Handpump maintenance in Zimbabwe

by Ngoni R. Mudege

The continuous service and viability of water facilities will only be ensured when an operation and maintenance system is in place and is carried out efficiently and cost effectively.

BEFORE INDEPENDENCE, the Zimbabwe rural water supply programme was weak and poorly co-ordinated. Rural development was basically managed in line with the Land Tenure Act, which divided the rural areas into Tribal Trust Lands (now communal areas), commercial farming sectors, African purchase areas, and state lands. In the Tribal Trust Lands, the development of basic infrastructure was the responsibility of the African Councils, who received limited support from the central government. Councils were expected to raise their own revenue through levies. The major players in the water, health, and sanitation sector were the Ministry of Health (which placed a lot more emphasis on curative medicine than preventive), the African Development Fund (created within the Ministry of Internal Affairs in 1949 with emphasis on rural feeder roads, dipping services, etc.), and the Department of Water Resources Development (for borehole drilling, mainly on government projects, and the construction of large dams). Little attention was given to the protection and use of safe water supplies in rural areas.

Pre-independence technology

Although there was no deliberate government strategy to develop low-cost water supply technologies for rural ares, the need for such systems was always there, especially because Zimbabwe is a drought-prone country. It was in this context that Tommy Murgatroyd, a water supply officer operating in the Plumtree district of Matebeleland (a dry, semi-arid area in south-western Zimbabwe) designed and developed in 1933 a handpump which was to become the forerunner of the Zimbabwe Bush pump.[1] With limited government support and limited back-up maintenance systems, and operating in inaccessible, isolated, rural bush, the handpump has stood the test of time, undergoing its first major change in the mid-1970s. As the Bush pump was not patented, a family of Bush pumps was created, with the main common characteristic being the use of hardwood as a bearing block. The limited government support for the development of a specific type of pump led, in the initial stages, to more free choice for users, implementors, and manufacturers, and allowed for a period of undirected field trials during which only the most durable and easily maintained versions survived. The standardization of the pump which occurred after independence included the best aspects of the various versions.

Since very few of the communal boreholes for which the Murgatroyd and the subsequent Bush pumps were designed existed in the countryside, rural people depended on unprotected water holes, rivers, and, to some extent, deep wells with either a rope and bucket or a bucket and windlass. The mining technique for the development of deep wells is well known in the rural areas, and has contributed to the acceptance by local communities of the bucket and windlass system as an alternative to the Bush pump.

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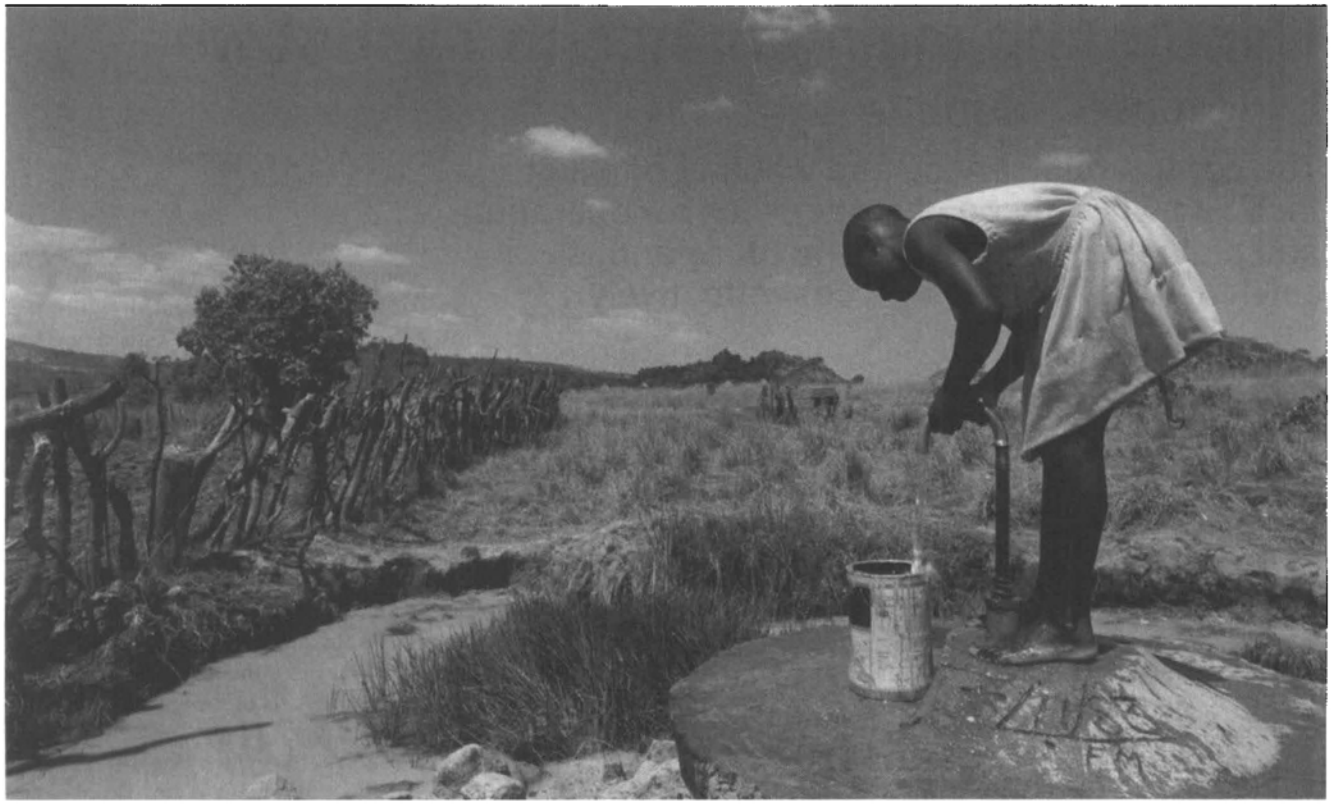

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The Blair pump worked, but was not durable enough to be used in busy communal settings.

In the mid-1970s the Blair Research Laboratories became active in the development of sanitation technologies, and one result was the development of the Blair pump. The Blair pump was later found not to be durable enough in busy communal settings, a constraint made worse by the absence of a proper maintenance system: it was considered to be a Ministry of Health pump and therefore fell outside the new handpump maintenance arrangements. Other handpumps were also tried out, including the DW1, the Maldev, the Bumi (a diaphragm pump), and the Mono pump, all in direct competition with the Bush pump.

Influences

The development of the Bush pump during the 50 years before independence happened in an environment where:

- the government took little direct action in pump promotion and development, hence unintentionally strengthening market forces, local innovation, and competition, and enhancing private sector participation;
- no maintenance system was in place, and so durability in design and installation became critical;
- there was a dire need for a reliable groundwater-lifting device because of persistent water shortages;
- local rather than external experiences were the dominant features; and
- there was no standardization of components and so only the best parts stood the test of time.

These influences were to be the key factors when a formal maintenance system was finally established.

Independence

Zimbabwe gained her independence in 1980, the same year the UN launched the International Decade for Drinking Water Supply. At the same time the Zimbabwean government adopted a policy of accelerating rural development, especially water supplies, by using NORAD funding to create the Rural Water Supply and Sanitation Master Plan (NMWP). Building on imported experiences and the dynamic technology base already established in the country, the NMWP recommended that a National Action Committee (NAC) be revitalized to co-ordinate the rural water supply sector activities in an inter-ministerial manner. The NAC was made up of the newly reconstituted ministries, while the departments set up rural water and sanitation sub-committees at provincial and district levels for project planning and implementation. These committees were to serve under the government-established Village (VIDCO), Ward (WADCO), District, and Provincial Development Committees. These new structures did not, however, take into account the traditional structures which had, over the years, been responsible for and assisted in the development, promotion, use, adaptation, and management of water-supply technologies such as the Bush pump. This departure from 'what people knew', led to conflicts of decision-making, especially with regards to the ownership of pumps in rural areas. A study done in 1985 after the creation of the VIDCOs and WADCOs revealed that 'VIDCOs may be an administrative reality, but their establishment as dynamic and representative bodies above other competing claims for control from traditional and political authorities has not yet been achieved. The lesson for water supply provision is that these structures need clearer definitions, and they need to be offered clear and meaningful opportunities for real decision-making.'[2]

The setting up and strengthening of government support institutions for water supply was a major step. The NAC however, was aware of the need to transfer, at some stage in the future, responsibility for the facilities to the users. To keep this in focus the NAC initiated continuous debate on the sustainability of the programme and programme effects. As well as regular meetings, this took the form of:

- Cost recovery paper (1989)
- Sustainability workshop (1990)
- Decade consultative meeting (1990)
- Gokwe Pilot Project on decentralized planning (1991)
- Sector review workshop and the World Bank sector review (1992)
- Kadoma workshop (1992)

In 1988 the government enacted the Rural District Councils Act, which

paved the way for local authorities to control rural development. In the initial stages of the programme strong central institutions were needed, but it was also necessary to plan for the point at which the user groups would take over. Getting this transitional point right is critical for the long-term sustainability of the facilities.

The National Action Committee is capitalizing on the decentralization drive currently under way in the country to transfer the development of rural water supply services, including the maintenance of pumps, to the Rural District Councils. Up until now, the maintenance of the pumps has been the responsibility of the District Development Fund (DDF).

Maintenance system

The DDF has adapted a three-tier handpump maintenance system, organized as follows:

Tier One A waterpoint committee is selected by the users, and one member of this committee is chosen as caretaker. The caretaker is equipped with a spanner for carrying out preventive maintenance on the pump head. The committee is responsible for organizing the cleaning of the pump surrounds and, in some cases, raising funds for the procurement of grease and spare parts. The collection of funds from users at waterpoints is more common in the marginal areas of the country, such as Matabeleland, than in the wetter areas of central Mashonaland, where the water is not needed as badly.

Tier Two The waterpoint committees are supported by pumpminders, who are locally recruited artisans trained by the DDF. The DDF has over 540 pumpminders in 55 districts of the country. The pumpminder's main role is to support the communities by carrying out below-ground pump repairs. The DDF provides each pumpminder with basic repair tools (pipe vices, vice grips, rod dices, etc.) and a bicycle, and pays them a monthly allowance of approximately Z$200 (US$40). Studies done by DDF in 1989 set some guidelines on the operations of the pumpminders. Each pumpminder covers two to three wards of 10km radius, (a ward has approximately 3600 people) and services a minimum of 50 pumps.

Tier Three A pumpminder is supported by a crew of DDF water supply operatives and supervisors on motorbikes or in trucks. Theoretically this third tier is supposed to provide backup services, such as the provision of spares and tools; supervise the pumpminder; and do minimum repair work (except where there is a need to fish out fallen pipes). But in a number of cases this tier has actually been doing more than 48 per cent of the Bush pumps repairs.[3] This figure is even higher now, as more and more operatives are being recruited.

The three-tier system is supposed to be cost effective, with minimum transport demands, but in Zimbabwe this has not been the case. The workload of the pumpminder is still too low to warrant a full-time person, mainly because there are low service levels in the communal areas and many of the pumps are new and therefore have low breakdown rates. The existence of an active team of water-supply operatives whose main function is the repair of pumps has further reduced the workload of the pumpminder, as in reality they compete for work. The users are marginalized by the repair agency, and because pump spares are unavailable at the local level, the villages are still dependent on the district team. Finally, the pumpminders are poorly equipped, and cannot operate independently.

Other additional advantages and disadvantages of this system have also been highlighted. To its credit, the system:

- offers good opportunities for on-the-job training of local personnel;
- allows for linkages between institutions and users in a supply-driven situation;
- has potential for effective monitoring, and equity in the provision of services; and
- is a necessary interim solution for strengthening the new and existing community, private, and public institutions' involvement in pump maintenance.

On the negative side, the system:

- is supply driven instead of demand driven;
- duplicates elements of the roles of pumpminders and district maintenance team, thereby marginalizing the pumpminders, who in turn have pushed out communities;
- cannot accommodate local initiatives;
- limits the scope for community management, choices, accountability, and responsibility;
- is centrally directed, and hence is expensive. Pumpminders' allowances alone account for US$256 000 annually;
- does not allow for local response to local problems, as the ownership of pumps is still viewed as that of the supply institutions; and
- has long reporting lines, which lead to slow responses to breakdowns.

Pump breakdown

There are many reasons given for pump breakdowns, including the age of the pump, how it is used, how it was installed, and the durability of its parts. The Bush pump is designed to take a lot of punishment, and in 80 per cent of Bush pump complete failures there is a major below-ground component failure. The main advantage of the Bush pump head is that most of the moving parts are easily accessible, and users can usually improvise parts to fix a simple above-ground failure.

The frequency of pump breakdowns varies from place to place. A study done by DDF in 1989 showed that only four per cent of one to two-year-old pumps break down at least once a year, while nearly all of the 15 to 20-year-old pumps break down at least once a year. The DDF estimates, however, that an average of 48 per cent of pumps break down once a year in normal years. In the drought period of 1991-2, the DDF recorded that 72 per cent of pumps broke down at least once, and of these breakdowns 78 per cent were below-ground failures.

Pumps will always break down, irrespective of type, but the important question to consider is whether or not there is a cost-effective system to fix them. The DDF estimates that the annual cost of Bush pump repair ranges between Z$250 and 400 (US$50 to 80). These figures are rather conservative as they do not include government overheads, which are quite significant in the present system. Attempts are being made to carry out studies to determine the real costs of pump repair. At the moment, however, the DDF budget for pump repairs forms a small proportion of its overall annual expenditure (4 per cent in 1990-91 compared to 22 per cent for salaries and 28 per cent for development in the same financial year).

The system is being adjusted to involve the user groups more. In most cases, however, the communities have neither the tools nor the spares to carry out down-the-hole repairs, which involves lifting the rising mains, rods, and cylinders. The pumpminders do not carry or have the necessary spares all the time. A study done in a number of districts showed that 48 per cent of repairs on Bush pumps are done by the mobile district maintenance team, with 3 per cent carried out by users and 35 per cent by pumpminders.[3] A lot of repair work is done by agencies outside

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of the community setting. The DDF is continuously strengthening the capacity of pumpminders to carry out repairs. Pumpminder training, reporting systems, and access to relevant tools are all improving, although there is still some concern over the marginalization of user groups.

To strengthen further the communities' capabilities, the DDF, with support from UNICEF, is piloting a maintenance system which is based on the Village and Ward development committees. Similar projects were carried out with DANIDA financing in the late 1980s with encouraging results, although the main emphasis then was on strengthening the capacity of government support agencies to enhance community maintenance. Although it is still too early to assess the impact of this move, indications are that this will have an improved effect on the 'down time'. The 'down time' (defined as the period between pump breakdown and pump repair) used to vary quite considerably, depending on the reporting system used. Now 40 per cent of repairs are carried out within seven days of the breakdown being reported, and 20 per cent of repairs are done after one month. The 'down time' is critical as it reflects the rural communities' access to safe water supply. At present it is not clear from the studies carried out in Zimbabwe whether or not there is a reduction in 'down time' where communities do the repairs themselves, because the system is still mixed, and communities resort to carrying out repairs themselves only when help from the next level in the tier has not been forthcoming. In fact, Cleaver concludes that 'there is some evidence that the more contact the community has with the corrective maintenance system, the less they are likely to do for themselves. Therefore more peripheral communities, while losing out on institutional inputs, may be far better at self-help'.[3]

A number of factors influence the speed with which repairs can be carried out, one of which is the availability of spares at the user level. In Zimbabwe, pump spares are produced locally, but they can only be obtained from DDF centres or the manufacturer's premises in urban areas. The standardization of pumps has limited the range of spares required as the Bush pump family has a number of interchangeable parts, and similar down-the-hole components.

Standardization

The NAC Sub-Committee on Technology has standardized the Bush pump and is encouraging the installation of the Model B Bush pump for all deep water sources.

Standardization limits the range of spare parts required, making the training of local personnel and the sourcing of parts easy, and limiting the proliferation of untested products. But it has disadvantages too in that it does not allow for choice, assumes the technology is ideal for all situations, does not encourage market forces and competition between manufacturers which would inevitably improve quality of product, and limits local innovations and adaptations in a centrally driven programme. Despite some of the more obvious disadvantages, the move by the NAC was viewed as a courageous one for Zimbabwe and has ensured the strengthening of the maintenance system in the early stages of the programme. Current moves by the water and sanitation sector towards the involvement of Rural District Councils are bringing with them opportunities to choose technologies.

This move is coming at a time when an industrial base for the local manufacture of pumps is in place. The private sector in Zimbabwe has worked closely with the public sector in the development of the Bush pump. There is competitive bidding for the manufacturing of spares, in which both the private and public sectors participate. Spares are therefore readily available (although at the central level), local materials are used, and the relationships between the private and public sectors have a lot of room for research and development. New ideas are being incorporated, such as the development of new tools for the repair of pumps. One such development is the SIWIL, a simple device designed by field staff in Masvingo province for lifting the pipes of a Bush pump.

Gender

The involvement of both sexes in the repair of Bush pumps, especially at local level, has had significant results. Instead of having a 'women' programme, the DDF has opted for a gender-sensitive programme which allows for the participation of both sexes and takes into account the sociocultural dynamics of a user group. To ensure the active participation of women, training programmes are in place and the Bush pump is continually being modified to make repairs easier. One such move is to use extractable pistons and rods which can be easily disconnected.

Future

It is important to note that a maintenance system is an inter-marriage of several factors. The Zimbabwean maintenance system has been in its centric stages, and the past five years have been characterized by institution building (community, private, and public), technology selection, and experimentation. The key lesson learned is that it is the system that keeps the technology functioning which is important, not the actual technology.

Zimbabwe is rapidly moving towards community management and control, and the current system is evolving to accommodate these changes. Already there are moves to privatize pump maintenance, making pumpminders private mechanics whose services are paid for by the user groups. ●

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