Water and Sanitation Program

An international partnership to help the poor gain sustained access to improved water supply and sanitation services

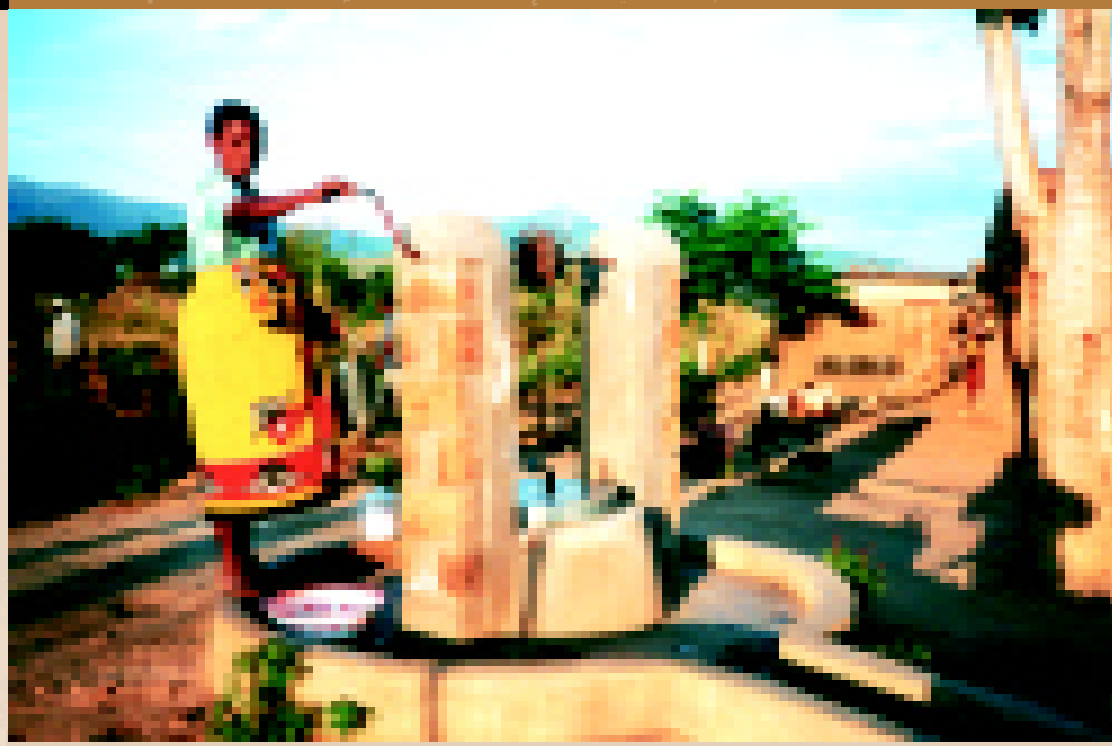
Upgraded Family Wells in Zimbabwe: Household-Level Water Supplies for Multiple Uses

Africa Region

Water, sanitation and hygiene are vital components of sustainable development and the alleviation of poverty. Across Africa, political leaders and sector specialists are generating new momentum in these important areas. This Field Note, together with the others in the same series, constitutes a timely contribution to that work. It is intended principally to help politicians, leaders and professionals in their activities. As the Water Ambassador for Africa, invited by the African Development Bank and endorsed by the African Water Task Force and the African Ministerial Conference on Water (AMCOW), I commend it to your attention.

Salim Ahmed Salim
Water Ambassador for Africa

Blue Gold
Building African Solutions for Water, Sanitation and Hygiene



Drawing water from a UFW. Note the run-off channelling excess water to an irrigated garden.

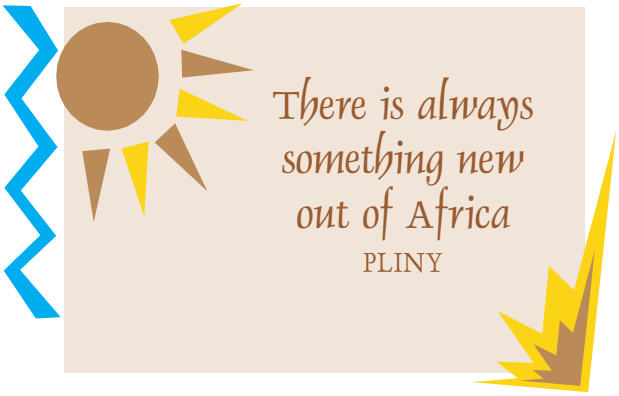
Summary

Most drinking-water programmes of governments, NGOs and external support agencies concentrate on public supplies, for domestic purposes only. In Zimbabwe, however, the long-established upgraded family well (UFW) programme has two particularly interesting features. Each household invests in and manages its own water supply without depending on the government for maintenance; the same water source is often used for both domestic and productive purposes, which can considerably increase the incomes of poor people.

This programme dates back many years and has grown to a large scale across the country. The individual wells are simple, convenient and reliable. The household-level approach avoids the problems of ownership and decision making associated with public water provision. The wells build on traditional practice, and serve people's multiple needs and uses for water, not just domestic drinking water. In particular they can provide enough irrigation water for small-scale agriculture, which contributes directly to the alleviation of poverty. Adding simple hand- or foot-pumps, which typically produce incomes eight times greater than wells with buckets, can magnify this benefit. Thus the same water facilities can improve both health and economic development.

Given Zimbabwe's current economic problems, these UFWs are proving more sustainable than the public supplies, and so are playing a vital role in enabling rural people to survive. This concept of household-level water supply could have wide application across Africa.[1]

[1] Rain-water harvesting is another example of household-level water supply, but is not described in this Field Note.



Background

The vast majority of rural Zimbabweans live in 'communal areas', where the most common source of water is ground-water. Many have simple family-owned hand-dug wells, while others use public wells or boreholes. Zimbabwe's independence in 1980 coincided with the start of the United Nations International Drinking Water Supply and Sanitation Decade. Clean water and sanitation for rural communities was one of the priorities of the new government and Zimbabwe was able to tap significant international support for its efforts. An inter-ministerial National Action Committee for Water and Sanitation was established to manage a national programme to decentralise public rural water provision.[2]

The national programme operated successfully for a number of years, and achieved reasonable levels of access to safe water and steady progress in sanitation, most notably with the ventilated improved pit (VIP) latrine.[3] However, the sustainability of this success has been jeopardised in the last few years by economic decline both at the household and the national level. The national government's budgetary allocations for maintenance of rural water infrastructure have been cut drastically in real terms. These cuts have been explained in the name of community-based management; however, the requirement for communities to assume responsibility for maintenance comes at a time when their resources are more stretched than ever. Ironically the rural water and sanitation programme, itself supposed to reduce poverty in rural areas, has been threatened by worsening poverty.

As rural people have become increasingly dependent on their own resources, one form of water supply stands out for its sustainability: the upgraded family well (UFW). This concept was originally developed by the Ministry of Health's Blair Research Laboratory as part of the government's main rural water programme, and has more recently been promoted by a number of NGOs.

Context and description of the upgraded family wells programme

The government's main work in drinking water and in irrigation

Over the last two decades, the government's rural water programme has been largely based on supplying ground-water, with hand-pumps being the dominant technology for raising water. At least two-thirds of the rural population with access to clean water obtain it from hand-pumps fitted to boreholes and deep wells. As to sanitation, the internationally recognised ventilated improved pit latrine (known locally as the Blair latrine) is the technology of choice.

The focus in the national programme was primarily on improving health through providing safe water and adequate sanitation for rural communities. Many boreholes made provision for cattle watering in the dry season and some provided communal washing facilities, but few were intended to assist vegetable or crop production or other household income-generating activities. Because the programme was only concerned with the comparatively small volumes of water for drinking, it did not apply the costly process of careful siting needed for higher-yielding irrigation boreholes. Where boreholes were found to be sufficiently productive, vegetable gardens were encouraged, but the emphasis was on products for home consumption, better nutrition being a further contribution to improved health status. There was little attempt within the rural water supply and sanitation programme to identify the water requirements of rural communities other than for domestic use, or to ask the people themselves about their water needs and uses. Productive water was the responsibility of other agencies and ministries, notably the Department of Agricultural and Technical Services (AGRITEX) located in the Ministry of Lands and Agriculture.

AGRITEX provided formal irrigation schemes for groups of smallholder farmers (referred to as plotholders). The schemes typically involved building dams and providing flood or sprinkler irrigation technologies, the latter often involving large recurrent subsidies to pay for the pumping of water. By 1999, the communal rural population was around 5.8 million (1 million households). The number on plotholder irrigation schemes amounted to just 2% of this total.

[2] This programme is described in a separate Field Note published in 2002 by the Water and Sanitation Program-Africa Region.
[3] See the WSP Blue Gold Field Note: *VIP Latrines in Zimbabwe*, August 2002.

Despite this tiny proportion of beneficiaries, the government invested a high level of extension work and direct subsidies into plotholder irrigation schemes. This strategy might be considered justified if these schemes had proved to be unambiguously viable and successful for the farmers involved. Unfortunately, while some schemes have clearly been successful, the majority of plotholders have not achieved significant levels of income from irrigation.

Development of the UFW programme

Government staff and others had long anticipated the problems that are now evident in the national rural water programme. They sought solutions that were both less expensive in terms of initial investment costs and more likely to be sustainable in the long term. The UFW is one such solution.

Before 1980, very large numbers of family-owned wells were known to exist in rural areas, all self-built and self-financed: later surveys showed that these traditional wells served 30 to 40% of the rural population. But such unprotected wells have been associated with outbreaks of disease, and are prone to pollution by run-off water in times of rain and flood. The Ministry of Health offered small subsidies to help some families to make improvements such as concrete cover slabs, and Health Assistants advised on simple protection. The traditional windlass was widely used.

The Ministry of Health's Blair Laboratory staff had long observed that the key to the success of Zimbabwe's sanitation programme lay in each latrine being owned and maintained by the individual household, rather than by the community as a whole. In 1988, they applied the same logic to water supply. They established that by lining the well with bricks, raising the head works above ground level, adding an apron and water run-off to remove excess water (often to a vegetable garden or fruit trees) and using a steel windlass, both water quality and well safety were significantly improved. The initial design of the UFW was established at the Blair Laboratory by combining all these simple elements. In the initial design, the windlass was supported on poles, but brick columns later replaced these.

In 1988/89, the Blair Laboratory initiated demonstrations and trials in many parts of Zimbabwe through the Ministry of Health. The Ministry of Health endorsed the method in 1990, as did the National Action Committee in 1991. By the end of 1991, 2,500 units had been built, and this total had doubled within the next year. These early efforts in promoting UFWs were supported by several external agencies, including Swedish International Development Co-operation Agency (Sida), United Nations Children's Fund (UNICEF), Rotary, WaterAid, Redd Barna (Save the Children–Norway) and the Save the Children Fund (UK).

The international NGO WaterAid founded a Zimbabwe country programme in 1993, which became the Mvuramanzi Trust. Several field staff from the Blair Laboratory joined the Mvuramanzi Trust. Over the following nine years the Mvuramanzi Trust promoted the upgrading of a further 34,000 family wells, with financial support from WaterAid, Sida, Norwegian Agency for Development Co-operation (NORAD), UNICEF, Rotary and the Oak Foundation. Several other NGOs, and the British Government's Department for International Development, also promoted UFWs in Zimbabwe.

Upgrading a family well by building brick columns to raise the head works above ground level.

Productive water for a rural household

Mr Tendai Chinamo and his family live in a communal area 50 km north of Murehwa. Their farm of approximately 2.5 hectares is all in productive use. The farm is in an area with a high water table, and has several water sources. For domestic use, the family has a properly protected UFW. For productive use, they have two wells equipped with rope-and-washer pumps as well as open wells, with watering via buckets.

Mr Chinamo is an outgrower for a horticultural export company. He grows a wide range of vegetables for export to Europe. The family also produces maize, basic vegetables and fruit for home consumption and for sale both locally and in the capital city Harare. Their agricultural income, derived from managing water for productive use, is significant. The family is easily able to cover the maintenance costs of their domestic water and productive water sources.

By 2002 an estimated 50,000 UFWs, serving as many as half a million people, had been built across Zimbabwe at no cost to the government. The household approach changes the emphasis in rural water from public supplies for drinking water to individual household supplies for both domestic and productive needs, which enable families to increase their generation of cash income. The potential of this approach is illustrated by the description of a successful farming family given in the box above.

While this example shows what can be achieved, the majority of farmers in communal areas eke out a subsistence and depend on remittances from family members employed in the urban areas or in other countries in southern Africa or abroad. Addressing poverty in the communal areas, particularly when the government is focusing on other issues, requires strategies for individual households to work their way out of poverty without large capital and recurrent subsidies. Family wells provide an opportunity for them to do so.

Analysis

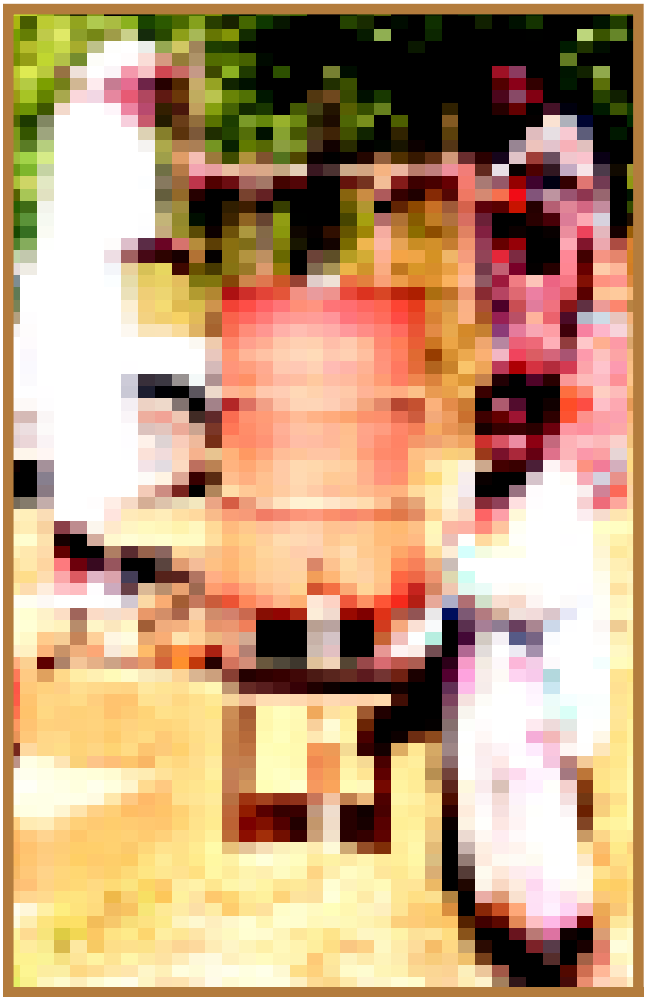
Over a decade of experience with tens of thousands of UFWs has shown that they are widely accepted and appreciated by households. Once UFWs are introduced into an area, the majority of households seek to improve their existing wells or construct new improved wells. The households are willing to bear much of the initial capital cost (around 80%), which both indicates their commitment to the technology and allows public or external support agency finance to be spread over a much larger number of households.

Maintenance

The maintenance requirements of UFWs are minimal. Some structural repairs may be necessary from time to time, plus periodic replacement of bearings for the windlass, which are made from old car tyres, and of the chain and bucket for drawing the water.

The potential for further upgrading

A standard UFW can be used for horticulture, watering with the bucket and windlass. This is hard work, and consequently most well owners can only cultivate a small area. Adding a simple pump, such as a rope-and-washer pump or a treadle pump (see box on page 5), makes it possible to water an area some eight times larger than



A rope-and-washer pump helps make more water available for productive use.

with a bucket. Pumping is not unduly arduous with such a pump, while the initial cost is less than US$100 (for a rope-and-washer pump). The materials used are all readily available and farmers for whom the pumps provide additional income should be able to keep them in working condition, although any such technology will inevitably have more maintenance problems than a simple windlass and bucket.

There is a trade-off between the extra economic benefits of adding a pump, and the increased cost and complication. The use of rope-and-washer pumps in Zimbabwe is growing and at this juncture the longer-run sustainability of this technology remains to be proven. If pump-owning households do thereby increase their incomes, they will have both the means and the incentive to maintain or replace the pumps over time. If, on the other hand, conditions change and the pumps no longer offer economic benefits, they will not be maintained. However, the longevity or otherwise of productive water technologies does not raise the same concerns as those which apply to the sustainability of life-supporting domestic water programmes.

Agricultural applications

In addition to water, however, rural people face a number of other constraints in increasing their agricultural incomes. They often have difficulty in procuring inputs such as high-quality seed, fertiliser and chemicals; they may lack the knowledge to make the best use of such inputs; they may have difficulty in marketing their produce to best advantage. However, by concentrating on producing high-value commodities, farmers with water pumped manually from UFWs can still generate incomes comparable with their counterparts in the formal irrigation schemes.

In Zimbabwe the main intermediaries supporting such farmers have been private marketing companies (see box on page 6).

There have not been many detailed studies on the returns which farmers are able to achieve from horticultural production. However, it appears that an efficient farmer growing export crops can achieve an annual return of up to

Treadle pumps in Africa

The treadle pump was invented in Bangladesh, where several variants have been developed over many years and millions are in use. It has spread to a number of countries in Africa (such as Kenya, Malawi and Zambia). There are at least three companies in Zimbabwe manufacturing local versions. The treadle pump in Zimbabwe is about twice the price of a rope-and-washer pump, and the latter is currently more common on wells used for commercial horticultural production. However, the treadle pump appears to have several advantages: it uses the leg muscles, which are much stronger than the arm muscles; it can discharge under pressure, either into a reservoir above the pump level for gravity feed or via a hosepipe directly to the field; it is easily portable from well to well and to the homestead for overnight security.

A labour-saving treadle pump, Malawi.

US$600 from a 0.24-hectare plot with a well and a pump. The same farmer with the same well and a bucket could only cultivate a 0.03-hectare plot and achieve an annual return of perhaps US$75. These increased income figures represent a significant opportunity to generate cash income for rural households, in the same range as incomes from conventional irrigation schemes.[4] These figures relate to production for export, but domestic markets can also be profitable and are easier for small farmers to access. The important point is to start with market analysis and hence decide the production needs, including water.

Objections and constraints

Despite their many benefits, UFWs have not been completely accepted by the decision makers in the water sector in Zimbabwe. There are a number of reasons for this.

Geographical considerations

At national level, some people asserted that UFW technology would only apply in parts of the country with high water tables and good rainfall. In practice, however, families have successfully upgraded wells in districts throughout the country, including notoriously dry or supposedly poor ground-water areas. During times of drought, UFWs are certainly more likely to dry up than boreholes because they are less deep, but experience in the 1991/92 and 1994/95 severe droughts showed that boreholes frequently dry up also. People may then be forced to resort to unprotected sources of water. One solution to this problem would be to install a small number of very deep boreholes to provide drinking water in droughts, and a large number of family wells for normal usage.

Reservations about water quality

Concerns have also been raised about the quality of water from family wells. Upgrading and protecting a well markedly improves water quality compared to an unprotected well, and health benefits can be assured if the upgrading programmes are backed by effective health and hygiene education. Furthermore, sector specialists worldwide now agree that the *quantity* of water used is a more important determinant of the health benefits of improved water supplies than the *quality* of water itself. UFWs, being located adjacent to houses, result in much higher levels of water use than communal boreholes. Proximity also encourages the use of water for vegetable and fruit production and hence improved nutrition.

Funding

Some water-sector leaders hesitated to promote UFWs because the external funds are given to benefit individual families, rather than the whole community. However, this is exactly the same situation as for latrine construction, so there is no logic in supporting one but not the other. In fact, from the external support agency's point of view, the cost per person of supporting a family-well programme is less than that of supporting a borehole and hand-pump programme. This is partly because most of the cost of the UFW is borne by the owner.

Staffing

Another constraint on the expansion of the family wells was staffing: a government agency can install one borehole with much less work, education and time than, say, twenty-five family wells.

The work of Hortico: smallholders and big business in partnership

One successful smallholder scheme is run by Hortico, a company formed initially to export to Europe the horticultural produce from the large-scale commercial farming sector. Seeking to expand and diversify its production base, Hortico initially approached groups on some of AGRITEX's formal schemes, but had mixed experience with these plotholders. Not only was the water supply and hence continuity of production frequently disrupted, but there were disputes about grading the produce and sharing the incomes. Hortico then developed a system of working with individual families, which has proved very successful.

Now working with about 3,000 households, Hortico has a network of small depots, each located within an area of about 200 farmers. The depots feed two main packhouses, from which the produce is sent ready packed and labelled directly to supermarket shelves in the UK. Hortico addresses systematically all of the constraints faced by the farmers except water supply, which individual farmers obtain from their own household wells. It encourages farmers to produce crops which have high margins; it loans all the inputs (seeds, fertilisers, etc.) required for a specified production area; it trains local extension staff to assist the farmers to produce the crops; it provides on-the-spot grading and payment when the crops are brought to the depot. The individual productive areas vary according to the crop, but are small (typically 300 to 600 square metres).

[4] In a recent major study of ten formal irrigation schemes [Tawonezi & Mudima (2000)], half had annual average incomes per farmer of less than US$420. The best scheme had an average income per farmer of US$4,200 per annum.

Small-scale horticulture irrigated by bucket.

Lessons for sustainability and poverty reduction

The UFW is a sustainable system

The UFW was originally conceived and designed by the Blair Laboratory team as a sustainable household-level water supply, and its sustainability has been clearly demonstrated over a fourteen-year period. Each household has sole ownership and hence sole responsibility, and can select the technology appropriate to its circumstances. The Zimbabwe upgraded family wells programme promotes technologies (well linings, bucket and windlass) that are cheap and durable. In addition, each family can easily upgrade the technology further as it wishes.

The UFW helps reduce poverty

The provision of water and sanitation is not just an objective in its own right, but part of a strategy to eliminate poverty. In rural areas household-level water supplies, such as UFWs, can play a central role in respect of this wider objective. A UFW can serve both domestic and productive needs and produce high-value horticultural crops. The addition of a simple water-lifting device to a UFW or to an adjacent well dedicated to water for productive purposes, while adding to maintenance requirements, greatly enlarges the area which a family can comfortably water and increases income-earning potential, often to levels comparable with incomes on conventional, formal irrigation schemes. A well with a bucket enables a family to survive; a well with a pump helps it to overcome poverty.

Marketing is vital for profitable commercial use of UFWs

Household-level access to productive water can contribute to rural poverty alleviation, if profitable markets can be identified. Market access should define the crops to be grown and hence the inputs, technical knowledge and skills which need to be provided. With extension inputs from locally recruited extension agents, rural households have shown themselves capable of growing specialised horticultural crops using their UFWs. There is a range of high-value crops that could be successfully grown and marketed from rural areas in Zimbabwe and other countries in Africa.

Typical layout for horticulture using pump irrigation.

An upgraded family well, covered to maintain water quality.

The UFW has international applicability

The ideas developed in Zimbabwe have already spread to Mozambique, where the government has recognised the benefits of household-level water supply and has successfully implemented programmes supported by both GTZ (German Technical Co-operation) and WaterAid. A small programme has also started in Sierra Leone.

There are no special conditions in Zimbabwe that suggest that the UFW would remain unique to that country – on the contrary, appropriate conditions for its use apply across large parts of the continent.

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