



Trial of sludging technology in Kawende, Lui Ward, Western Province, Zambia



Background

Part of Oxfam's EC-funded project in Western Province is innovation, researching new water and sanitation technologies which may be applicable specifically in the province or more generally in Zambia. It was found that DAPP was using a manual method of borehole/tubewell drilling which used low cost equipment. A decision was made to trial this technology for drilling a tubewell in a typical community in Western Province. The village of Kawende, population 21 households, near Nalwei (Lui ward) was chosen as a suitable location for carrying out this trial. The soils are sandy and lend themselves to simple manual drilling methods.

Description of the sludging method:

Sludging is one method of manual drilling where the weight of a drill bit, and an attached series of drill pipes, is used to penetrate the upper levels of the soil until the aquifer is reached. The weight of the drill pipes is used, with a pounding action, to loosen solid material (sand). The pressure caused by a column of water is used to create a higher impact also. A frame is used to support the weight of the drill pipes and drill bits, and to enable the use of a pulley for raising and lowering the drill pipes. The first segment of the drill pipe was made of galvanised iron, whereas the remaining segments were made of PVC pipes. The drill bit was fabricated from recycled car springs.



Comments and observations:

Water was found at a depth of 6m, however drilling continued to a depth of 13.5m, to ensure that the water was of an acceptable quality and to ensure a sufficient quantity of water year-round.

Clay was available locally from a few hundred metres away where a brickmaking enterprise was located. This was used as a drilling mud to prevent sides of the tubewell from collapsing in the sandy soils.

Gravel for the gravel pack is usually not available locally in most villages of Western Province. However, this will be a problem no matter which method of drilling is used. In the case of Kawende, gravel was available from Kawende school, leftover from school construction activities. It had been purchased from outside Western Province.



Advantages:

- Low capital and maintenance costs for this technology
- Equipment can be fabricated from steel and PVC pipes, and recycled car springs.
- Requires the use of manual labour which enables community participation
- Technology is simple and easy for villagers to learn
- If used to replace hand dug wells, it is safer for the well diggers, especially for deeper wells; due to decreased risk of asphyxiation, hole collapse or falling objects.
- Construction proceeds at a much faster rate than for hand dug wells.
- Less cement is used than for hand dug well construction, resulting in cost savings and easier logistics arrangements. (Cement is not manufactured in Western Province and transport costs are high.)
- This technology is far more sustainable than other alternatives.

**Disadvantages:**

To date, little expertise in the use of this technology is available locally.

For boreholes, construction rate is slower than for more expensive options such as the use of rotary mud drilling or down-the-hole hammer drills

Not suitable at this stage for humanitarian/emergency situations as there are insufficient sets of equipment available.

The introduction of this new technology would slow down a construction programme.

The construction of tube wells rather than hand dug wells precludes reverting to a bucket and rope system if a pump fails and is not repaired.

As temporary casings are not used, the use of clay is necessary to prevent soil collapse. This may be difficult to obtain in some parts of Western Province.

The bore diameter is not well adapted to the type of rope and washer pump which is available in Western Province.

Conclusions:

The benefits of introducing this potentially very sustainable technology far outweigh the disadvantages.

The technology is better suited to drilling boreholes which will use India MarkII handpumps, rather than replacing hand dug wells which will use rope and washer pumps.

Recommendations:

A second trial should be carried out in Kaoma where the soil type is slightly different.

The introduction of sludging technology in Western Province is highly recommended.

Other manual drilling methods should also be trialled to enable communities, councils and other relevant stakeholders to choose which technology better fits their context.

Nine boreholes in Western Province should be drilled using this sludging technology.

The remaining nine should be drilled using either a hand auger or jetting, or maybe even any other promising new manual drilling technology.

This technology should not be used for replacing hand-dug wells, unless either the rope and washer pump design can be adapted to the borehole diameter, or the sludging equipment can be adapted to the existing design of rope and washer pump.