Introduction

The rope pump is a simple technology hand pump that has the potential of reducing the cost of installing hand pumps in Ghana by about 75 to 80 percent.

The technology has been tested in Ghana before and for very simple reasons, the spirit seems to have died down.

WaterAid has supported one of its partner organizations in Ghana, Rural Aid, to undertake another pilot project on this potentially cost-effective technology in order to revive national interest in the technology once again.

This document presents the lessons from the project, efforts made to improve it, and challenges identified with the pump should the nation decide to improve the rope pump and recognize it as an option.

Piloting the Rope Pump in Ghana

Lessons and challenges ahead

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WaterAid - Water for life

The international NGO dedicated exclusively to the provision of safe domestic water, sanitation and hygiene promotion to the world's poorest people

Www.wateraid.org/ghana

An open well

A well fitted with a rope pump

Background

The provision of safe drinking water for the world's 1.1 billion deprived people has become one of the topmost priorities of many governments in developing countries in recent years. This has come about especially after about a hundred and fifty governments declared in the year 2000 to halve the number of people without access to safe drinking water by 2015.

Potable water resources abound in many developing countries including Ghana. However, the means to tap the water and make it potable for the people has become a big challenge of many governments and donors.

Hand-dug wells, boreholes and rainwater reservoirs have been accepted in many countries in Africa, Latin America and Asia as useful technologies for providing safe water to the people. A major challenge associated with these technologies has been how to make the water safe for drinking. For boreholes, there must be a hand pump before the water can be tapped. With hand-dug wells, they could be left open for people to fetch the water with rope and bucket. With rainwater reservoirs, hand pumps are also optional. However, open wells come with the risk of exposing the water to contamination through flying objects, insects, dirty fetching containers, falling animals, as well as the danger of children falling into the usually deep holes.

In every respect, the hand pump has been accepted as the best tool for protecting well water in many countries. It provides the opportunity to cover and seal the well to prevent all foreign materials from entering the water. This has worked well on most occasions but for the fact that the cost of the pumps has also introduced another hindrance and challenge to both the provider and beneficiary.

The hand pump as an essential component of water provision leaves us with no other option than to develop affordable and cost effective brands in order to accelerate the rate of coverage, given the urgency required to serve everybody.

The Rope pump as a technology option

The 'rope pump' is a simple technology hand pump that has been gaining popularity in many countries especially since the mid-nineties. It is made of simple, cheap and locally available materials and the cost has always been just a small fraction of other imported pumps. In Africa, countries like Angola, Mauritania, Congo, Ethiopia, The Gambia, Kenya, Madagascar, Mozambique, Senegal, Uganda, Zambia and Zimbabwe are all at various stages of developing the rope pump as an affordable option. The same can be said about Asian countries like Bangladesh, Afghanistan, Cambodia, India, Papua New Guinea and Vietnam. In Latin America, Bolivia, Colombia, Cuba, El Salvador, Ecuador, Honduras, Guatemala and Nicaragua are all at various stages of rope pump development.

In Bangladesh, the rope pump was accepted as a potential factor in controlling arsenic content in drinking water. Hand-dug or shallow wells were identified as being arsenic free or at worse containing lesser amounts than deep wells. The combination of hand-dug wells, which were cheaper, and rope pump, also cheaper, was identified as an apparent solution to the arsenic problem. In Nicaragua, there was a national policy in 1995 to make the rope pump the number one option. This policy came after the Rope pump was certified as giving adequate protection to the quality of the well water, while at the same time, providing adequate social satisfaction. A step-by-step development, promotion and introduction approach was adopted until the technology was accepted in the society.

Ghana and the rope pump

Ghana could have been among the first in Africa to adopt the rope pump had earlier attempts to adapt the technology to the Ghanaian context succeeded. The Community Water and Sanitation Agency (CWSA), with support from the World Bank, sent a delegation to Nicaragua to study the rope pump system and find ways to introduce it to Ghana. The delegation was impressed and determined to nurture a local production base for the pumps. It was later established that the capacity to produce the rope pump and its spare parts existed in the country. Two local manufacturing firms were identified for support to start piloting the rope pump technology in Ghana. Representative technicians from the firms were sent to Nicaragua to be trained in the production and marketing process and were expected to transfer the newly acquired skill to Ghana. Unfortunately, however, the process could not succeed in the country and the spirit seems to have died down in the country since then. Recent investigations have revealed that even before this attempt, the rope pump existed in certain parts of Ghana even as far back as 1988.

Reasons for initial rope pump failure in Ghana

WaterAid Ghana's investigations have identified various reasons for the failure of the technology in Ghana. These include: Lapses during technology transfer. The rope was exposed to the environment outside the well making it possible for secondary contamination. Again, the rope needed to be replaced too often, making it unattractive for the users. The metal used for the frame also rusted too early and this would call for frequent repairs. Wicked persons and children could easily play with the rope, either breaking it or polluting it etc. Lack of promotion to stimulate social interest. Many communities had become used to imported hand pumps. To replace such an accepted technology with another one would not be that easy as it takes time for human beings to develop new tastes and abandon tradition. This was almost absent in the pilot phase.

Poor relationship between pilot communities and manufacturers due to inaccessibility. It is reported that communities were far apart and it took several hours or days to visit them for follow up and also for the communities to access the manufacturer for any information or interaction (Ref. Bombas de Mecate website www.ropepump.com).

There was also over reliance on the private sector to do the promotion of the technology. This could only have been possible with initial capacity support, which was also absent.

Little political will to 'keep on trying' in order to improve on the technology systematically. In some other countries, it was considered as a process until it reached an acceptable stage. In Ghana, the spirit has almost disappeared after just a few years of trial.

Rural Aid / WaterAid interventions – Reasons

In 2003, Rural Aid, a WaterAid implementing partner organization, began to revive the

hope for the rope pump in the country. This decision was necessitated by the fact that there exists in the country, several thousands of open wells provided by a number of development organizations as a response to a desperate situation of acute water problems. In the Upper East Region alone, where Rural Aid operates, there were about 2000 open wells. Rural Aid had begun a process of providing hand pumps to all these wells. Due to financial constraints and the high cost of imported hand pumps, the process was found to be too slow. The problem was how to improve the rope pump and make it acceptable to Ghanaian authorities and communities.

The VSO factor

Rural Aid and WaterAid seized an opportunity presented by an expatriate VSO volunteer on secondment to Rural Aid to turn the dream into reality. The volunteer was very experienced in the rope pump technology and had been to Nicaragua, Papua New Guinea, Bangladesh and other countries studying the technology. With him as the lead person, the rope pump pilot project began in 2003.

The piloting approach

Rural Aid and Janamese Enterprise

A Dutch charity, Victory foundation, had supported a private artisan to set up a rope pump manufacturing enterprise in Bolgatanga, the capital of the Upper East Region. Rural Aid therefore saw it wise to establish a formal partnership with Janamese Enterprise for the pilot project of 30 pumps spread over three districts all in the Upper East Region: namely Bongo, Bolga, and Kassena Nankana. WaterAid provided funds for the pilot project. Under the partnership agreement,

- Rural Aid was to identify the pilot communities, mobilize them and raise commitment fees of ¢150,000 per community,
- Rural Aid was to make necessary modifications on the concrete covers of the wells initially designed for other types of pumps,
- Janamese Enterprise was to be contracted to supply and install the rope pumps on the wells after the communities had paid their commitment fees,
- Janamese Enterprise to back up with spare parts,
- Rural Aid and Janamese Enterprise to train communities on the proper use and maintenance of the pumps,
- Rural Aid and Janamese Enterprise to continuously monitor and evaluate the pilot project.

Community selection criteria

Three districts in the Upper East Region were randomly selected for the pilot project. The reason was that they were all close to the project offices for easier monitoring and communication. The target wells were those that were high yielding and were at least more than two years old but had not been fitted with hand pumps. Ten communities were selected from Kassena Nankana District, 12 from Bongo District and eight from Bolga District.

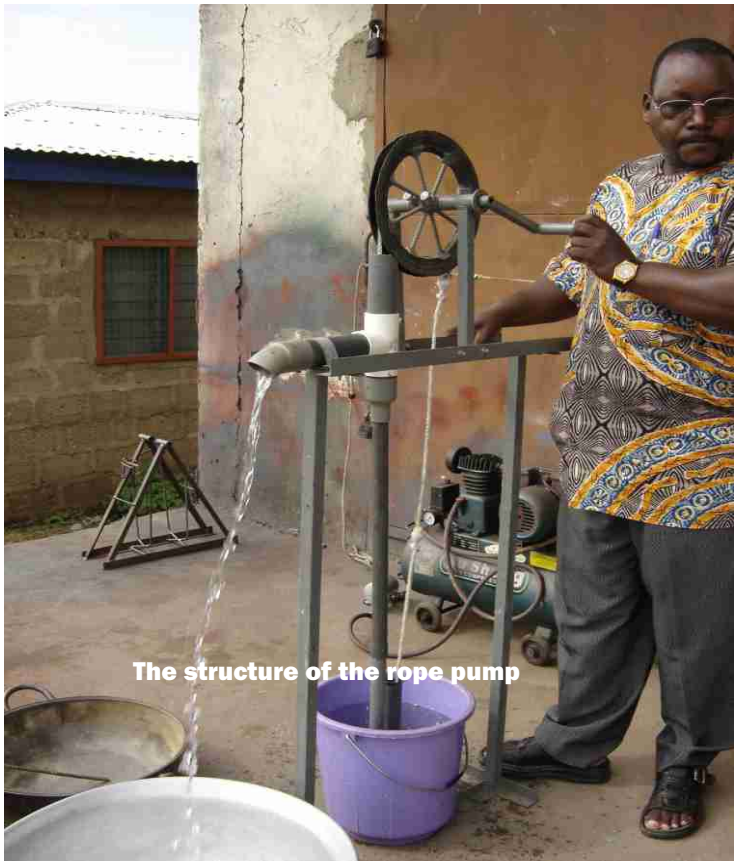
Monitoring and evaluation

Monitoring and evaluation have focused mainly on the suitability of the pump in terms of operation and maintenance, social acceptance, rope performance, technical data like pumping capacity, flow rate, and durability of the pump itself.

Modifications and improvements

With technical advice by the VSO and lessons from the pilot project, there have been some remarkable improvements to the rope pumps so far:

The rope used to wear out too early: The rope touched the concrete guide block as a result of not setting it up properly and this caused the problem through friction. This has been improved by setting a smooth bottle at a more appropriate place to direct the rope in such a way that the rope and the pistons would never touch the concrete guide block nor the riser pipe. The size of the rope and pistons should therefore be determined by the internal diameter of the pipe to prevent friction. In Bolgatanga, a private borehole owner using the rope pump says he has never replaced the rope for seven years!



The structure of the rope pump

The metal frame on which the wheel is set rusted too early:. This problem was caused by fixing the frame directly on the concrete well cover, using corrosive materials and refusing to paint them. Raising the frame a few millimeters above the concrete cover and painting the frame with anti-corrosive paints have improved these.

The rope caused secondary contamination: This was because the rope was not covered and was exposed to the outer environment. A metal cover has been developed to cover the rope to prevent it from external pollutants. In addition a full cover has been developed for the whole pump, leaving only the handle accessible to users and any foreign material or animal. It is, however, possible to open and grease or repair any part whenever necessary.

Initially, pistons were imported from Nicaragua: Now, the pistons are easily produced here in Ghana with plastic waste.

The wheel often automatically turned in the opposite direction with force, sometimes hurting the user. Fixing a metal brake in-between the spokes of the wheel has prevented this.

Social acceptance

This has been made possible by involving communities in the installation process and making them understand the need for a pump. Watsan committees in the communities are in charge of operation and maintenance of the wells in general, and the pump for the purpose of this pilot project. Again, the modifications and improvements made on the pump have generated a rise in demand for the pump. Some private well owners have already started buying directly from the manufacturer.

Identified comparative advantages

Comparative cost advantage

The rope pump costs between 75 and 80 percent lower than the cost of other traditional pumps currently in use in Ghana. This is because all the raw materials are locally available and cheap. Plastic and metal waste account for a greater part of the materials needed to manufacture a rope pump. Maintenance cost is also very low. The part that needs regular repair, probably, is the rope

itself, which is also very cheap and available locally.

Long life

The lifespan of the pump is determined by how properly it is operated and managed. In fact it is made of metal and plastic, all of which can last for decades. The only part that wears out quite often is the rope itself. However, with proper manufacturing procedure the rope can last for three years or more A year after installing the 30 pumps, only two of the ropes wore out This was later found to be a manufacturing defect; the bottle was not properly set. With anti corrosive paints and galvanized iron, the pump can have a very prolonged lifespan and can compare with other known pumps.

Availability of affordable spare parts

All the parts of the rope pump are available almost everywhere in Ghana. The only part that may be unavailable is the piston, which can easily be manufactured using a very simple technology. The materials for manufacturing the pistons, plastic waste, abound in every community in Ghana.

Easier to operate

The pump requires comparatively lesser energy to operate in that the handle is smaller and the fulcrum is softer. The height is also within the reach of very young children. There is no need to mount the cover of the well before operating it – one just stands on the ground and can still reach the handle. It has been observed that even children below eight years are also capable of operating it.

High flow rate

The pump has the capacity of filling up to a 70-liter container per minute. This, however, depends on the depth of the well. Where the well is very deep, the pumping capacity is low and vice versa. From a five-meter deep well, a seven-year old boy was able to pump 39 liters in a minute in one of the pilot communities. This is also one of the reasons for the social acceptability of the pump.

Easy to install

It takes approximately 45 minutes or less to install the rope pump since the technology is simple. The components of the pump are very few and easy to handle. It therefore takes very little effort to train community management committees to install, operate, and manage the rope pump.

Can be used both on Hand-dug Well and Borehole

The rope pump can be fitted on both borehole and hand-dug wells. It has been proven that it performs excellently up to 40 meters deep. With adjustments and double crank it can perform well up to 60 meters. It is being experimented to see if it can perform well up to 80 meters. In Bolgatanga, a private man installed a rope pump on his 135-foot deep private borehole in 2000 and it is still performing excellently, having changed the rope only once.

No sand interference

Unlike some other pumps, sand does not affect the functioning of the rope pump. Because of this attribute, the guide box is positioned on the bottom of the well. This means that the rope pump can still fetch water to the barest level during dry seasons. This also adds to the social acceptance of the pump. With other pumps, the foot valve has to be at a certain distance (at least one metre) above the bottom of the well to prevent sand from entering the pump.

Lessons learnt

So far during the pilot phase, it has been learnt that the rope pump still has the potential in minimizing the cost of providing safe underground water for the vulnerable in Ghana. The pump has most of the qualities of the conventional pumps that we are used to and can even perform better in several ways. With a little more work and patience, as well as a systematic approach at promotion, the rope pump can be improved in efficiency, durability, and social acceptance.

Communities must understand and appreciate the essence and capabilities of the rope pump before they would accept it. This can only be done through well-crafted marketing strategies.

There should not be difficulties for communities to communicate with the promoting agency and/or the manufacturer. Whatever they doubt or need support for must be clarified or provided as early as possible. In this respect there is no need to pilot projects too far from the piloting agency.

Challenges ahead

To make the pump more attractive and competitive, there are still quite a number of challenges to confront:

Making the pump look more attractive

Using rust resistible materials and providing training support to artisans for quality finish could help achieve this.

Keeping the cost low

The cost should be kept low enough so that the objective of attaining cost-effectiveness would be upheld. This means that even as we think of quality finish, we equally consider the comparative cost implications.

Generating social acceptance

This could be achieved by highlighting the positive attributes and comparative advantages of the rope pump through a concerted sectorwide effort in effective communication strategies, as well as practical demonstrations in communities.

Ensuring regular supply

This could be achieved by building the capacity of the existing workshops, training more artisans and the support to especially the private sector to create more workshops to manufacture the pumps.

Recommendations and conclusion

Rural Aid and WaterAid have not completed the work on the rope pump. The two organizations are only trying to revive the spirit and recall the momentum built somewhere in 1999. The fact remains that the rope pump is still a potential solution to our problems associated with hand pumps and their spare parts. The pump can speed up the work on fitting pumps on all our open wells that are producing contaminated water to our people. There is the need for the respective authorities especially the Ministry of Works and Housing, CWSA, Ministry of Private Sector Development, Ministry of Trade and Industry, engineers and artisans to keep up the flame. Ghana can indeed develop this technology, create jobs, reduce importation and drain on our foreign exchange, and more importantly, accelerate the rate of providing safe water to the Ghanaian poor.

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