Design of hand-dug wells

by Daniel Schotanus

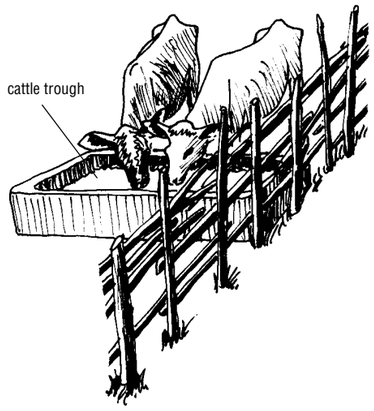
There are several ways to design and build hand-dug wells. In many societies there are local experts with knowledge and expertise developed through years of experience. In the Borana area of Ethiopia, for example, traditional hand-dug wells have been reported with depths of over 100 metres.

Designs vary according to local preferences and conditions. This design has been used by a Tearfund partner in Ethiopia and is suitable for areas with firm soils. Generally, hand-dug wells are 10–15 metres deep. For deeper wells, drilling is more appropriate.

Wells should only be dug in suitable places where good supplies of clean ground water are likely to be available.

There are dangers in building hand-dug wells. Skill, knowledge and expertise are essential to ensure the safety of workers during the construction process.

A communal hand-dug well can give long-lasting service if it is well designed and constructed.



Safety first

Digging deep wells can be dangerous, both for the diggers and for observers.

The dangers include:

- collapse of the sides (dig inside precast concrete rings if soil is unstable)
- objects or buckets falling from the surface
- people or animals falling in the well (use fences or covers)
- lack of oxygen in the well
- poison exhaust gases from a generator used to pump out water
- unsafe entering and climbing out of the well (use a safety harness and tripod and at least two helpers at the surface)
- electric shock due to poor isolation of the electric pump or cutting of power cable
- worker collapse due to exhaustion
- unhygienic conditions in the well (do not allow the well to be used as a toilet during digging).

If the completed well will not have a cover and handpump, build a protection wall at least 70cm high to prevent children and animals falling in.

Hygiene

Ground water is generally safe to drink, because of natural filtering through the soil. However, chemical contamination is possible.

- Make sure that the well is located upstream of potential pollution sources such as pit latrines, petrol stations, rubbish pits or burial grounds.
- Prevent surface pollution at the well site. Ensure any spaces between concrete rings, the slab and well cover are filled in with concrete. Fit a pump on a raised pedestal.
- Spilled water from the pump should drain into a soak-away pit filled with rocks and gravel some distance away from the well.
- After the handpump is installed, disinfect the well with chlorine before use.

Improvements

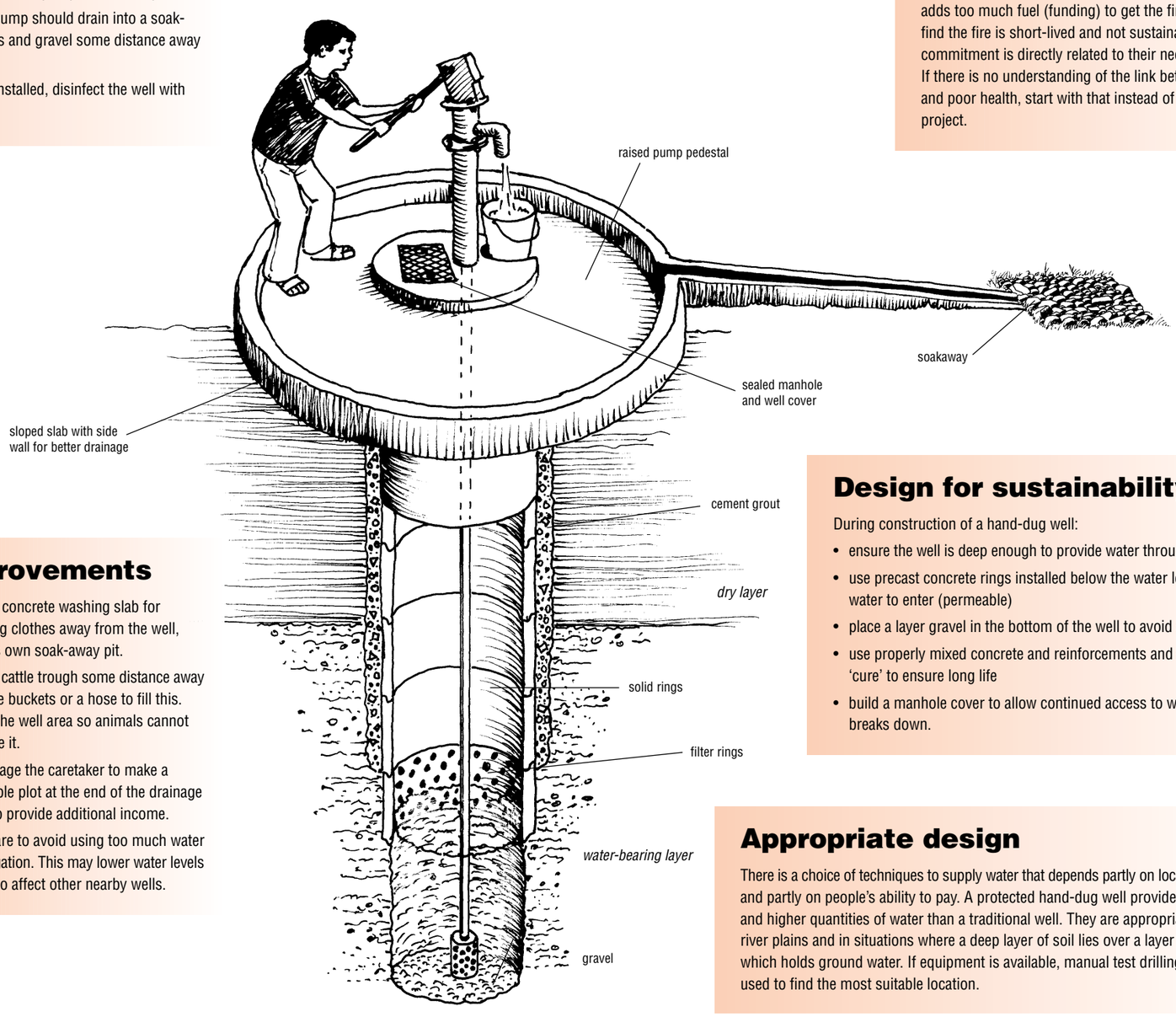
- Build a concrete washing slab for washing clothes away from the well, with its own soak-away pit.
- Build a cattle trough some distance away and use buckets or a hose to fill this. Fence the well area so animals cannot damage it.
- Encourage the caretaker to make a vegetable plot at the end of the drainage ditch to provide additional income.
- Take care to avoid using too much water for irrigation. This may lower water levels and also affect other nearby wells.

Recommended handpumps

Three handpumps recommended by Unicef are the TARA, the AFRIDEV and the India Mark II.

The TARA is very suitable for shallow hand-dug wells of approximately ten metres deep. It is a double-action handpump, lifting water on the up-stroke as well as the down-stroke with a bicycle pump type movement.

For deeper wells, the AFRIDEV and the India Mark II are lever-action, single-action handpumps suitable for wells up to 30 metres deep (up to 50 metres for the India Mark II).



Community ownership

Trying to light a fire with wet wood is very difficult. Instead of allowing the wood to dry, you may add paper, petrol or kerosene. This is rather like starting a project without the wholehearted support of local people. It is essential that the community 'owns' a water project. Outside agencies such as NGOs or churches can help in 'gathering the (dry) wood' and providing a match. However, too often the outside agency adds too much fuel (funding) to get the fire going, only to find the fire is short-lived and not sustainable. People's commitment is directly related to their need for clean water. If there is no understanding of the link between dirty water and poor health, start with that instead of setting up a water project.

Design for sustainability

During construction of a hand-dug well:

- ensure the well is deep enough to provide water through the dry season
- use precast concrete rings installed below the water level which allow water to enter (permeable)
- place a layer gravel in the bottom of the well to avoid silting up
- use properly mixed concrete and reinforcements and allow them to 'cure' to ensure long life
- build a manhole cover to allow continued access to water if the pump breaks down.

Appropriate design

There is a choice of techniques to supply water that depends partly on local conditions and partly on people's ability to pay. A protected hand-dug well provides cleaner and higher quantities of water than a traditional well. They are appropriate in broad river plains and in situations where a deep layer of soil lies over a layer of rock, which holds ground water. If equipment is available, manual test drilling can be used to find the most suitable location.