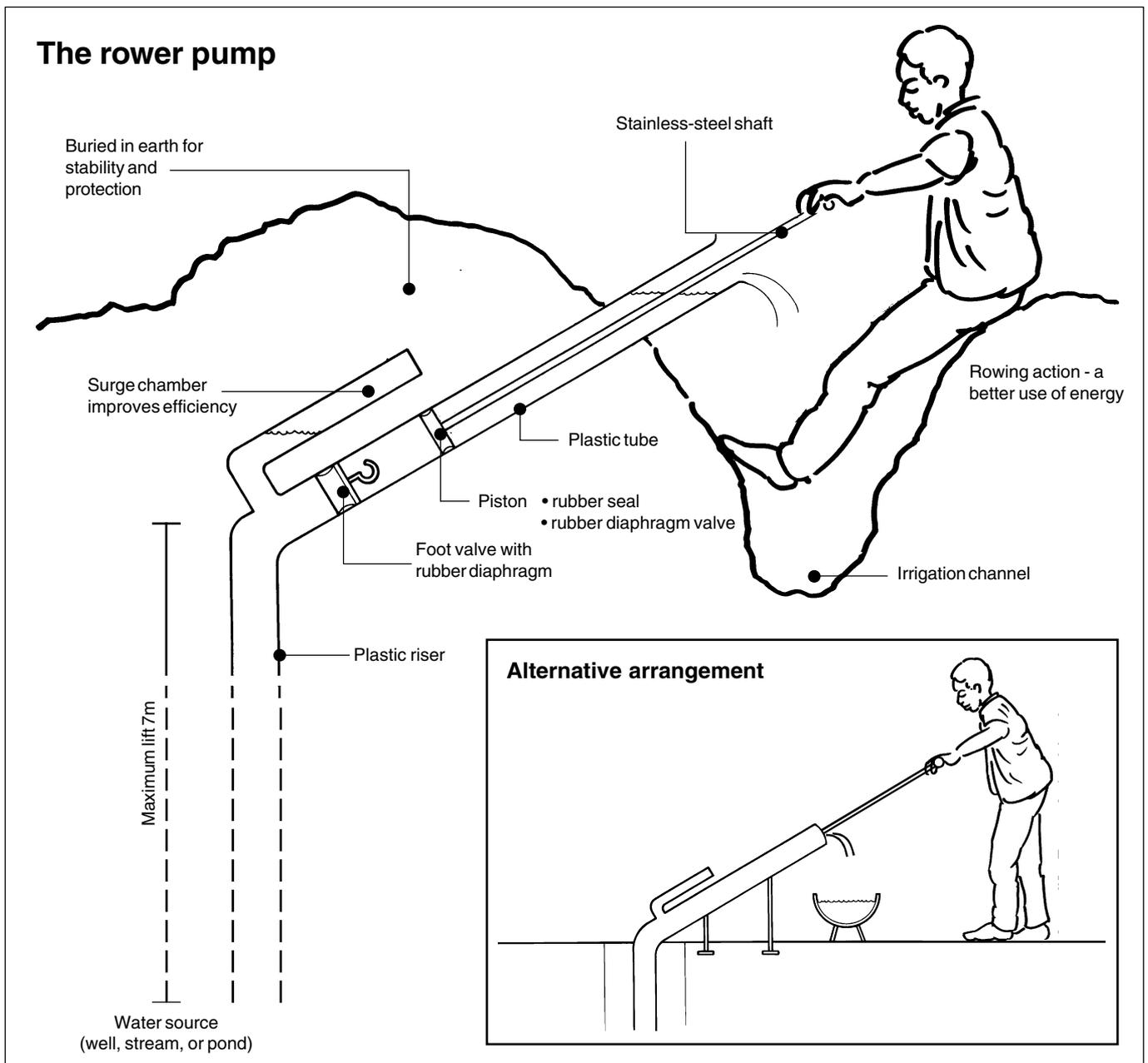


35. Low-lift irrigation pumps

Small-scale irrigation is a key factor in the development of many rural communities in developing countries. A variety of water-lifting devices have been used in the past and this Technical Brief describes some of the most practical and efficient pumps in use today.

An irrigation pump needs to be able to deliver a large volume of water over a long period of time, and in order to achieve this the available human power needs to be used efficiently. Arms and shoulders are normally used to operate machinery, but higher power outputs can be achieved by using the whole body. A pedalling action gives the most power, as it uses the leg muscles, the largest in the body.

The water being pumped can come from a variety of sources – wells, boreholes, streams, rivers, and ponds.



Low-lift irrigation pumps

The rope-and-washer pump

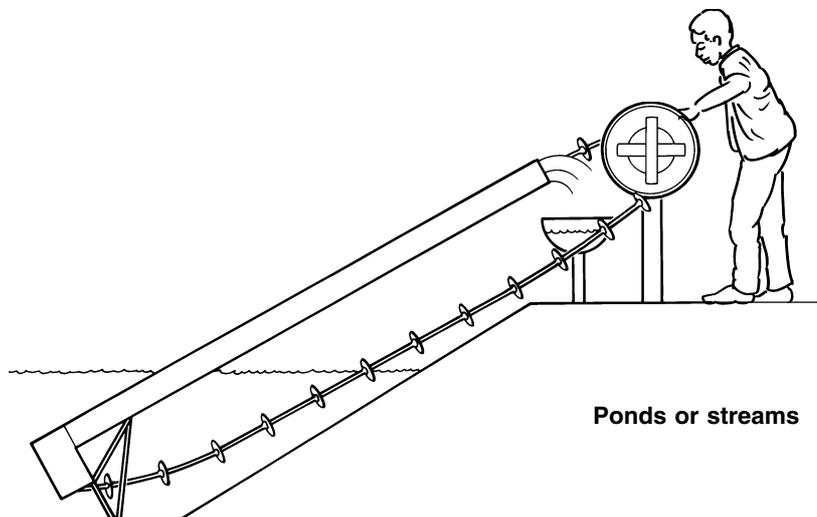
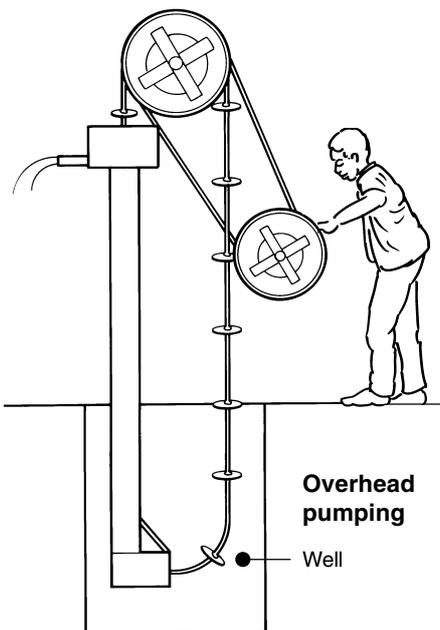
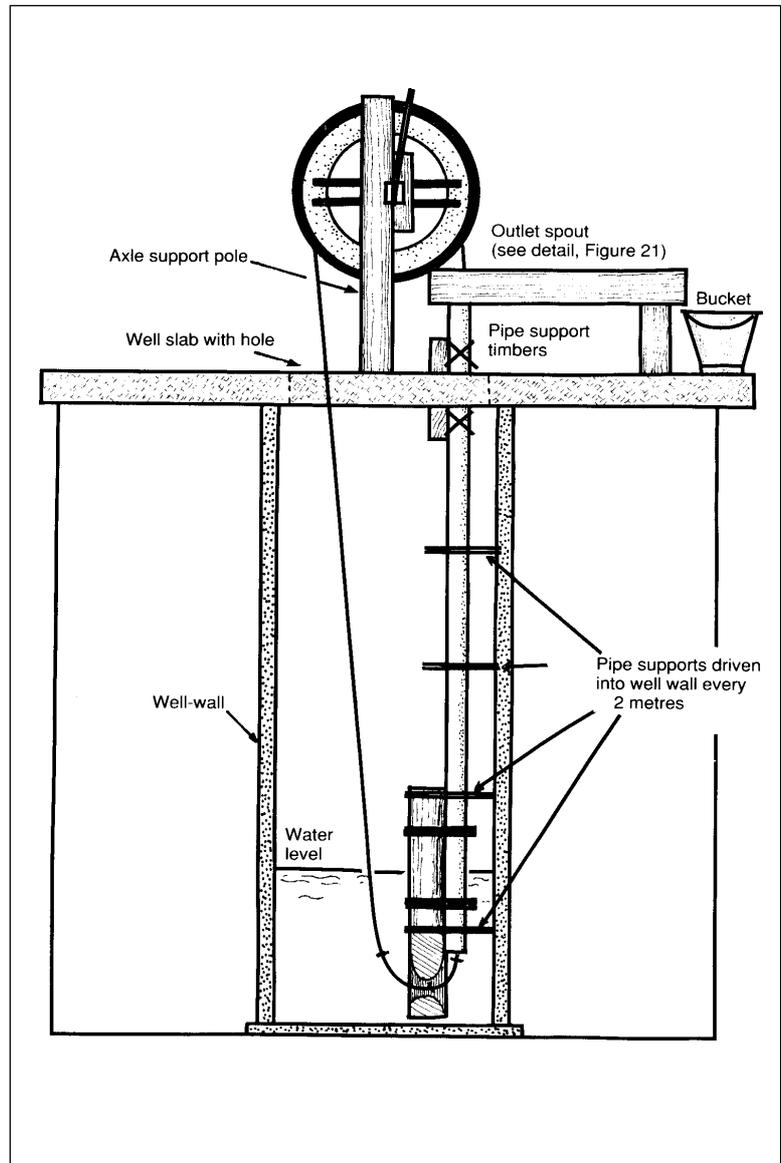
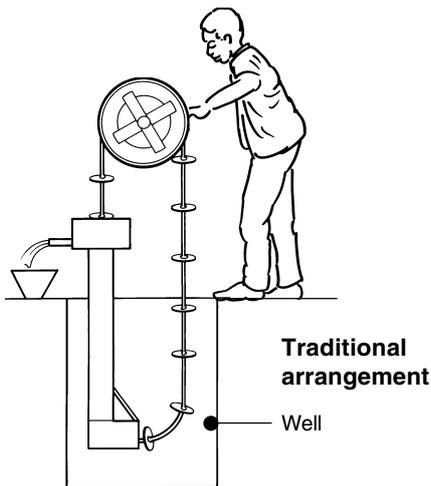
Based on a principle developed in ancient China, the recent design is a VLOM pump that can be built from materials that are available in most communities.

The main pulley is an old car-tyre rim and this is used to turn a rope knotted to hold a series of rubber washers, made from car tyres. The riser pipe can be either plastic or bored-out bamboo.

Water can be lifted from up to 20m below the pump and delivered 5m above it, with output rates of up to 50 litres per minute depending on lift.

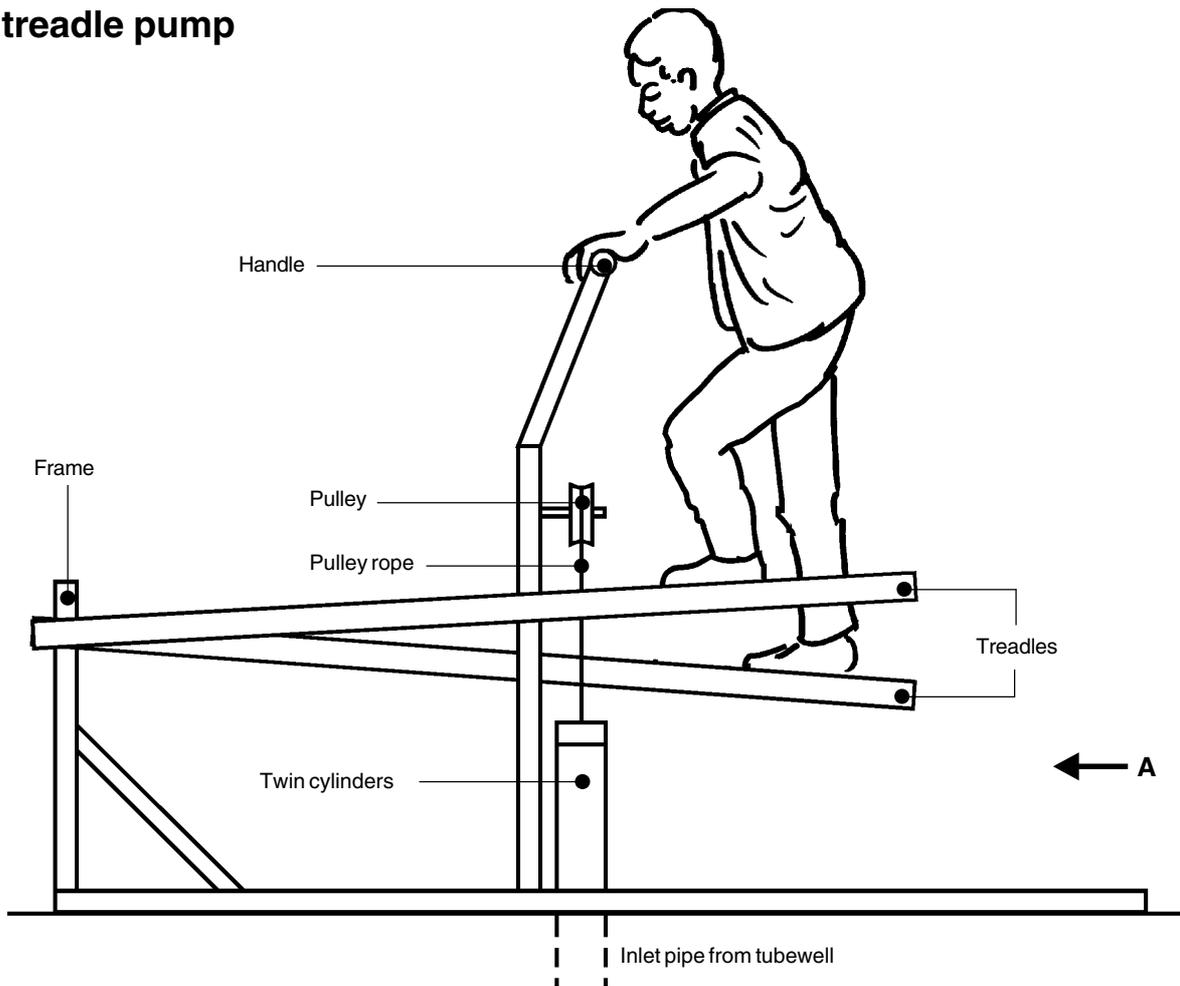
Sources can be wells, large diameter bore-holes, ponds, and streams.

Alternative arrangements



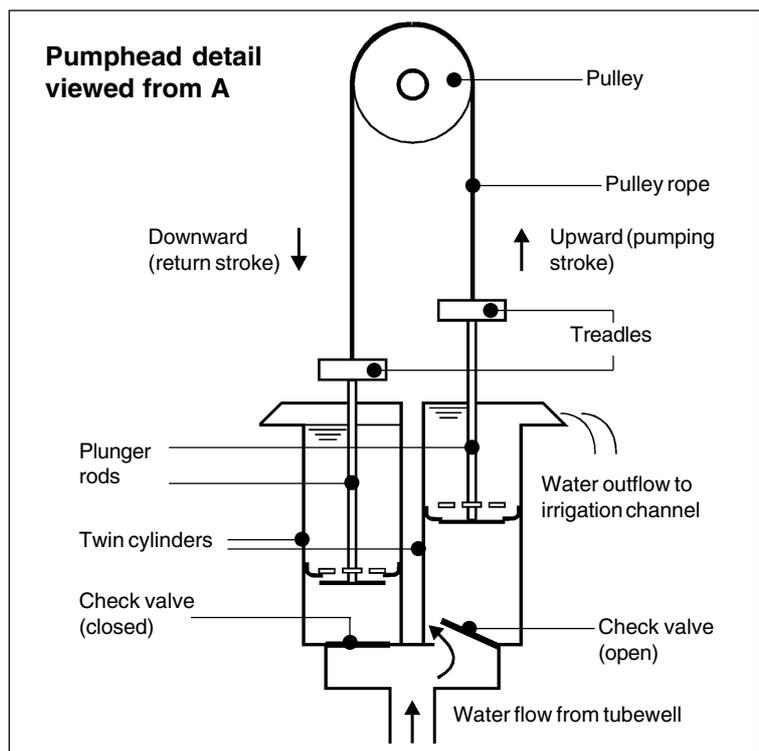
Low-lift irrigation pumps

The treadle pump



Because the treadle pump is operated by the most powerful muscles of the human body, it can be operated for longer than other human-powered pumps.

The pump originally developed in Bangladesh has since been modified so that the discharge is pressurized. In this form it is capable of lifting water up to 20m above the pump, but because it works on a suction principle it can only be a maximum of 6m above the source. Water can be pumped from wells, boreholes, streams, and ponds, and discharge rates of 50 litres per minute can be achieved. This is a VLOM (Village Level Operation and Maintenance) pump but welding facilities are required for its manufacture.

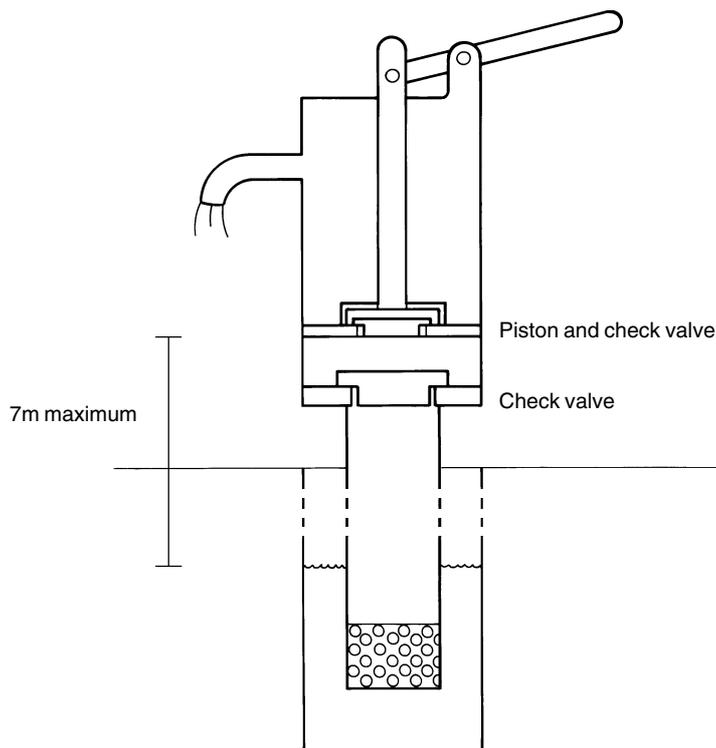


Low-lift irrigation pumps

Suction pumps

Suction pumps exist in a great variety of designs. They can be used for low-lift irrigation purposes, but they have several disadvantages:

- lower discharge rates
- need to be fixed in a stable position over a well or borehole
- less efficient for prolonged use as arm and shoulder muscles used
- more sophisticated manufacture required



Alternative methods

There are other ways of lifting water for irrigation that have been in use for many generations. These include the Egyptian *shadoof*, the *dhone* and various water wheels and devices such as the *mohte*, which use animal power. Wind power can also be used to power irrigation devices.

Further reading

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