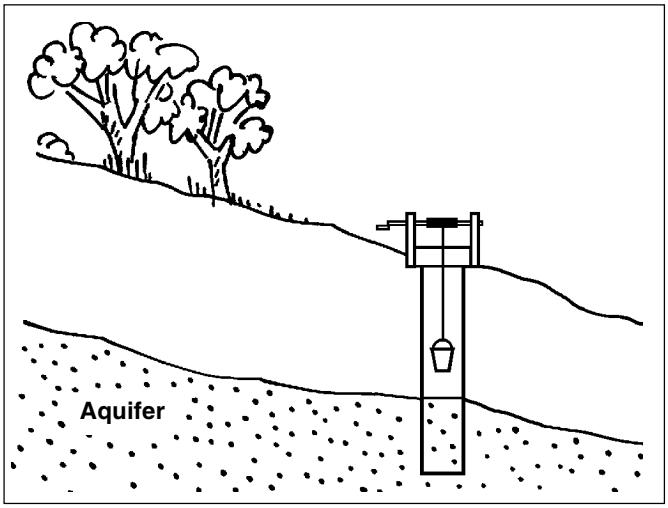
39. Upgrading traditional wells

Wells have been used to obtain water since ancient times. Some wells have been in continuous use for hundreds of years. Others are fairly new, but have been built by traditional methods. Good quality water can usually be obtained from a well that is properly constructed, maintained, and used. Some traditional wells are excellent. Others are not and need upgrading.

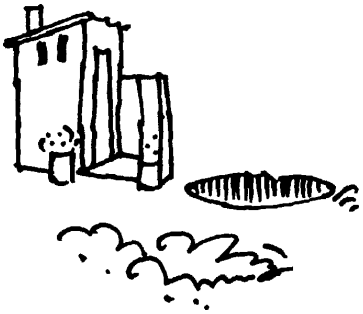
Water drawn from surface sources – streams, rivers, lakes, and tanks – is often polluted. Groundwater, however, is filtered naturally as it passes through the soil to reach the *aquifer,* where it is stored underground. The word 'aquifer' means 'water-carrying'. Aquifers occur in pores, voids and fissures. Pores are the spaces between the mineral grains. Some aquifers carry water in layers of sand or gravel, others in fractured rock. Some are only a few metres thick, others hundreds of metres. Some underlie a few hectares, others extend across thousands of square kilometres. Some are hundreds of metres down and others lie just under the surface. Most traditional wells take water from shallow aquifers.

Where groundwater is deep, hand or motorized pumps may be necessary.



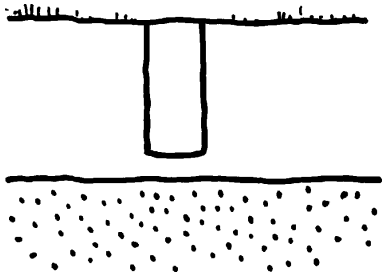
Many traditional wells are unsatisfactory because ...

1.



They are near pit latrines, rubbish dumps, or animal pens, which pollute the groundwater that is the source for the well.

2.



They are not deep enough, so water is inaccessible in dry weather when the groundwater level is low.

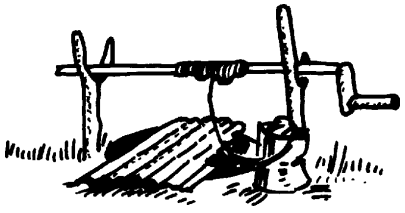
3.

People may enter the well to collect water, making it dirty and increasing the risk of spreading guineaworm disease in areas where it is endemic.

4.

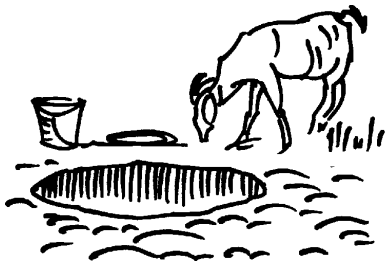
The sides collapse, reducing the amount of water that can be collected and allowing surface water to get into the well from the top.

5.



The top is open, so polluted water and dirt falls in, polluting the well water, and there is a risk of shoes, animals, and children falling in.

6.



Dirty buckets and ropes are used for drawing water, thereby polluting the well.

Upgrading traditional wells

How can wells be upgraded?

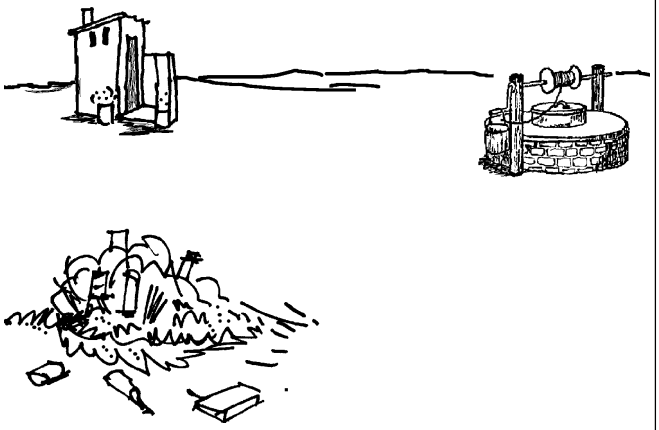
1.

Move rubbish dumps and animal pens far away from the well.

A minimum distance of 25 metres is recommended, and the dump or pen should not be on higher ground than the well.

A well which is very near to a deep pit latrine should not be upgraded.

A new well should be dug at least 25 metres from the pit, and the old well closed off.



A well should be situated at least 25m away from latrines, rubbish dumps and animal pens

2.

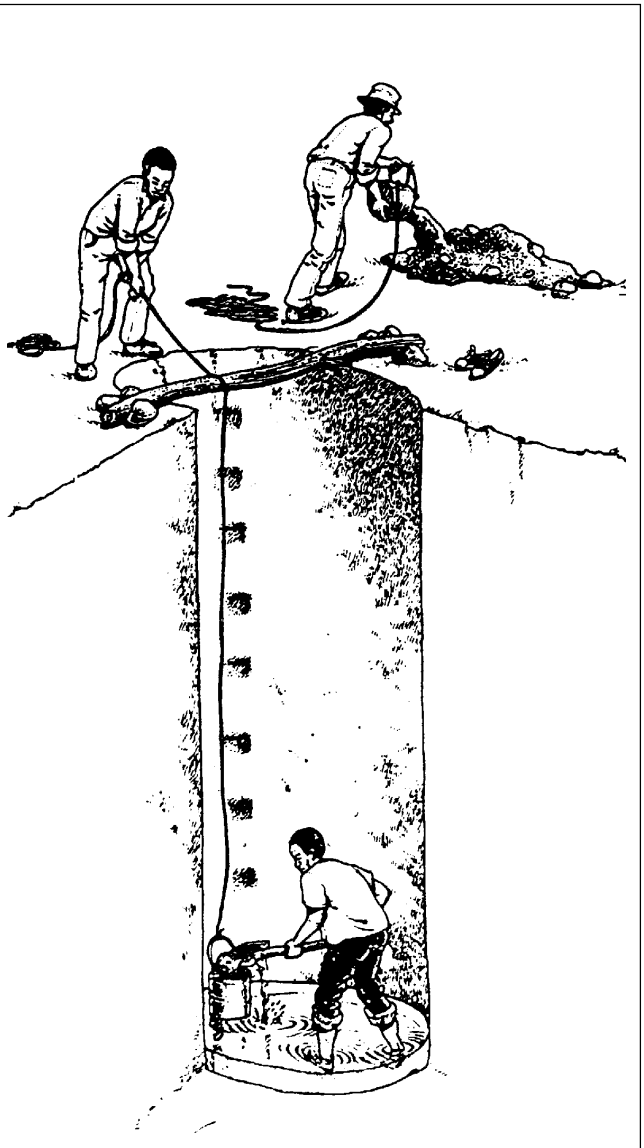
Deepen the well so that the bottom reaches the groundwater during dry weather

At the end of the dry season, when the groundwater is likely to be at its lowest level, use two buckets to deepen the well.

Continue to remove soil and water when groundwater is reached. It is often possible to dig two metres or so into the aquifer, although this depends on the rate of re-charge. Obviously work has to stop when the water is filling the well faster than it can be removed.

An experienced well digger should be chosen to dig into the aquifer, because of the danger of collapse.

A windlass can be used to lower and raise people working in the well, and to raise soil and water.



Deepening the well

3.

Improve the well so that people and animals cannot get in

This can be done by lining the well as illustrated opposite and by providing a cover as illustrated below.

Providing a cover for the well

4.

Line the well

Materials that are often used for lining wells include:

- **Bricks:** Kiln-dried bricks should be used at the bottom (below the highest level of groundwater) and at the top.
- **Natural stone** (masonry): Untrimmed rough stone is particularly suitable in the aquifer.
- **Concrete blocks:** These may be curved to suit the shape of the well, or ordinary rectangular blocks can be used.
- **Concrete rings:** These may be made on site, or may be cast in a central yard and brought to the well.
- ***In-situ* concrete:** Concrete is cast around steel shutters in the well. This is an expensive method and is not normally used for upgrading wells.

The bottom of the well should be lined so that water can flow in:

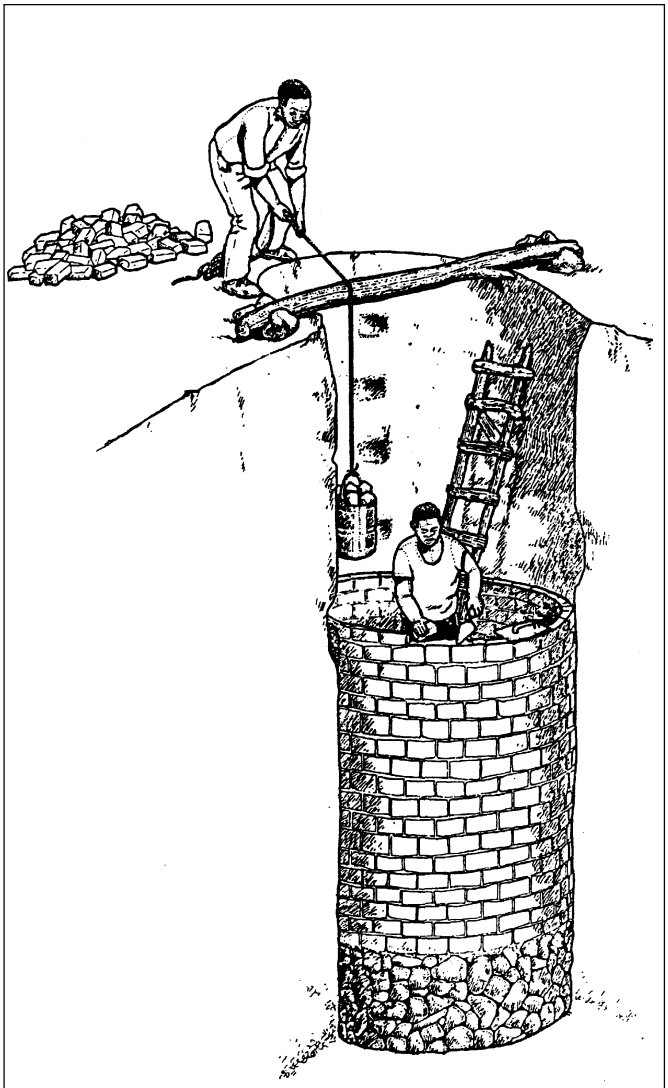
- Concrete rings may have holes made during casting, or holes may be carefully broken through the concrete after casting. Gaps may be formed by putting small stones between the rings.
- Masonry linings may be built as a 'dry wall' with no mortar between the stones.
- Joints between bricks or blocks should have the smallest amount of mortar necessary to hold them in position. Sometimes no mortar is put in vertical joints. Alternatively, unjointed masonry is used as a base for bricks or blocks.

The remainder of the lining should be back-filled with soil that is 'tamped' down by treading or pushing down with poles.

If the soil around the well is very loose it may be necessary to back-fill with weak concrete.

The top part of the lining should have good mortar joints and should extend at least 300mm above ground level. The back-filling should be impervious, using 'puddled' clay or weak concrete.

Puddled clay is clay which has been thoroughly mixed with water — it is 'kneaded' in the way that dough is kneaded when making bread.



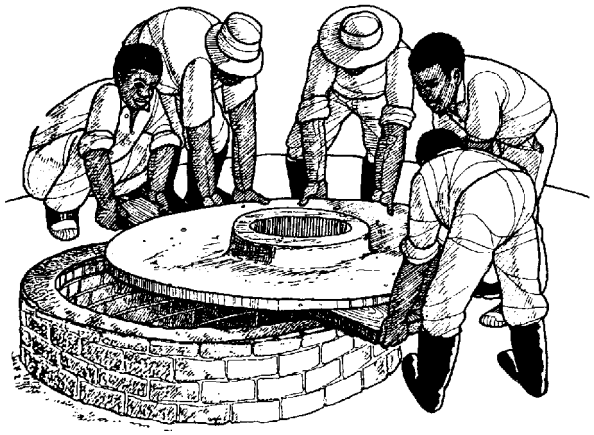
Lining the well

5.

Provide a cover or a parapet wall

A cover can be a reinforced concrete slab with a hole for buckets to pass through. It can be cast near the well and lifted to fit on the lining.

Parapet walls are extensions of the wall lining about a metre above the top of the apron.



Putting a cover in place

Upgrading traditional wells

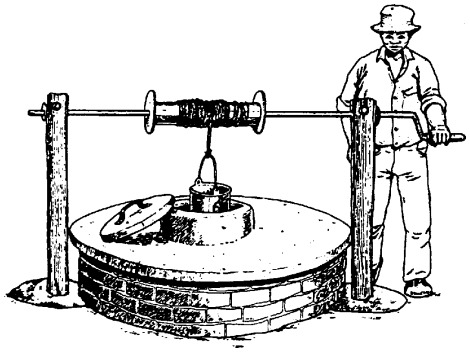
6.

Install a windlass or handpump

A windlass enables buckets full of water to be raised easily by turning a handle.

- Stout wooden posts or steel pipes are embedded about 600mm deep in concrete on each side of the well.
- A windlass may be purchased ready-made or can be fabricated from 20 - 25mm steel pipe or rod.

Handpumps should be firmly fixed to the cover.

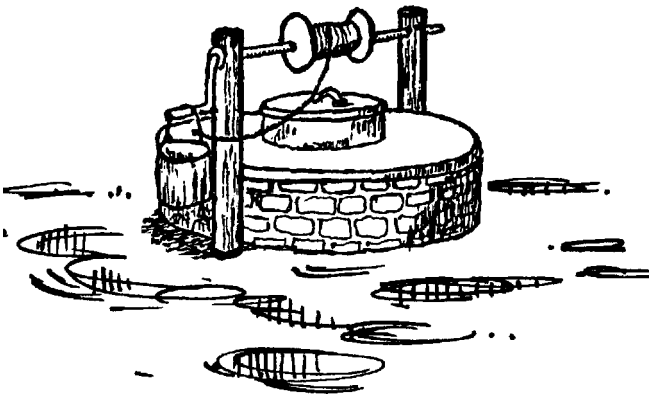


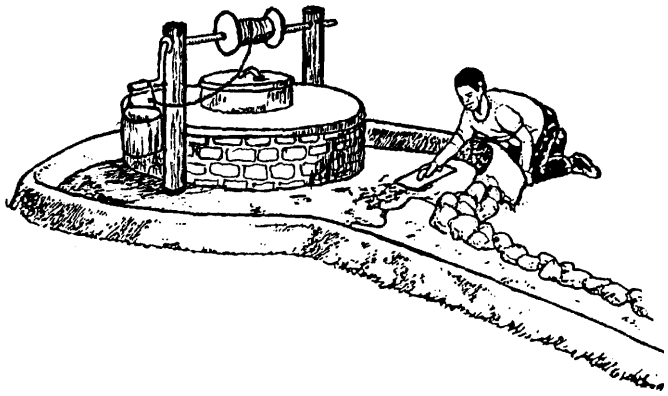
A well with a windlass

What else needs to be done?

Even if a traditional well has been improved by giving attention to all the matters listed above, it may still be unsatisfactory without other improvements.

A well head which is surrounded by a pool of spilled water is unpleasant for users, can lead to pollution of the water in the well, and may provide a breeding place for mosquitoes.





Therefore...

an apron and a drain should be provided.

The apron should be wide enough for people to stand on. It should be made of concrete that is between 75 and 100mm thick, preferably reinforced by steel rods or mesh. It should have a smooth surface sloping down to the drain and a rim to prevent water going over the edge.

The drain should be a cement-lined channel, at least four metres long, that takes spilled water to a soakage pit, an animal-watering trough, or a vegetable garden.

This Technical Brief has been adapted from *Rural water supplies and sanitation* by Peter Morgan, The Blair Research Laboratory, Ministry of Health, Harare, Zimbabwe. Published by Macmillan, London, 1990.

Adapted for IT Publications by John Pickford Additional drawings by Rod Shaw

WEDC Loughborough University Leicestershire LE11 3TU UK
www.lboro.ac.uk/departments/cv/wedc/ wedc@lboro.ac.uk