



13 • The Rope Pump - Introduction

Low-cost solutions to address water scarcity

Drought spells and erratic rainfalls frequently affect Southern Africa. We thus urgently need low-cost solutions to improve food production and consequently improve living conditions

The rope pump is an efficient and low-cost solution for small-scale irrigation systems. The quantity of water depends on the depth of the well. The amount of water it provides depends mainly on the depth of the well. At 10 metres, it is possible to obtain 200 litres in 5 minutes.

Compared to treadle pumps, rope pumps can be used in much deeper wells. Treadle pumps can only extract water from wells up to 6-7 metres deep. Rope pumps can reach depths of at least 30 metres.

The rope pumps can be built locally with materials that can be acquired in the area - steel, PVC pipes and used car tyres. The only requirement is the existence of a workshop with machines for welding and cutting steel. The techniques are simple to understand and it is possible to train people in the villages to install and maintain the pumps.

The promotion of pumps for small-scale irrigation can also be a way to improve the natural environment. Many communities establish irrigated gardens at the riverbanks in order to be able to produce food during the dry season. Deforestation of the riverbanks leads to increased erosion and over time reduces the amount of water in the river during the dry season. Rope pumps make it

possible to irrigate gardens away from the riverbanks, thus providing an alternative to the destruction of the vegetation along the rivers.

What is the rope pump?

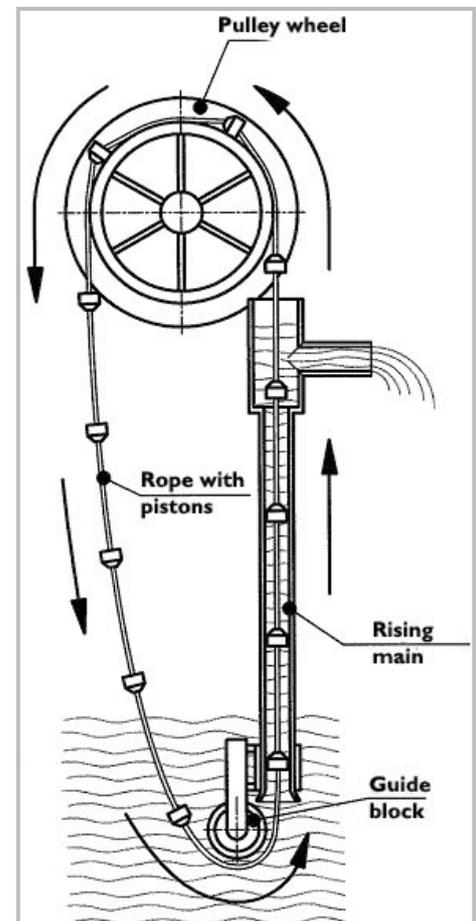
The rope pump is economical and easy to build. It is made of metal, PVC pipes and recycled tyres. It can be built and maintained by people with little technical training.

A rope pump uses a continuous rope with attached pistons. The rope runs up through a PVC tube (main ascending tube on the drawing). The low extremity of the tube reaches the ground water in the well. The top extremity is above ground. Pistons are attached to the rope at every metre and fits perfectly inside the tube. When the rope is pulled up through the tube, the water above each piston is pushed up.

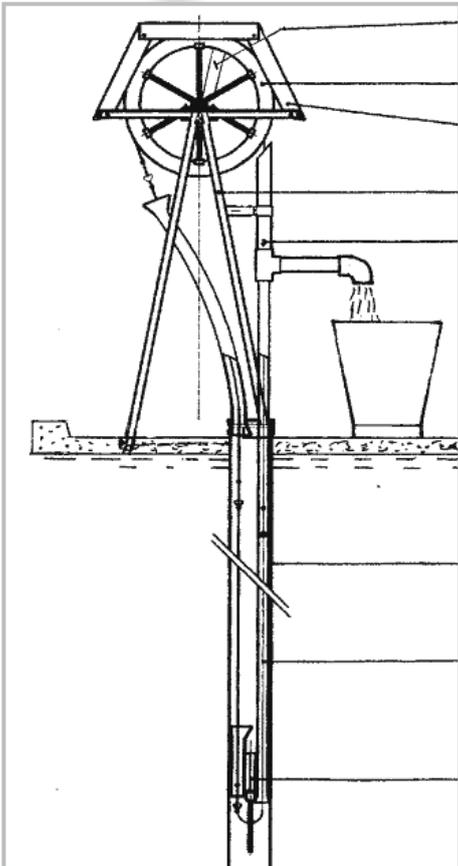
Above ground, the rope works over a wheel, so that when the wheel handle is turned, the rope is pulled up through the tube and goes down into the well

again. At the bottom there is a specially constructed guide block that makes the rope re-enter the PVC tube smoothly as soon as the rope is pulled.

The rope pump can be used to a depth of about 30 metres. The deeper the water is, the smaller the diameter of the tube must



The rope pump system



A rope pump installed in a borehole also below

be to avoid the water column becoming too heavy. This means less water can be extracted from a deep well.

Two different models

The pole model

This system is built with a handle fixed to two poles - see the drawing. Work can be made easier with handles at both sides of the well.

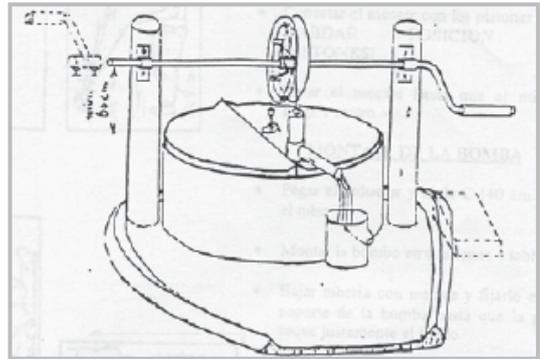
The pole model can be installed in an open well, when the water is only used

for irrigation. If the water is also used for drinking, the well must be covered with a concrete lid to ensure that the well water is not contaminated.

The "A" model:

The A model has a metal frame that is fixed to a concrete lid (see the drawing above). It can be installed over open wells or boreholes, and when the water is well protected from contami-

nation it is safe to drink.



The pole model rope pump

Rope pumps around the world

50,000 pumps in Nicaragua, 20,000 in Mexico, Guatemala, Honduras, Ghana, Zimbabwe, Zambia, Tanzania, etc. Rope pumps are produced by DAPP (Development Aid from People to People) in Shamva, Zimbabwe, by DAPP in Monze and Chibombo, Zambia, by ADPP in Chimoio and Bilibiza, Mozambique and soon by ADPP in Cabinda, Angola.

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A wooden rope pump has been developed and is now made by local carpenters in Northern Mozambique



14 • Well Drilling - Introduction

The Rota-sludge method

The manual excavation method, Rota-sludge, is based on the sludge method, which has been employed to drill millions of wells in soft ground in Asia. Recently this method has been improved to make it more effective on harder ground. By training local organizations and craftsmen it is successfully being used in Nicaragua, Tanzania, Ethiopia, Senegal, Zambia, Mozambique and Zimbabwe.

How it works

The drilling mechanism consists of a bamboo or wooden lever, a 1½ to 2-inch drill pipe and an auger (soil drilling bit) with hardened teeth. To begin drilling, a starter hole is dug. The hole is connected to a shallow pit.

This hole is then filled with drilling fluid, which consists of water and clay or cow dung (or bentonite if possible). The function is to make a thick fluid that can lift up the sand and clay. Another function is to plaster the sides of the well, so that the water does not disappear.

The lever creates up and down movements. During the upward movement, the top of the drilling tube must stay closed. You can use your hand to close the top and create a vacuum. During the downward movement, remove your hand to open the pipe and allow the drilling fluid to flow back into the pit. The heavy particles and sand settle on the bottom of the pit while the “clean” drilling fluid flows back into the drill hole. As the hole gets deeper, new pieces of threaded pipe are added.

The drilling becomes more efficient if the tube is rotated 45 degrees at the moment the drilling tube touches the bottom of the hole. This technique allows the drill bit to scrape compact layers of sand, clay, sand stone or tuff stone. It does not work with solid rocks.



Rota-sludge drilling in Northern Mozambique: 15-20 m in 3-4 days

“Baptist” drilling

“Baptist” drilling is another low-cost drilling method. It was developed by Terry Waller at the Human Needs Project in Bolivia.

Families are here trained and assisted to drill their own boreholes. They drill up to 60 metres down through clay and sand with equipment made locally.

The differences from the Rota-sludge system are:

- the drilling bit has a valve
- a rope and pulley is used
- only bottom pipes are of steel. The rest are of thick walled PVC, making the system easier to transport.

See the photo next page.

Information kindly provided by Henk Holtslag



Teeth of drill bit from steel from truck springs