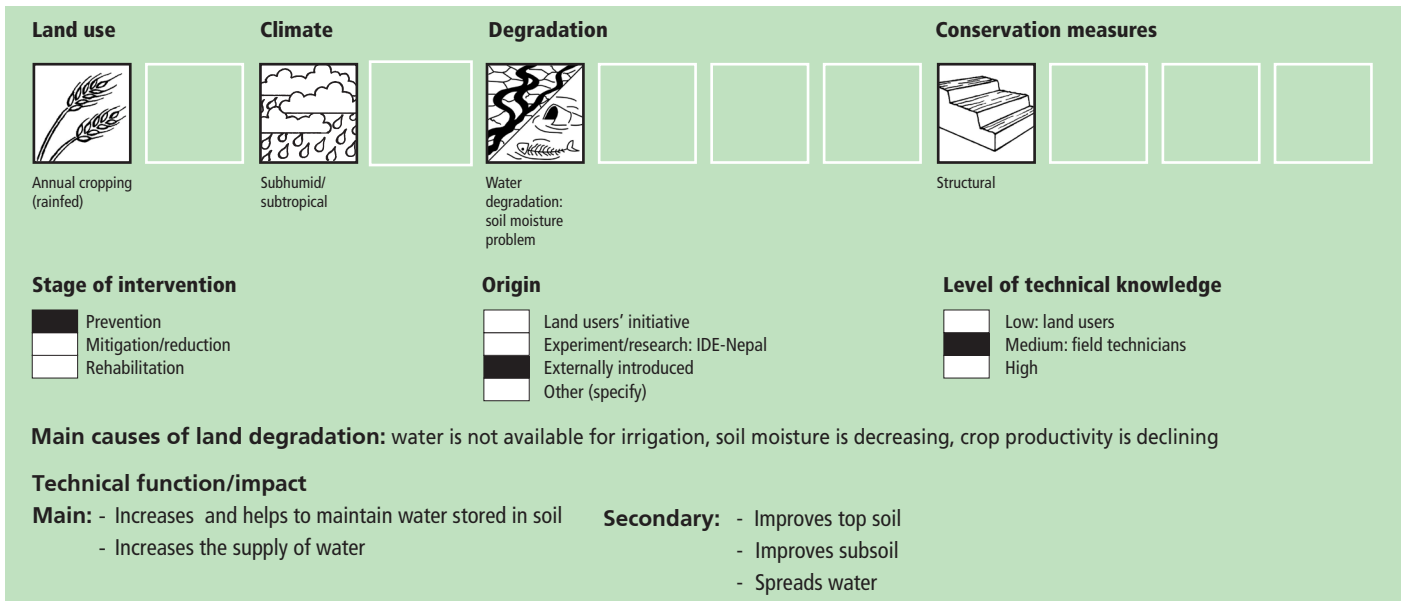
IDE नेपाल  
Nepal

WOCAT

## Classification

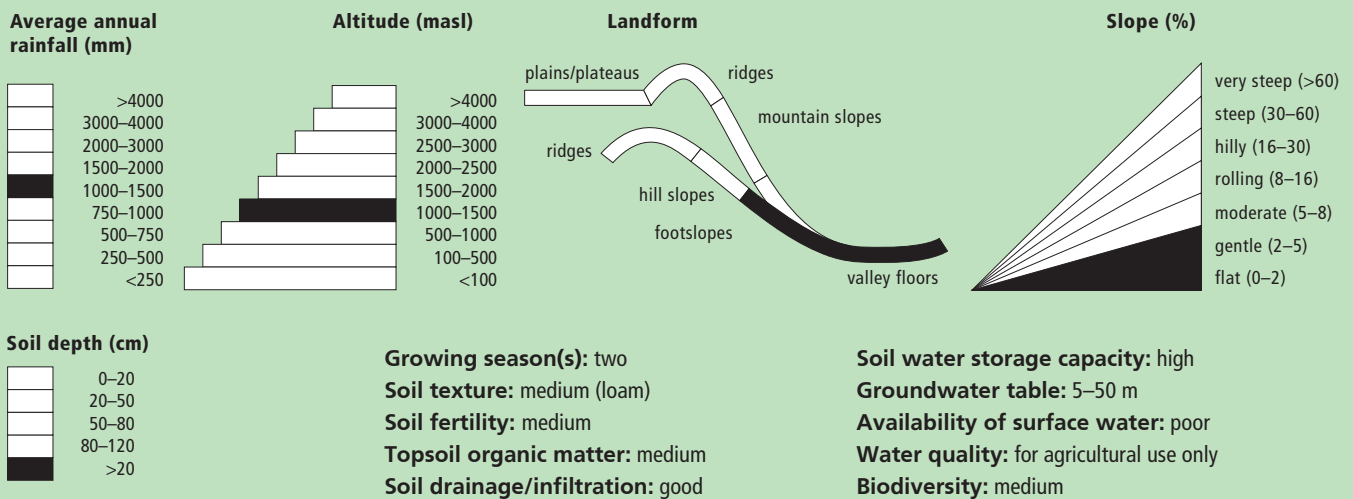
### Land use problems

Most agriculture in Nepal is rainfed. There is a general scarcity of water for irrigation and the availability of the water that exists is limited by economic and energy constraints.



## Environment

### Natural environment

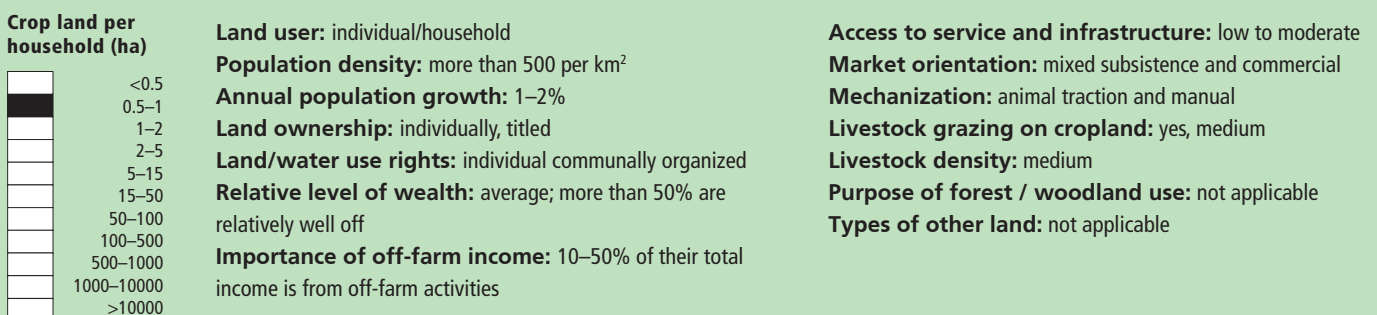


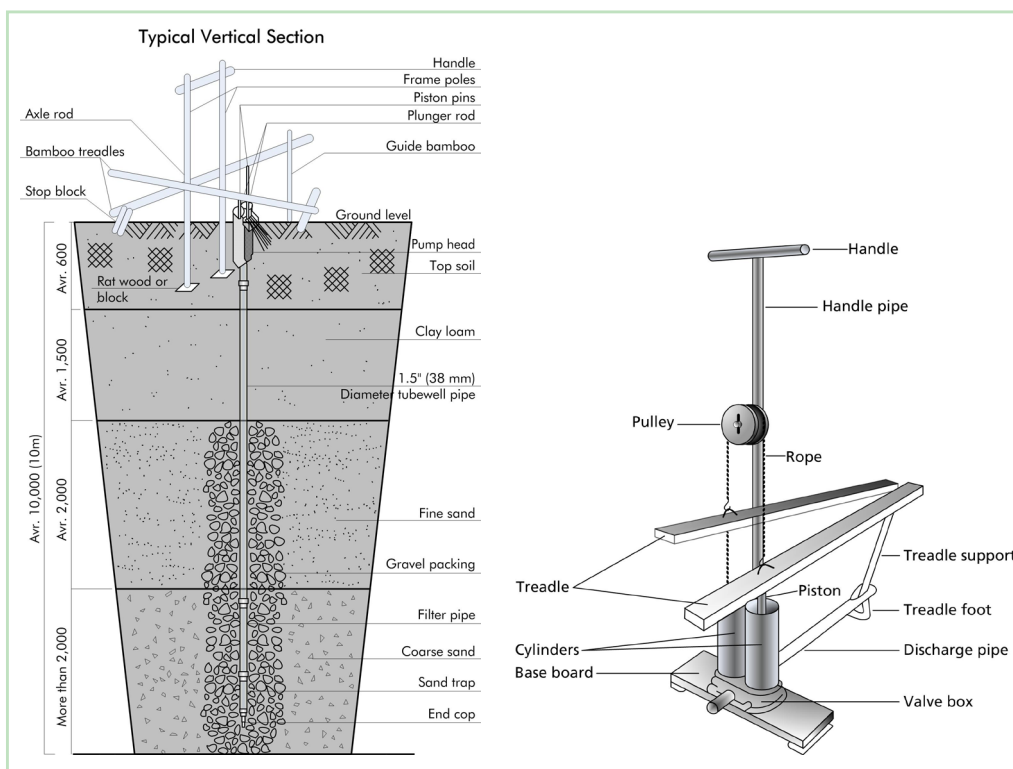
**Tolerant of climatic extremes:** seasonal extremes in rainfall, wind storms, and dust storms

**Sensitive to climatic extremes:** droughts, dry spells, and floods

**If sensitive, what modifications were made/are possible:** a larger bore (12.7 cm) treadle pump can be used to access deeper in the water table where more water may be available

### Human environment





**Technical drawing**  
Components of a treadle pump  
(Purusottam Gupta, AK Thaku)

## Implementation activities, inputs and costs

### Establishment activities

- The site first needs to be evaluated in order to verify whether sufficient groundwater is available.
- The pump should be installed by a trained technician.

### Establishment inputs and costs per unit

Inputs	Cost (USD)	% met by land user
Labour (3 person days)	16	100%
Materials		
– Bamboo poles, high density polyethylene (HDP) pipe, galvanized iron (GI) pipe and nipple, HDP pipe filter, pump head, thread tape, solvent and cement	43	100%
<b>TOTAL</b>	<b>59</b>	<b>100%</b>

### Maintenance/recurrent activities

The pump needs to be maintained on a regular basis and, if possible, an extra set of spare parts should be kept on hand. A trained technician should be consulted for major repairs.

Routine maintenance activities are:

- Repairing or replacing the treadle frame

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

Inputs	Cost (USD)	% met by land user
Labour (2 person days)	8	100%
Materials		
- Washer, check valve, and bamboo treadle frame	5	100%
<b>TOTAL</b>	<b>13</b>	<b>100%</b>

### Remarks:

- This is an average cost estimate, the actual cost will be a function of the soil type, how far the water table is below the surface, and the type and quality of the materials used (metallic vs. non-metallic, timber vs. bamboo) and the cost of labour.
- All costs and amounts are rough estimates by the technicians and authors. Exchange rate USD 1 = NPR 72 in May 2011.

## Assessment

### Impacts of the technology

#### Production and socioeconomic benefits

- + + + Can increase crop yields and farm income by more than 50%
- + + + Can increase the availability of irrigation water by more than 50%
- + + + Can increase the production area by more than 50%
- + + ■ Decreases workload and labour constraints by 20–50%

#### Socio-cultural benefits

- + + + Improved cultural and recreational opportunities
- + + + Less disputes over water rights and water sharing
- + + + Socially and economically disadvantaged groups benefit significantly and enjoy improved food security

#### Ecological benefits

- + + + Increased water quantity
- + + + Reduced surface runoff
- + + ■ Increased soil moisture
- + + ■ Increased crop diversification
- + + ■ Farming can continue through periods of drought

#### Off-site benefit

none

#### Production and socioeconomic disadvantages

none

#### Socio-cultural disadvantages

none

#### Ecological disadvantages

- - ■ Can reduce the natural water table if water is continuously drawn
- - ■ The land close to the pump area remains wet and swampy

#### Off-site disadvantages

none

#### Contribution to human wellbeing/livelihood

- + + + Increased farm income helps to improve the lives and livelihoods of smallholder farmers, and of other socially and economically disadvantaged groups.

### Benefits/costs according to the land user

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

#### Acceptance/adoption:

Good. Land users are quick to adopt this technology voluntarily even without any external support.

### Concluding statements

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

It meets the need for a low-cost irrigation measure and is accessible to farmers → Sustained effort by the government to disseminate information, assist INGOs and local people to get started.

Can be manually operated and does not require any sophisticated or skilled manpower → Make it even easier, simpler, and cheaper to buy and maintain by introducing improved methods and techniques.

Does not require electricity or any other external form of energy so it is easy to implement even in remote places → Continue efforts at research and development to make the pumps even more effective.

It is an affordable technology for growing vegetables. Purchase and installation are within the means of most farmers and it is easy to maintain. Technical know-how for installation is available locally. → Continue research and development to make pumps even more effective.

#### Weaknesses and →how to overcome

Requires manpower. It irrigates only a limited area. → Continue research and development to make it even simpler to use, possibly even by those who are not so physically fit.

Requires continuous inspection and maintenance and a supply of spare parts (washer, check valve, bamboo poles) → Continue research and development to make it even more robust without the need for vigilant maintenance.

Over time, the pumps pump less water, there is frothing, and sand is also lifted → The joints and sockets need tightening. The right place should be selected for boring and, after installation; the area needs to be packed with gravel.

At times the pump has trouble lifting water, it is not working properly → Check the treadle frame installation. Check that the size of the washer is appropriate.

**Key reference(s):** IDE-Nepal (no date) *Technical guideline for treadle pump installation and maintenance*. Kathmandu, Nepal: IDE-Nepal

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