Small steps count — building on traditional methods for rural water supply

by Peter Morgan

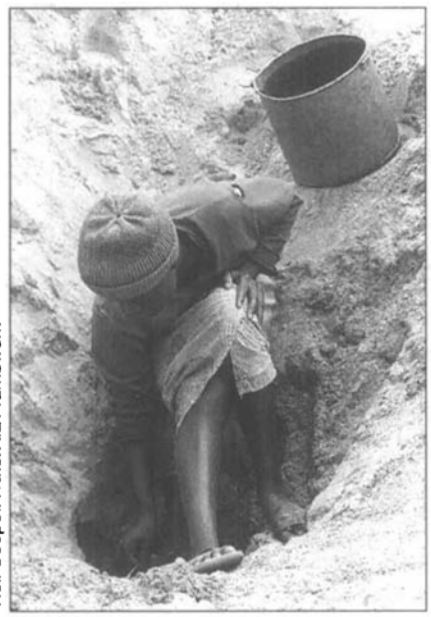
All that glitters ... can end up as a rusty heap of useless technology. Are we overlooking traditional methods of water provision? Can't something that has stood the test of time cope with some careful improvement?

> 'The designer knows he has reached perfection, not when there is no longer anything to add, but when there is no longer anything to take away.'
>
> *Anon.*

FOR THE LAST 20 years or more, during an era of enhanced international interest in bringing improved water supplies to the rural peoples of the world, many fine innovations have been achieved, not only in design, but also in methods of reaching people and involving them in community-development projects. Several questions arise constantly, however — and one of the most important centres around sustainability.

If we take rural Africa as an example, many, perhaps most, of all the mechanized rural water supply systems installed within recent years, at great cost and with supreme effort, will have turned to rust — often literally — within the space of a decade. We know that many schemes have failed because far too little emphasis has been placed on maintenance. We also know that most governments lack the funds and, in some cases, the will, to maintain the large number of installations that are put into place every year, mainly with donor support. Communities are asked to contribute — but, all too often, they are unwilling or unable to do so, and return to their former traditional supplies. If this is the case, a serious question arises — is the method that has been chosen truly appropriate — or has the wrong level of technology been selected?

This issue of *Waterlines* focuses on using upgraded, traditional methods to provide water in rural Africa. Is this one viable option that should be considered more seriously in future?



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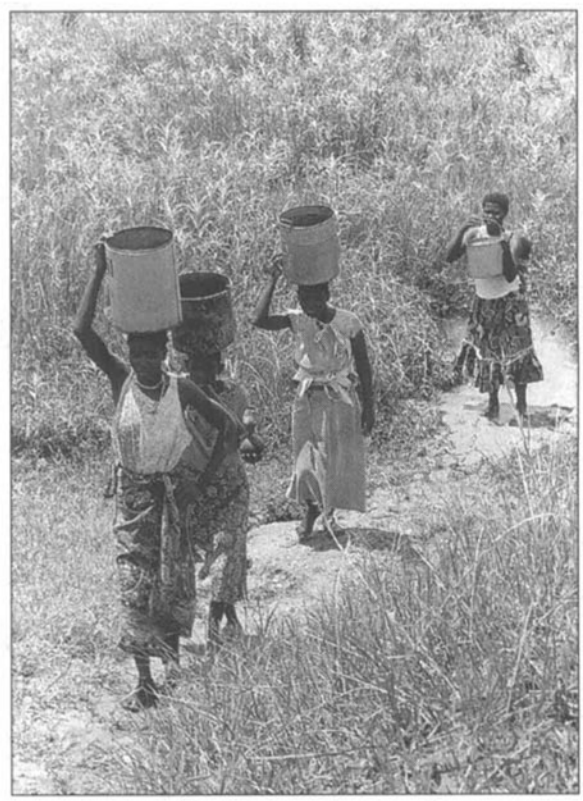

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Unless the new technology is suitable, people will return to their old source, even if dangerously dirty (right), or practically dried up (above).

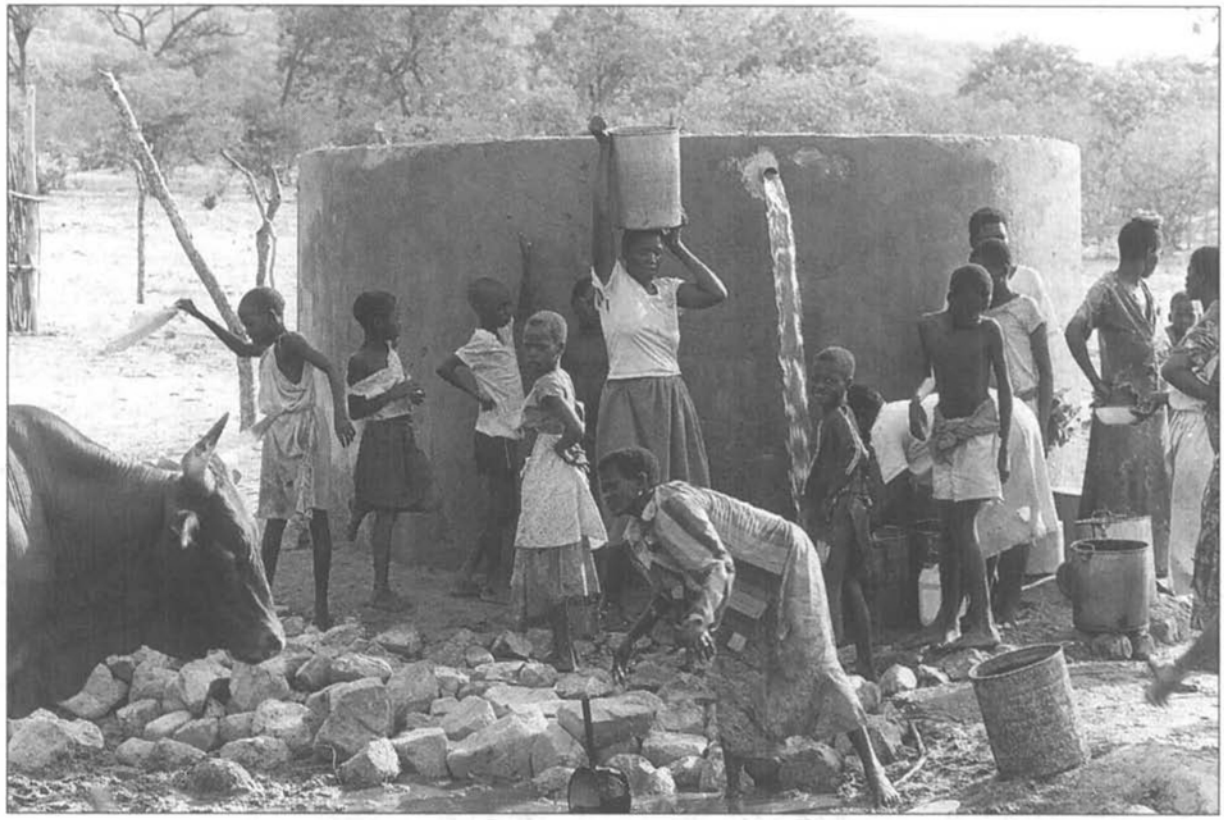
What evidence is there?

On a recent visit to Maputaland, in a remote part of South Africa, I was struck by the stark comparison of the rusted remains of two old, broken handpumps lying next to a closed well and, some hundreds of metres away, in the same wetland area, the constant activity of women and children around a waterpoint which the community had designed and built with no outside intervention. This image reminded me of other occasions, in other countries, where the same local ingenuity had been used to gain access to water by the simplest and most sustainable means. It also reminded me of the enormous effort and cost (not to mention the high hopes which had been dashed), of installing more up-to-date technology in an environment which was not yet ready to sustain it.

For the villagers of Maputaland, I am not sure whether this community's efforts sprang from the frustration of walking to a modern supply which became unreliable and finally failed, or whether the traditional supply was constructed before the new supply was introduced, was used in parallel to the new supply, and continued to operate long after the new supply had ceased to function. I suspect the latter.

Looking at local methods

Perhaps the time has come to reinforce a trend which, clearly, is being talked about far more; studying what local villagers do of their own accord and helping the community to upgrade these efforts. Evidence suggests that traditional methods of providing water, whilst simple in concept and design, have a great intrinsic merit — basically, they often outlast their more modern counterparts. Such methods usually stand the test of time because they actually work in practice, surviving generation after generation. They are the result of a long, evolutionary process which has proven to be



Neil Cooper/Panos Pictures

Zimbabwean villagers collect water from a spring-fed gravity tank — as contact with the source is eliminated, quality is improved.

both practical and effective. Traditionally evolved water technology harmonizes with its environment — it is compatible with local conditions and cultures, and this gives it great strength.

Ancient principles still hold

Since the time of the ancients, local craftsmen and those skilled in the art of finding and protecting water sources, have devised ways and means of bringing water to where people live. Many texts feature references to ancient wells and cisterns used for hundreds and, in some cases, thousands of years. Three thousand years ago, the Persians learned to dig *qanats* to bring mountain groundwater, by the force of gravity, to the arid plains. These horizontal tunnels were built on a huge scale in Iran, Pakistan, North Africa and Afghanistan, and many survive today. In Oman, 60 per cent of the rural population still depends on the same technology, there called a *falaj*, which recently has undergone refurbishment.

In Yemen, where water is abundant for only a short time every year, great ingenuity has been directed into improving the catchment and surface storage of water. There are many examples of remarkable feats of cistern construction, some holding as much as 6000m^3 of water. The cisterns are constructed of stone and lined with *gadhadh*, a locally produced lime mortar, which stays waterproof for centuries.[1]

Surface storage reservoirs, or *hafirs*, are also used in Sudan. These huge depressions in the ground are sited in areas of natural runoff, and many have been rehabilitated in recent years.[2] Similarly, efforts have been made to restore the 2000 year-old run-off irrigation schemes built by the Nabatheans in Israel's Negev desert. There are many other examples.

Rainwater harvesting

Such local ingenuity did not die out with the ancients, but is still much in evidence in developing countries. In some parts of Mozambique, notably in the more remote parts of northern Machaze district, an area known for its barrenness and deep groundwater, the local people build cisterns to collect rainwater. This appears to be an age-old method in a land which lacks operational pumps and other forms of improved water supply. These cisterns, which are hand-dug, steep-sided holes in the ground, can hold between 5 and 18m^3 of water. The catchment area around the cistern is sloped in such a way that water feeds into the storage system. In many cases, these traditional cisterns were built by a man for his wife or wives, and so were erected on a family basis. In 1994, 1421 cisterns were recorded in northern Machaze.[3] Care International is currently implementing a programme of repairing and upgrading.

John Gould, in his article on upgrading rainwater catchment systems

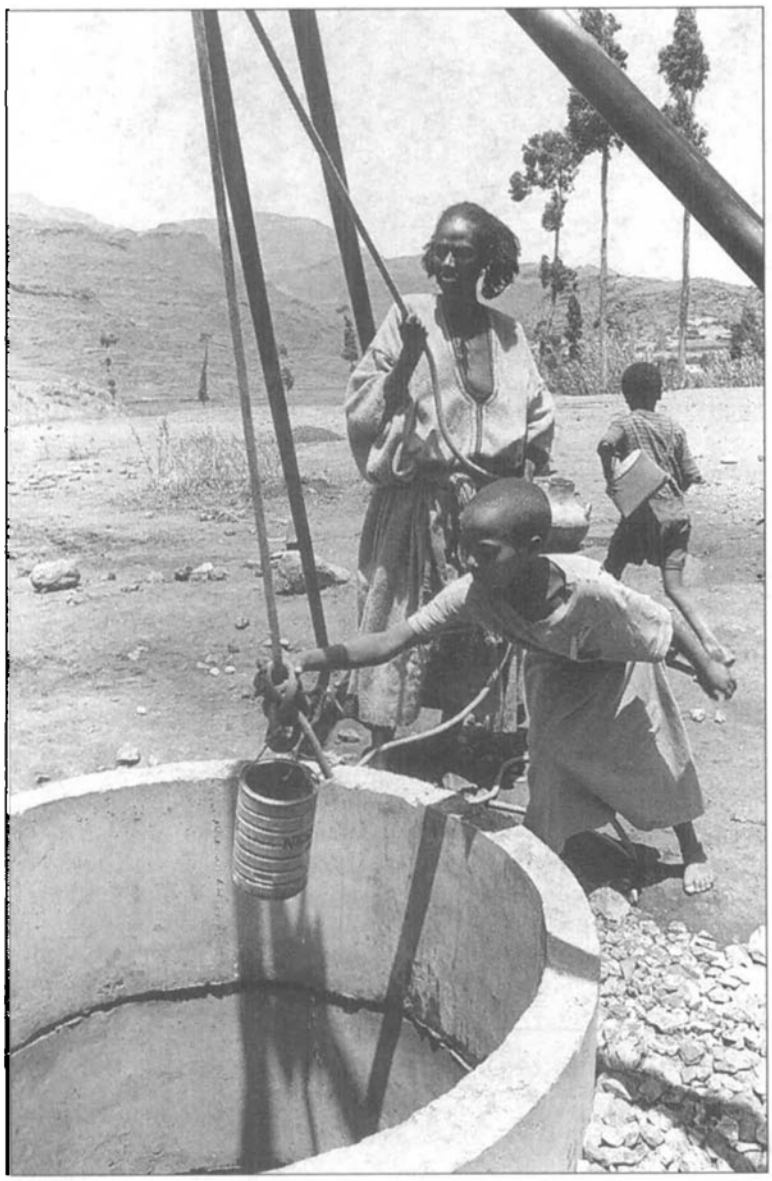
In the April issue of Waterlines

Capacity Building: perhaps the development buzzword of the late 1990s. But how does it work in real life? Can all stakeholders participate and balance their interests? And how can the momentum be sustained in the face of cutbacks and conflict?

This issue — produced in conjunction with the Delft-based International Institute for Infrastructural, Hydraulic and Environmental Engineering — highlights some resourceful solutions to these problems at different levels: from the organization — how Sri Lanka's Water Board is turning itself into a consumer-oriented institution; up to the basic level: how Rhine riparians finally came to co-operate on pollution control; and we hear how Israeli and Palestinian experts are faring in their struggle to overcome political differences to work on joint aquifer management.

Faced with a drop in aid, poor South African communities find the funds to improve their W&S facilities, and Filipinos develop a training network. Plus more stories from around the world bring us up to date on local capacity-building experiences.

in Botswana, describes the upgrading of pan catchment systems in the Kalahari desert. Traditionally, the local bushmen excavated pits in the calcrete surface of pans to capture and store water. The Rural Industries Innovations Centre (RIIC) in Kanye, realizing the significance of this method, set up a specific upgrading project and the pan catchment systems are proving to be more reliable than the diesel-pumped, piped system also installed in the area. Gould's example shows that, by carefully combining traditional concepts with modern materials, it is not only possible to retain the inherent merit of simplest way. By using well-placed stones to reduce soil erosion, and re-channelling water from the site of the original spring to a new collection site at a lower point, regular contact is made, not with the source of the spring, but at a point some distance below it. This simple principle forms the basis of all modern protected springs, where contact with the source is eliminated and, as a result, the quality of the water collected is enhanced. On page 21, Zvidzai Zana describes several methods used by the indigenous people of Mozambique to upgrade their own water supplies.



Jan Hammond/Panos Pictures

A newly completed well in Tigré. Ethiopians have designed and developed methods of raising water for thousands of years.

a design, but also to give the facility added vigour.

Traditional springs

In the more remote parts of Mozambique's Mossurize district, local communities, without outside intervention, have upgraded natural springs in the Mossurize; water quality is improved if the source is separated from the take-off point.

Traditional springs have been upgraded on a massive scale in the Eastern Cape Province of South Africa, where, for kilometres, water is fed by pipe from the site of the original source to new waterpoints adjacent to people's homes. The scale of such projects is mind-boggling, but the basic principle is the same as for those simple units in

Simple traditional wells

Wells have been used as a source of water since the dawn of mankind. It is not surprising, therefore, that in many parts of Africa, people have devised simple methods for lining the upper part of the well and protecting the well-head. Throughout much of Manica Province, in Mozambique, communities have dug and preserved relatively large numbers of shallow wells, which they protect at the surface with an open-ended steel drum. By both raising the upper end of the drum above ground level, and 'doming' rammed soil around this central point, Manicans prevent wastewater running back down the well, an essential ingredient of all improved wells.

Remarkably, very similar wells are constructed in Ethiopia, using the same principle of digging down from the unlined well-head, laying two logs across the well about half a metre down, inserting an open-ended steel drum, and then backfilling with soil so that the rim of the drum is above ground-level, and is surrounded by a raised dome of rammed soil. In Ethiopia, the 'buckets' lowered into the well on traditional ropes, are no longer made of leather, but of car-tyre inner tubes; extremely effective at raising water. These simple, easily maintained and locally designed wells serve countless thousands of Ethiopians outside the Government's national water-supply programme.

The same simple principles of partly protecting the well-head with a drum, or even discarded car tyres, can be seen in most countries in southern and eastern Africa. When the well is very shallow, in a wetland area or river bed, water is scooped out directly by hand using a bailer. In Maputaland, the local people have worked out a method of improving water quality by inserting sticks into the 'eyes' of tubular capillaries which collect water from the sandy soils and open up into the base of the well. This reduces the flow rate of water entering the base of the well, but enhances the filtration effect of the sand.

Improved traditional wells

In Ethiopia, people have access to more sophisticated wells, often going down to a depth of 30 metres or more; some use a pulley to assist in the raising of water, but the more interesting examples use a windlass to raise a

rubber bucket. The Ethiopian windlass dates from antiquity. The ancient world knew the capstan and the windlass — both of which may be described as a set of wheels with spokes but no rims, the former having its shaft vertical and the latter its shaft horizontal.[4] In each case, however, the spokes by which men turned the mechanism radiated out from the hub. Such windlasses are still in use in Ethiopia, and can be seen on wells protected at the surface with a raised well-lining and apron. The shaft is made of wood, running on a wooden bearing. This method of raising water is over a thousand years old — the hanging gardens of Babylon are thought to have been watered by a chain of buckets driven by a windlass of this type.

The windlass method of raising water, which both lightens the load and is a hygienic way of storing the rope or chain, was used in Europe for hundreds of years. Although by the end of the nineteenth century it had largely been replaced by the handpump, some wells in remote areas — notably Sweden — continued to use the windlass.

In Zimbabwe, the windlass is thought to have been introduced by gold-miners at the turn of the century. Since these shafts often penetrated water, they often turned into wells. The local people recognized the windlass as a simple and useful device which could be copied easily. This 'modified' technology was soon absorbed into the traditional way of life and spread widely across the country. Tens of thousands of home-made windlasses can still be seen raising water from family-owned wells throughout the Zimbabwean countryside. The uptake of this technology into traditional culture did not take place as part of a development programme — it was copied because it was seen as a valuable tool which was simple to build and maintain.

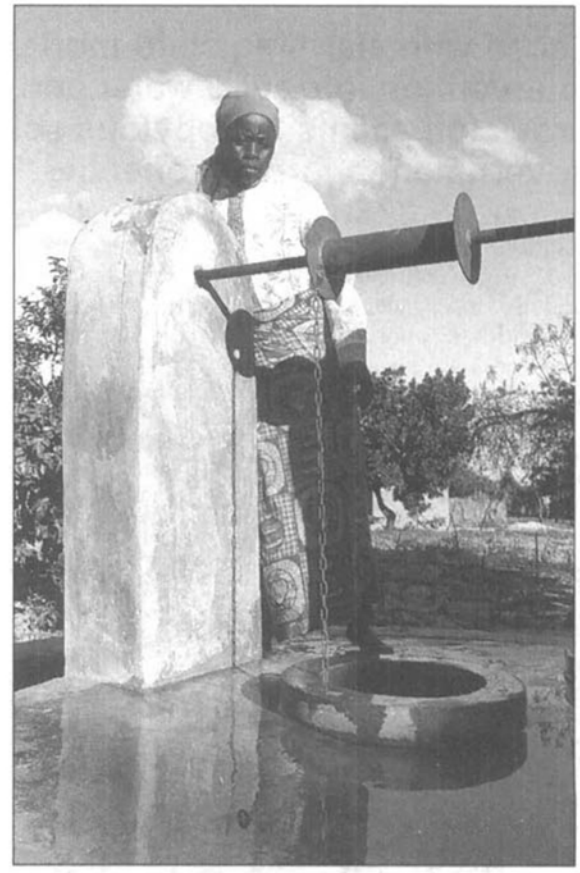
The concept of lining a well with stones and adding some protective covering was introduced into Zimbabwe's culture in a different way — as part of a Ministry of Health campaign. Methods which prevent well-collapse, and improve both safety and water quality, have been promoted by Health Assistants and their successors for over 45 years. The combined use of a windlass on a stabilized well was already commonplace some 20 years ago. The success of the current upgraded family well programme,[5] is, no doubt, based on the long-established, traditional acceptance of the method.

The potential for similar programmes using upgraded wells without the use of a handpump, has also been realized in Zambia, where simple upgraded traditional wells, using the bucket and windlass, are being used. There is also considerable potential in northern Namibia, where examples of owner-built windlass-wells can be seen. Successfully introduced into Mozambique and in Western Tanzania, the non-handpump option is currently being considered for the remote parts of South Africa. It has enormous and, as yet unrealized, potential for many villages throughout the continent.

For areas nearer the Horn of Africa and in the Middle East, the remarkable *shaduf*, another hygienic method of raising water from shallow wells, has enormous potential. Like the windlass, the *shaduf* can be dated back to 1550 BC, and is still used today.

Lessons?

Whilst using upgraded traditional methods as a means of providing water is of growing interest, they have been largely overlooked in most recent programmes, and replaced by more modern techniques.



Neil Cooper/WaterAid

A modified family well — although WaterAid provided the materials, the owner did the rest!

The new technical approach is certainly seductive — promoting the latest technical advance will always be commercially expedient and politically acceptable — whether it be a handpump or mechanized supply. And in those situations which are ready and able to absorb and support such methods, there can be nothing more appropriate — the new technology will provide more water of better quality. But there is overwhelming evidence that, for the more remote areas of Africa, where the poorly developed infrastructure and the capacity of the recipients to manage their own supplies is limited, an alternative approach must be sought.

It is true that most of the more basic, traditional methods highlighted in this issue of *Waterlines* do not provide water of the quality expected in modern programmes — even when upgraded, most could not meet WHO standards for water quality. Neither do they produce water in volume; and they also have their limitations in terms of making deep groundwater available. Such factors have played a part in diminishing the potential role they might have played during the recent phase of rural water development.

Surely, however, another closer look at traditional indigenous innovations, and building on local knowledge to provide a more sustainable water supply can only be productive. An improved water supply is one that provides cleaner water more reliably. Each stepping stone in the development process must not be too far from the one preceding it. Upgraded traditional supplies can offer water of improved quality, and can provide facilities which are more permanent. By going step by step, at a rate which local resources can manage, there will be no end to truly sustainable development.

References

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