



## ORGANISATION AND IMPLEMENTATION OF A DUG WELLS PROGRAMME

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### INTRODUCTION

This paper is based on experience gained in the Water programme of the Lutheran World Federation (L.W.F.), initiated 2 years ago at the request of the Lutheran Church of Zimbabwe and presently covering 5 districts in Southern Zimbabwe, namely Gwanda, Beitbridge, Mberengwa, Zrishavane and Mwanezi.

The dual aims of the project are:

1. To assist in improving the water supplies for domestic use, both in quantity and quality.
2. To assist in improving, expanding and establishing vegetable gardens and small irrigation projects, which also include the construction of small dams.

The scope of this paper is limited to the first aim, i.e. water supplies for domestic use.

### ORGANISATION

In the organisational structure of the L.W.P. Water Programme which gradually evolved during the first year of operation, Community Organisms (C.O.'s) have come to play an important role.

Sixteen C.O.'s are employed in the Project presently, who are local residents recruited through the recommendations of pastors and councillors. Each C.O. covers an area that varies from 800 to more than 2 000 km<sup>2</sup>, by using a bicycle provided by the Project. Most C.O.'s hold no special qualifications, but have been trained on the job. Their educational standards vary from Grade 6 to Form IV. It was considered more essential that they be resident in their area of duty, where they are well known and respected. Their duties include:

1. To carry out a water sources and population survey.
2. To organise and address local meetings at various levels.
3. To identify possible projects.
4. To encourage and organise the participation of the communities in the implementation of the projects.

The technical implementation of the projects is supervised by District Supervisors (and/or Assistant Supervisors) who have a motor vehicle at their disposal. The Supervisors and C.O.'s are both directly responsible to an expatriate Water Engineer. The Supervisors oversee the digging of wells, and the technical staff such as pump-fitters and wellsinking foreman. The actual digging of wells is done by local wellsinkers, who have been trained under the project, on the basis of a simple contract agreement. Wellsinking equipment, tools and materials are provided by the L.W.F.

The wellsinker is usually paid once a month for the number of metres he has dug. The labourer, 3 or 4, are employed by the wellsinker and therefore paid by him, and not by the L.W.F.

Wellsinker-trainees are assisted by the L.W.F. to obtain a blasting licence after they have worked for at least 2 months under the direct supervision of a qualified wellsinker. A blasting licence is a prerequisite before a wellsinker is considered qualified. Approximately 120 wellsinking gangs are working under the project presently.

### SURVEY AND COMMUNITY PARTICIPATION

The Community Organisers carry out a "water sources and population survey" to obtain information about the names and locations of the communities, the number of families per community and about the existing water sources. At the same time, meetings are organised with Community leaders at ward level to explain and introduce the Water programme. After the introduction of the project to the Community leaders, the C.O. starts organising meetings with the communities usually in consultation with the councillor and the representative of the church.

At these meetings the following points are discussed and explained:

- Wells are to be spaced approximately 2 Km apart (up to 1 Km apart in densely populated areas) and each well is to serve about 10 families.
- The community is advised to elect a Water committee comprising of two female

members and one male member, which will liaise with the project officials and look after the well when completed and handed over to the community.

- The community is invited to select a well site/s which is to be inspected and approved at a later stage by an employee of L.W.F. usually the well sinking foreman. Mapping of approved wellsites is usually done by the Supervisor.
- The required contribution by the community consists of:
  - (a) Provision of accommodation and mealiemeal for two wellsinkers.
  - (b) Supply of river sand and aggregate for lining the well.
  - (c) Erection of a fence around the wellsite.

In addition, the community may be requested to carry the wellsinking equipment to the wellsite.

A higher priority is given for the implementation of certain wells where the people are prepared to start digging voluntarily.

#### WELL CONSTRUCTION

The method of well digging is largely based on a technique developed by the then Rhodesian Government about 25 years ago. A circular hole with a diameter of 1.5m is dug manually, with pick and shovel and if necessary a miner's bar. When the hole is 2-3m deep further digging is done with the aid of a 50 l. mining bucket and a simple windlass. The bucket serves to lower and lift the wellsinker in or out of the well and also takes out earth, stones and water. The windlass is operated by one man on either side.

In rocky formations the diameter of the well is reduced to 1.20 m thus providing a foundation for the concrete lining. There is usually no need to line a well all the way up from the bottom. The wells are lined by casting concrete rings in situ, with the aid of a circular steel mould of 1m height, consisting of four pieces. While pouring concrete behind the shuttering, the well-sinker stands on a wooden platform that is suspended in the well and kept in position by four long sisal ropes. The lining protrudes 30 cm above the surface to prevent dirt or surface water leaking into the well.

When the material is too hard to use with pick and shovel, usually after 2-5m, explosives are used. The charge holes, which vary from 3 to 10 in number, depending on

the hardness of the formations, are drilled manually to a depth of about 60 cm, using 60 and 90 cm long mild drill steel and 4lb hammers. For hard stone, it is preferred to use tungstan tip reinforced steel, although these cannot be sharpened by the local blacksmiths. All well sinkers have been provided with portable explosives boxes to store a small stock of explosives, enough to last for a month. After reaching water, digging or blasting continues until about 4m below the water table. Water is bailed out with the mining bucket every morning. When the amount of water to be taken out every day is at least 100 buckets i.e. approximately 5 m<sup>3</sup> the depth is considered to be sufficient. Two compressor teams are available to increase the depth of wells wherever necessary.

In certain areas, wells sometimes cave in before they are lined. Prefabricated concrete rings, (diam. 1.20, height 1m, wall thickness 6 cm, reinforced with chicken wire) are then lowered into the well. Several rings are placed on top of each other, while digging inside the rings continues until the amount of water is sufficient.

The well-cover consists of two semi circular slabs of 8 cm thick reinforced concrete.

If the well is shallow and to be equipped with a Blair pump, a small concrete block is cast on one side of the slab with a hole to fit the internally threaded PVC socket of the Blair pump. The wall top is then sealed and an apron is made sloping towards a drain. When pumping, the bucket is placed on top of the well while the person pumping stands beside the well.

However, wells that are to be equipped with deep well handpumps, require a slightly different well-cover and a different layout. The pumpstand is concreted-in beside the well, while the pipe assembly is bolted on to the side of the well cover, thus making it possible to open the wall by removing the other half of the well cover without having to pull out the pump. This eliminates the need for a special manhole. The well does not need to be sealed as the water is pumped through a 2m long delivery pipe into a trough.

#### EPILOGUE

The L.W.F. well-digging project is scheduled to be phased out after 4-5 years of operation in any given area. To encourage the continuation of well sinking activities, whether for private individuals or for communities, after the L.W.P. has withdrawn, the well sinking equipment will be made available to well sinkers who want to set up

their private well sinking business. On the other hand it is hoped that the Government (D.D.F.) will also continue to use the hand-dug wells technique.

As indicated above, the well-digging technique was borrowed from the former Rhodesian Government, although it was more or less abandoned years ago in favour of mechanically drilled boreholes. However, wells appear to have a number of important advantages compared to boreholes:-

- A well can be maintained and deepened, if necessary by the users themselves.
- Water can be drawn from a well, even when the pump is out of order.
- Well-digging is a labour intensive method that provides much needed employment in the rural areas.
- The equipment and materials used in well-digging are almost entirely locally made.
- Wells are considerably cheaper than boreholes.
- Community participation is relatively easy in a well sinking project.
- Rural people are thus provided with skills and tools that enable them to improve their own situation with their own means if necessary.

A disadvantage of a hand dug well is that its yield is usually, but not always, less than that of a borehole. However, if a well can yield 4-5 m<sup>3</sup> daily, then the water requirements of 10 families and their livestock can be met adequately. Only where yields of over 5 m<sup>3</sup> per day are required, a borehole might be more appropriate than a hand dug well. But even then one could consider digging two wells instead of drilling one borehole.