



Are handpumps really affordable?

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DURING THE INTERNATIONAL Drinking Water Supply and Sanitation Decade of the 1980s many thousands of handpumps were installed in “developing countries” as part of the United Nations-led drive to provide safe drinking water and adequate sanitation for all by 1990.

Since then, thousands more handpumps of many different types have been put in by donors and governments.

Handpumps have been given a high profile in the quest to provide potable water to the worlds’ burgeoning rural population by leading players in development like the World Bank, UNICEF and a plethora of international Non-Government Organizations. Handpumps were vigorously promoted as being the best option by which communities could enjoy a safe and reliable water supply, based on the following set of assumptions:

That handpumps were:

- Low cost
- Affordable
- Easy to Maintain
- An appropriate technology
- Readily available
- Easy to instal
- User friendly
- Efficient

It has been generally accepted that handpumps render a shallow well or borehole “safe” against surface contamination based on the belief that the water will be contaminated to an unacceptable degree (having an E-Coli count of more than 10) if alternative extraction methods are used e.g. rope and bucket.

This paper will point out that handpumps have not lived up to earlier expectations, particularly in the area of affordability, and that donors and recipient governments would be well advised to consider other less politically correct options, under certain circumstances.

A brief history of handpumps

The first generation of handpumps included such stalwarts as the British made Godwin, which were installed in the 1930s,40s and 50s. They used super heavy duty materials like cast iron and hardened steel in the belief that one had, in the colonial era, to make pumps virtually indestructible so as to withstand constant use and abuse by people in the “Third World” who could not be expected to maintain, let alone repair, such advanced pieces of technology.

To their credit, many such pumps continued to pump water for many years beyond their original life expectancy, but many also broke down and stayed that way for months or years because government mechanics did not come to repair them for a variety of well-documented reasons.

During the 1960s and 70s a second generation of handpumps emerged, of which the India Mark II is the most notable example. With over five million installed worldwide, this is undoubtedly the world’s most widely used handpump. At the time of its development in India in the early 1970s, the Mark II was heralded as being the answer to the myriad problems of rural water supply.

However, this pump relied on a three-tier maintenance system. Although such a system was developed in India, in 1986 it was reported (World Water Conference, Nairobi) that over one million India Mark II pumps were broken down on the sub-continent.

The pump was, however, considered an affordable option at least in the Indian context where intense competition in the burgeoning manufacturing sector kept costs down.

It is still probably the most cost-effective handpump for depths up to 45 meters, even in Africa where high freight costs have always made imported pumps more expensive than they are in India.

But in Africa, the Mark II has not been a sustainable solution to rural water supply problems, mainly because the Indian-style tiered maintenance system frequently failed or simply was not there in the first place.

Development of the Afridev

During the 1970s, the World Bank/UNDP pioneered the concept of a simple handpump which could be maintained at the village level in Africa. The Bank financed the development of what became known as the Afridev, based on the belief that handpumps must be made and maintained locally, by local people. The Afridev design featured state-of-the-art light weight, non-corrosive, easy-to-assemble materials developed in cooperation with the Swiss multinational company, Dupont. Ironically, manufacture of the Afridev has never really taken off in Africa. One of the reasons being the extremely high price of the mould needed to produce the nylon bearing-bushes and the footvalve/plunger. Also, high import tariffs on raw materials make the manufacture of Afridevs in African countries expensive.

The Afridev is, however, being made in large numbers at competitive prices in India and Pakistan and is being sold for installation in African countries cheaper than African-made Afridevs !

One of the main reasons is that in most African countries the small scale industrial base is not nearly as developed as is the case in India or Pakistan. The price of a European-made Afridev landed in an African country right now is about US\$900.00; about double what an Indian made Afridev costs!

The handpump option

The donor community throughout the Water Decade, did much to persuade governments of developing countries that handpumps per se offered the best option in making safe water available to burgeoning rural populations.

The advent of the Village Level Operation and Maintenance handpumps in the late 1970s to early 1980s did much to further the handpump option, particularly in Africa with the Afridev leading the way toward the goal of affordable village-based maintenance.

Are handpumps sustainable?

Sustainability may be defined as an intervention which is capable of being supported and maintained by a community or individual over an extended period of time with an absolute minimum of outside assistance.

VLOM handpumps were developed and installed in remote rural areas because it was assumed that the users themselves would be able to maintain them. In many cases in Africa this has proved impractical due to a number of technical problems with the Afridev pump concerning:

- The PVC rising main
- The method of joining pump rods
- The nitrile rubber seal & O ring
- Fishing tools
- The supply of spare parts kits

Rising main

The Afridev blueprint specifies a 63mm O.D. PVC riser pipe having bell joints glued together. Originally it was thought that it would be unnecessary to remove these pipes once installed in the well. This is a big selling point. However, experience in Malawi, Ghana and Ethiopia has revealed that in some types of Afridev, the rod connector wears a hole in the riser pipes, necessitating their removal by sawing and re-gluing using PVC sockets. This operation is beyond the means of handpump caretakers. Also, PVC risers installed in wide-diameter wells tend to flex during pumping causing joint fatigue leading to cracking of the PVC pipe. Little thought has been given as to how to secure PVC pipes in the well.

Pump rod joining

Some manufacturers use a plastic clip-on device for joining the rods. These can and do come off after a few months use, necessitating the use of a **fishing tool** to extricate the fallen rods. The type of fishing tool supplied by the manufacturer is not able to do this job, so a special tool has to be fabricated. This too is beyond the means of handpump caretakers in the village.

Plunger seal & O ring

Experience has shown that the nitrile rubber plunger seal and footvalve O ring actually absorb water over time, and expand. This makes their removal difficult, especially in the case of removing the footvalve.

Supply of spare-parts kits

It is recommended by Afridev manufacturers that the plunger seal, bearing bushes and footvalve bobbins and O ring be replaced annually as a preventive maintenance strategy.

However, the issue of how the spare-parts kits are going to be supplied to the village caretaker has not been fully addressed. Difficulties arise when donors try to supply spare parts at the village level. Who is to look after them? Is the village expected to pay? Who is going to collect and keep the money? Are parts to be given freely or should a nominal charge be levied ?

Handpump caretakers

Many thousands of handpump caretakers, many of them women, have been trained to maintain handpumps like the Afridev. But this pump still has its problems. Can caretakers and their assistants fully repair this type of handpump? Experience to date suggests that they cannot. Most water supply projects have convenient "showpiece" communities not far from project headquarters where groups of highly trained women impress visitors by whipping out the rods and changing the plunger seal in textbook fashion.

What is less well known, but just as common, is that VLOM handpumps have failed in remote rural areas because problems have arisen beyond the means of the trained caretakers to repair.

Beautiful wells have been rendered useless and people have been forced back to traditional, unprotected sources because the VLOM handpumps have broken down, typically with rising main problems.

In Africa, the India Mark II does not enjoy an impressive record of sustainability mainly because there are not the village level mechanics available that are commonly found in rural areas of India, where the popularity of the ubiquitous bicycle has encouraged a culture of village bicycle repair shops whose mechanics are ideally suited to repair handpumps, a technology on a par with that of bicycles. As the bicycle makes inroads into the African countryside we can expect an upsurge in the repair business which will auger well for the continued sustainability of handpumps.

Affordability of handpumps

When we talk of affordability we must ask, affordable to whom? Who is paying? It has been said, for example, that the Afridev is an affordable handpump for Ethiopia. (Second National Handpumps Workshop, Addis Ababa, UNICEF, Jan.92). But is it?

In 1992 a bilateral aid project in Ethiopia imported 165 Afridevs from India costing US\$660 each including airfreight. If the cost of clearing, transport to the site and installation costs are included, the installed cost comes to around \$700. Each handpump serves about 55 households. The World Bank states that the average per capita income in Ethiopia is \$120. Therefore, if the users were paying, each family head would have to pay \$12.72 or 11% of their annual income. This is more than double the 5% guideline that the Bank has said is the maximum that families should have to pay for safe water. Clearly, in this scenario handpumps were not an affordable option.

The technical shortcomings mentioned above and the expense involved call into question whether handpumps, such as the Afridev, are the most appropriate and sustainable solution to potable water supply problems in rural areas. In isolated rural communities in the Tigrayan mountains of Ethiopia, or across the savannah lands of the Sahel, where outside technical assistance may be weeks or months in arriving, communities have been left without a safe water supply because their so-called VLOM pump failed and they couldn't fix it.

Alternatives

Having shown that handpumps may not be affordable or technically sustainable, we have to ask, "What is the alternative?"

One answer is "Back to Basics!"

Back, in fact, to the age-old rope and bucket system. But that is not the whole solution if contamination is to be kept to a minimum.

Coupled with this simple approach, must come improved well-head design featuring a large, well-drained concrete apron, a protective parapet and a simple windlass to which the rope is attached. Having a dedicated

bucket, be it half an inner tube or a proper bucket, will further reduce the risk of contamination.

Hygiene education

An integral part of a rope and bucket system must also incorporate a hard-hitting hygiene education program which focusses on women, the main users and managers of household water, and children, who are the most receptive to behavioral change.

Hygiene messages should be simple, to the point and unambiguous. The user community must be targeted with a well-thought out, ongoing education program, NOT just a blitz-like campaign that is here today gone tomorrow.

VLOM handpumps cost from \$US400 to 800 each. The money saved by NOT installing a handpump could be used:

- To finance improved well-head works
- To conduct ongoing and effective hygiene education programs.
- To build more wells in other communities thus making potentially safe water more available to more people.

Conclusions

Some people will undoubtedly think that the rope and bucket system is taking a step backwards; that it is too primitive; that rural communities deserve something better.

In some cases handpumps are indeed viable and sustainable, even affordable. But in many isolated rural communities in the emerging countries of the South, many millions of people still live and die of preventable diseases associated with unsafe water supply and inadequate sanitation facilities.

In order to increase coverage; to scale up to the levels required, we should not put all our faith in handpumps, but rather concentrate on more sustainable and more affordable solutions to the problems of rural water supply, so as to transform the goal of Health for All by the year 2000 into an achievable reality.