

This field note outlines the findings of an investigation into experiences of self-help water supply improvements in Uganda. It makes recommendations on how water supply professionals can best engage with communities to achieve sustainable supplies, briefly describing a recently-started pilot project supporting self-supply options.





Self-supply of water is one of the three flagship themes of the Rural Water Supply Network (RWSN). In 2005 an investigation was undertaken into self-supply improvements to water supplies in south and east Uganda. It was found that as much as 39 percent of the rural population relied on self-supply sources, ranging from very shallow unlined water holes, to drilled boreholes fitted with a range of water-lifting devices. This field note examines the strengths and drawbacks of the conventional externally-driven approach to supporting water self supply. It suggests a complementary approach, which is likely to be more sustainable because it is more responsive to on-the-ground technical, social and economic realities. The field note outlines the implications of such an approach for policy, and suggests steps that can be taken towards its full-scale implementation.



A communal well at a suburb in Bugiri town

The term 'self supply' refers to local-level or private initiatives by individuals, households or community groups to improve their own water supplies, without waiting for help from Government or non-government organizations (NGOs).

The individual, household or group provides most of the investment cost of the water source, either in cash or kind. While ownership may or may not be clear in law, there is no perception that Government or an NGO has either partial or total control of the source. The water source is nearly always used by a group, which goes well beyond the individual(s) who initiated and paid for the construction. However, upkeep is nearly always the responsibility of the person or people who developed the water

source, often with little or no support from the wider user group. In rural areas any form of payment is uncommon, but in the case of trading centers and urban locations, it is common for users to pay user fees on a volumetric basis.

In sub-Saharan Africa, households and communities have taken their own initiatives to improve water-supply services by constructing and managing an estimated one million self-supply water sources (Sutton 2004). These initiatives, which may already serve around 40 million people (RWSN undated), take many forms: a few logs across a waterhole; an earth bund around a waterhole to divert runoff; a natural spring or shallow groundwater source protected by the community; a hand-dug well constructed by a householder and shared with his/her neighbors; the widespread use of rainwater; even some cases of private individuals drilling deep boreholes for their own and neighbors' benefit.

In the past, water sector professionals have either ignored or disapproved of self-supply initiatives. They still tend to focus on the perceived disadvantages – poor water quality and construction quality, unreliability and lack of safety – rather than the advantages to the users, namely ease of access, low cost, and ease of management. The conventional approach to water-supply provision is externally driven – by Governments, donors, external agencies and NGOs.



Self-supply well in Busia town

A minimum standard of service is provided – in the form of a protected, but generally untreated community water supply, within about 1km of most users. While this approach has increased coverage, in many countries it is not progressing fast enough to meet national or year 2015 Millennium Development Goal (MDG) targets. This case study demonstrates that a complementary approach – supporting self-supply initiatives – has the potential to fill the gap.

In Uganda, water supply coverage is estimated as 61 percent (MoWE 2006). Of the 39 percent 'unserved', the vast majority probably get their water from a self-supply source that they have improved in some way. A self-supply approach builds on those initiatives, continuing people's progress toward better water supply services, at a potentially much lower unit cost than

the conventional approach, and with a greater likelihood of sustainability.

Much of the ground-breaking work on self-supply took place in Zimbabwe, following recognition of the importance of so-called 'family' wells. Prior to 1980, around 30 to 40 percent of the rural population obtained domestic water from 'unimproved' self-supply wells (WSP 2002, Morgan 2003). From the early 1990s onwards there was a rapidly accelerating program to support the improvement of self-supply sources, so that by 2002, an estimated 50,000 upgraded family wells – shallow wells with headwalls, concrete drainage aprons, and windlasses or handpumps – were serving about half a million people with both domestic and productive (small-scale irrigation) water.



A hand-dug well in poor condition that is nonetheless easily accessible

In Zambia, detailed research into potential low-cost improvements to traditional water sources (1998-2002) led to piloting and capacity-building, and the incorporation of self-supply approaches into national policy (Sutton 2002).

A 2004 desk study (Sutton 2004) examined the potential for self supply in sub-Saharan Africa. Overall the study concluded that the potential for promoting and supporting self supply was likely to be significant in Cote d'Ivoire, Benin, the Democratic Republic of Congo, Liberia, Mali, Nigeria, Sierra Leone, and Zambia and parts of Chad,

Malawi, Mozambique, Tanzania and Uganda.

Until the late 1990s, rural water-sector activities in Uganda tended to be pursued by projects that were geographically delimited. Now rural supply is largely addressed under a single nation-wide decentralized program, funded through a sector-wide approach using Government and donor funding. The NGO contribution to rural water and sanitation in Uganda is probably less than 20 percent of total sector spending.

In terms of the program of decentralization, Uganda's 70 districts, in partnership with communities and the private sector, now implement rural water services. Construction of new water sources has been 'privatized', or more accurately contracted out by districts, in a process starting in the second half of the 1990s. The private sector has grown and strengthened, but it still faces considerable challenges in terms of service delivery and cost-effectiveness.

In recent years, the emphasis on coverage and hence new water source construction has been at the expense of

sustainable operation and maintenance. This issue is being addressed however, and the publication of the National Operation and Maintenance Framework (DWD 2004) was an important milestone in the debate about how to balance expenditure between construction and post-construction support.

The Government and the Uganda Rainwater Association (URWA)¹ have made significant strides in recent years, initially in putting community-level and institutional rainwater harvesting on the agenda, and now moving increasingly toward support of household-level initiatives.

The current national safe water coverage is estimated as 61 percent (MoWE 2006), varying across districts from 27 percent to 92 percent.

Prior to this study (undertaken by WaterAid for RWSN), little was known about the practice of self supply in Uganda. However significant work had been carried out on rainwater harvesting, so this study focused on shallow groundwater utilization. The expectations were that (a) a certain level of self supply might exist, although there was significant uncertainty about this; and (b) that it would probably consist primarily of household water sources rather than communal water points. The study findings that follow show a very different situation.

¹ URWA is a national network of organizations and individuals with interests in domestic rainwater harvesting. It includes representatives of Government and non-government organizations.



Domestic rainwater collection

Interviews with more than 60 key informants – comprising water sector professionals, business people, civil servants and members of NGOs – showed that it was very difficult for them to appreciate what is meant by self-supply, or by private or local initiatives. There is a deeply entrenched view among water sector professionals in both Government and NGOs that private initiatives are not only far inferior to conventional improved water sources, but that they have no significant part to play in improving coverage in Uganda.

Table 1 shows that the technologies used for the supply of self-help

groundwater vary from rudimentary scoop holes and unlined reservoirs (types 1 and 2) to the increasingly sophisticated shallow wells and boreholes (types 3 and 4). What is notable is that across the whole spectrum of technologies people have made their own improvements in terms of access to water, protection of the source, and reliability of supply.

The initiators of self-supply water improvements show wide variation in personal characteristics. However, almost by definition, they all share an entrepreneurial spirit or a sense of leadership, and many have the money to carry their ideas into practice. At the wealthier end of the spectrum are business people, NGO workers, teachers, or others with incomes or pensions who are willing to invest in



Valley bottom water source protected with timber and earth bund

their communities. At the poorer end are community members who mobilize their friends and neighbors to improve traditional water sources using local labor and materials.

In rural areas, it is uncommon for the owner of a private water source to prevent his/her neighbors from sharing use of the water, even if they have

contributed nothing to the investment. Private wells for exclusive use by one family amounted to only four percent of the sample visited in this study. This finding concurs with the figures found elsewhere in sub-Saharan Africa – in Zimbabwe ‘family wells’ are used by neighbors when other supplies fail.

In Uganda, the study found that water users sharing a ‘private’ well are typically unwilling to cooperate in terms of maintenance and payment. While owners comment on the fact that users fail to contribute, they appear largely accepting of this. Payment for water (by volume, or by monthly or annual charge) becomes increasingly acceptable as one moves from rural areas to trading centers to urban locations. In rural areas it is usually unacceptable, while in the

Out of the 67 water sources visited the vast majority (80 percent) exist primarily for domestic water use. There was evidence in some cases that consumers use low-quality sources for bathing and laundry, and improved (typically handpump or tap water) sources for drinking and cooking. But in many cases a single source may supply all domestic functions, with recourse to a more distant, reliable, protected source when the nearby source dries up. It should be noted that convenience of access is of significantly greater importance to most (especially rural) consumers than water quality; while for sector professionals objectionable quality alone (by appearance or testing) can be enough to condemn a source.



Distance is a limiting factor when scoring water sources for reliability and cost

Source type	Description	Comment
1. Scoop hole Locally improved domestic water source.	A very shallow hole (water within 0.5m), usually unlined, sometimes protected by earth bunds and/or timber. Usually drained, sometimes fenced.	Typically, a hill slope or valley bottom location, where shallow groundwater almost emerges as a spring, but it can only be accessed by a shallow excavation.
2. Unlined reservoir (known in Uganda as a valley tank) Locally-built and acting as shared source of water.	A hand-dug excavation, typically 100m ² or more in plan area, up to 2m deep, supplying domestic water.	In valley bottom locations, utilizing shallow groundwater, but often catching surface runoff too.
3. Shallow well Water shared or sold.	Typically a brick-lined hand-dug well, up to about 20m deep, with rope-and-bucket, windlass, rope pump or handpump.	Found in rural locations, trading centers and towns. In eastern Uganda this is known (misleadingly) as a 'shadoof'.
4. Borehole Water sold.	A 'deep' drilled borehole with handpump or submersible pump.	Only found in trading centers and towns.

more urbanized areas users fully expect to pay.

Conventional thinking among rural water supply professionals tends to be dualistic. Either the water source that people are using is seen as 'traditional', 'unimproved' and 'unsafe', hence unacceptable; or, it is seen as a modern 'improved', 'protected' and 'safe' source. Nothing exists between these two extremes. Although the conventional ideal of a piped, treated, water supply service, delivering water into the yard or house and paid for by the users is prevalent, the experience of the researchers supports a more pluralistic

view, that recognizes a range of technical, investment, and management options.

This 'new approach' attempts to find a balance between an accessible, reliable supply of good quality water on the one hand, and affordability and good management on the other. In terms of this approach, five key water-supply characteristics were identified that are important for water consumers and those developing water services. These are 1) convenience of access, 2) water quality², 3) reliability of supply, 4) cost, and 5) management. (Water *quantity* is not explicitly mentioned since it is implicit in the issues of access and reliability.)

There is a trade-off between the first three factors (access, water quality and reliability) and the last two (cost and management). To achieve high standards of access, water quality and reliability in most cases implies a high cost and more complex management. On the other hand low-cost water supplies, which can be easily managed by households or communities, are often compromised in terms of access, water quality and/or reliability. Water supply services that score high on all five aspects are difficult to envisage; in nearly all cases compromises are necessary.

² The subject of water quality was explicitly excluded from this study, so no water samples were taken, and no measurements of water quality were made. Judgments about the water quality of sources visited in the field were primarily based on subjective judgments of pollution risk.



Self-supply well with windlass

We propose a scoring system for all types of water supply, based on the five characteristics listed above. The functions of this scoring system are:

- To take account of both end-users' and professionals' perspectives on the desirable features of a water supply
- To clearly identify the aspects of self-supply sources which need to be improved.

The scoring system also shows up some of the weaknesses (relating mostly to management and cost) of improved water services.

Each of the five water-supply characteristics is scored according

to the descriptors in Table 2. Each characteristic can score 0 (poor), 1 (medium) or 2 (good). The scores for a given water source are then summed to give an overall score, which can therefore range from 0 to 10. The scoring system implies that each characteristic has equal weight. The table has been drawn up using the assumption that a totally unimproved 'traditional', distant, surface water supply source (with no protection) should score near to zero (but not actually zero, since users at least have a survival water supply); a basic protected rural community supply (e.g. protected spring, shared tap, or handpump) should score around the mid-point of the scale; and treated piped water delivered into the home and managed well should score near to 10 (for examples of scores for different sources see Figure 1).

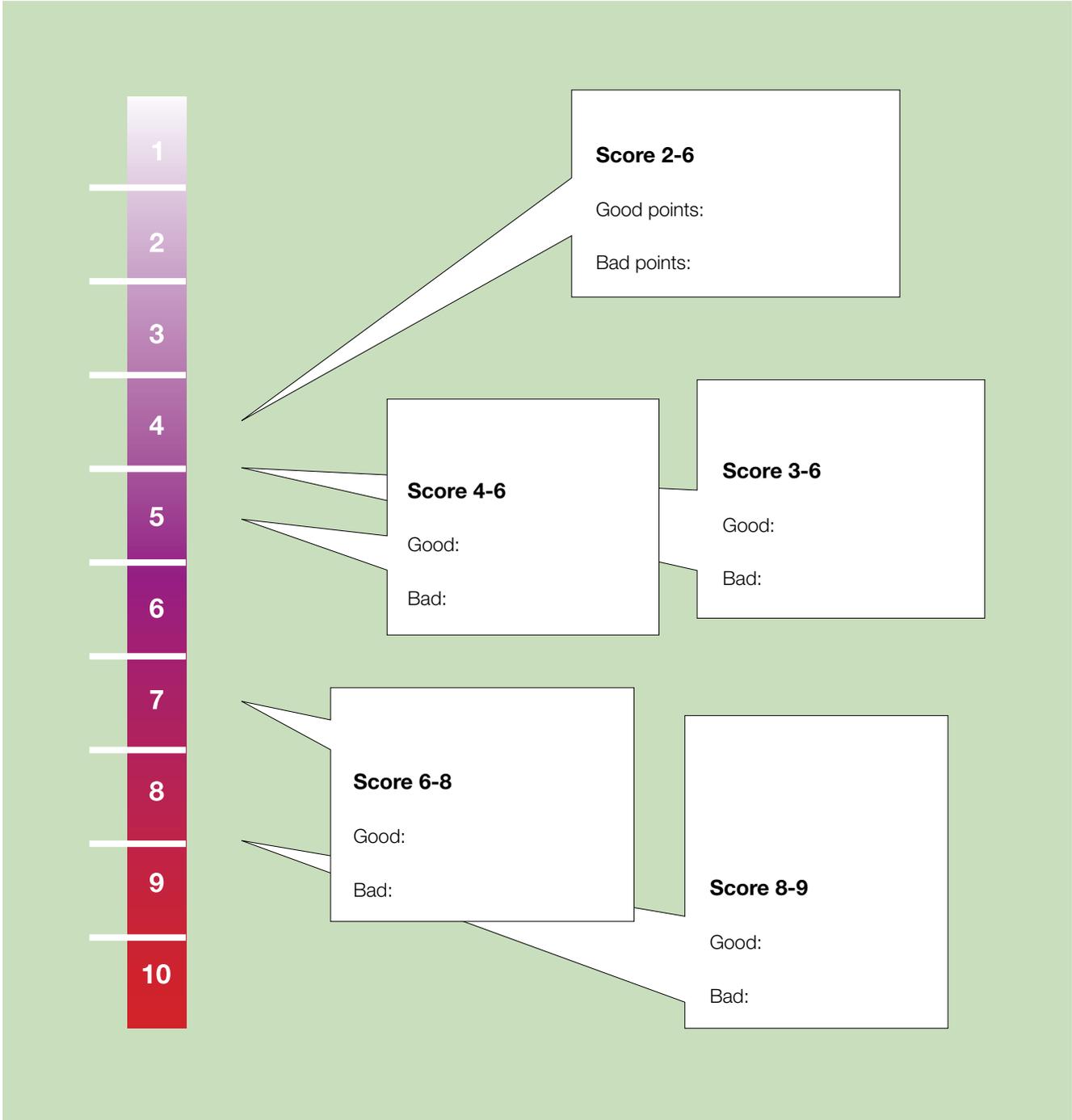
In Table 2 the scoring of 'access' is straightforward and explicit, while 'consumption' (quantity) is implicit. A score of zero is for situations where water is very distant and consumption correspondingly low. A score of 1 reflects a reasonable level of shared access, while a score of 2 is for water within the yard or home.

'Water quality' scoring is also straightforward. Zero is for obviously polluted or at-risk sources (usually open); 1 is for untreated protected sources (quality is good most of the time, but it cannot be guaranteed; also deterioration between source and point of use is the norm); 2 is for high quality disinfected water in the home.

With 'reliability', a zero score signifies an unreliable supply, for instance a pond, well or rainwater system which is dry for a significant part of the year. A score of 1 is for a shared supply in which consumption is limited not by source performance, but by distance (e.g., a communal handpump). A score of 2 is for water supplied reliably into the yard or home, allowing consumption typically to exceed (and sometimes far exceed) 20 litres per person per day.

For 'cost', a zero score signifies a high cost. This may be the very high human cost associated with a distant polluted water supply (in terms of time, energy, health and lost opportunity); or the high investment cost of, for example a pumped, treated piped water supply. A score of 1 is for a typical 'conventional' improved rural community water supply, in which the community contributes only a few hundred thousand Uganda

Characteristic	Score 0	Score 1	Score 2
Access	Distance and/or ascent result in very limited consumption (typically less than about 8 liters per person per day.)	Water is close to most users (typically within 0.5-1.0km), but still has to be carried home.	Water is supplied to the yard or house.
Water quality	Water is obviously polluted, reported to taste unacceptable, or is clearly at risk of contamination from pit latrines, livestock or other causes.	Source is well protected but untreated. Any storage is covered, and there are no obvious routes for contamination.	Water is treated (including disinfection), and treatment is managed to a high standard.
Reliability	Source performance fluctuates with season, or dries up with heavy use, such that users have to go elsewhere at certain times. Unreliability or low yield may lead to conflict between users.	Although consumption may be low because of access, the demands of the users can nearly always be met, and queuing times do not cause conflict or recourse to inferior sources.	Water is always available on demand, and supply capacity exceeds 20 liters per person per day.
Cost	Cost is high. In the case of some 'traditional' sources there is a high human cost in time, energy and ill health. In the case of some improved sources, capital cost can only be borne by a state or private investor. User fees may cover part or all of operation and maintenance costs, or users may pay no user fees.	Typically the users can contribute 10-15 percent of the capital cost. User fees cover basic maintenance only, when the need arises (and no contribution to capital cost recovery).	Human costs (health, time expenditure) are low. Capital cost is such that users can bear at least 50 percent of the investment. User fees for operation and maintenance are negligible.
Management	System operation and maintenance are of necessity the full responsibility of a competent body or person. The user contribution to management is purely financial. (If the private or public body provides a reliable service, raise score to 1. If the body is permanent, raise to 2.)	Long-term external support is needed to enable user management to function satisfactorily. In reality this refers to a situation of joint user/external agency responsibility for operation and maintenance tasks.	The source, as constructed, can be managed and maintained by the users, without external support.



Shillings³ (approximately US\$ 100 to 200), or around 10 percent of the investment cost. A high score (2) is for supply sources in which mainly local materials and labor are used, and dependence on external financial support is low or non-existent.

Finally for 'management', a high score (2) is typically for traditional sources of supply in which dependence on external management support is negligible. A medium score (1) is for typical 'conventional' improved supplies (e.g., from handpumps or gravity flow schemes), where it is becoming increasingly recognized (Schouten and Moriarty 2003, Carter and Rwamwanja 2006) that significant long-term external support to communities is necessary to ensure operation and maintenance sustainability. A score of zero is for sophisticated systems in which supply management and maintenance necessarily require a technically competent body. However, if that body is competent and reliable (e.g., management by an experienced utility or NGO), the score is raised to 1, and if it is also permanent (e.g., State or faith-based organization) the score is raised to 2. Naturally, such an assessment can change with time and circumstances, especially if political change or conflict undermine organizations.

There are four main barriers to the wider existence of self-supply initiatives:

- First, the differences in perception

³ The exchange rate is approximately 2000 Uganda Shillings to the US dollar (US\$).



Simple technology rates highly in terms of both cost-effectiveness and independence of management

between water users (interested primarily in accessibility, reliability, ease of maintenance and affordability) and water supply professionals who discourage development of sources that fall short of Government standards need to be constructively aired and addressed. It is understandable that sources which fall short of Government standards of construction quality, are verbally, if not actively discouraged by the authorities, given the desire of Governments and NGOs to protect their served populations from the dangers of poor quality water. It is even conceivable that litigation could follow (as has been the case with arsenic contamination in Bangladesh) if consumers were encouraged to drink water which was subsequently proven to have caused illness or

death. The linkage of self-supply with household-level water treatment is therefore of particular relevance.

- Second, many NGOs and Government authorities, whose official mandate is to support communities as opposed to individual households, tend not to subsidize householders who supply water within a community, because they view them as a household rather than a community resource. These authorities fear that assistance to individual water suppliers will somehow undermine their objectives, yet in reality most self-supply sources are *de facto* community sources.
- Third, almost no support is given to communities which make type 1 (scoop hole) or type 2 (unlined

reservoir) improvements. Most organizations appear blind to the positive significance of the investments made by individuals or communities, and none of the NGOs or Government agencies interviewed were considering simple low-investment improvements to such sources.

- Fourth, the investments necessary to construct protected shallow wells or boreholes are available to very few individuals. Some form of subsidy from the State could alter this, but here again the attitude that ‘Government does not help individuals’ would have to be overcome.



Ugandan small town borehole serving an extensive user community

Government statistics (MoWE 2006) estimate that just over 61 percent of Uganda’s rural population has access to ‘safe water’. The implications of this are that 39 percent of the rural population currently obtains domestic water from ‘unsafe’ sources. The findings suggest that the vast majority of these are type 1 and 2 sources – shallow scoops or water holes, with rudimentary protection (earth bunds, logs, stones, vegetation and live fencing), maintained entirely by the water users. A small percentage of the rural population may be served by shallow wells and boreholes (type 3 and 4) constructed on the initiative of private individuals, and another few percent are using rainwater for part or all of their needs. Consequently self-supply is of great importance in Uganda, and ripe for support and upgrading in a sensitive step-by-step manner.

With so large a proportion of the population already supplying its own water needs, initiatives to improve water provision are alive and well in Uganda. Shallow scoops and unlined water holes may together provide water to around one third of rural people, while shallow wells and boreholes probably serve around five percent of the population. Need, initiative, capital, and construction skills exist, although the last two are relatively scarce. Most self-supply sources serve an extensive user group (tens or even hundreds of households), with very few reserved for the exclusive use of the owners.

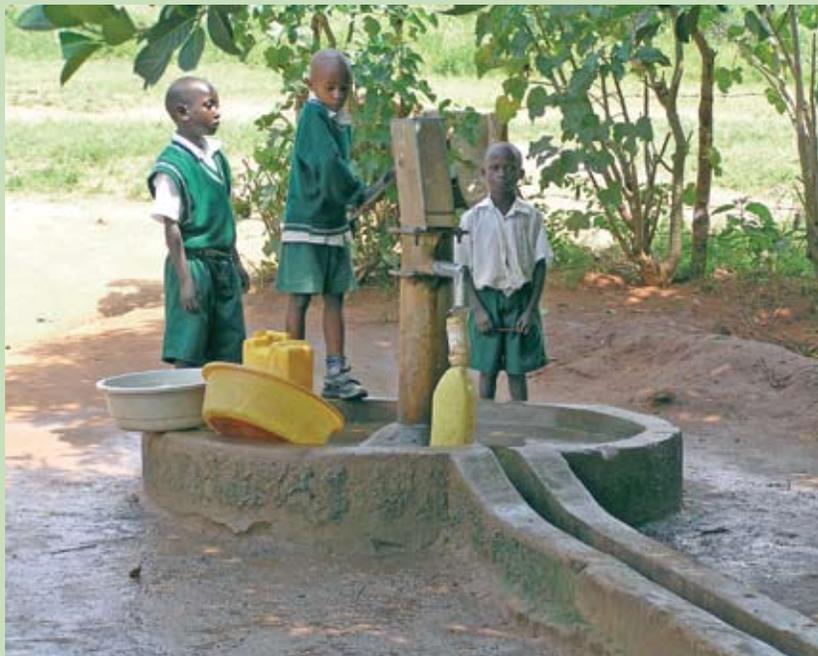
A great advantage of the self-supply system is that the providers of water within the community feel a strong sense of ownership of the water source. Construction of the water source

involves considerable effort and/or cash, so the interest in sustaining and managing the source is strong. While the need for official and NGO support to improve water provision is not in question, in contexts where there is almost no likelihood of fully-fledged state-supplied water provision, any interventions by Government or NGOs need to be extremely sensitive. Existing or potential self-supply initiatives can be overwhelmed or discouraged if support of the wrong kind, which often proves to be unsustainable, is provided.

Some options for supporting self-supply initiatives include the following:

- Where individuals demonstrate their willingness to invest in, for example, shallow wells, local Government could assist by supplying some or

Self-supply sources were reported by users to offer not only convenience and timesaving, but also the opportunity to use greater quantities of water. The downside of many self-supply shallow well sources relates to the quality of construction and their location – often too close to latrines. Furthermore, even in cases in which water is abstracted by rope and bucket (the majority of cases), when the rope breaks the source may remain out of action for a significant time. We found evidence of resistance to handpumps (pictured) – in the words of one woman: “If they could not afford to buy ropes in the past, how will they buy spare parts for the pump?”



all materials and equipment (e.g. windlass, ropepump, or Uganda’s standard deep well handpumps, the U2 and U3⁴) and maintenance support. Such an approach can be fully justified in all except the most urban of situations, if it is true (as this study has concluded) that exclusive private sources rarely if ever exist outside of the largest conurbations.

- Where self-supply sources already exist, and are used by the wider

⁴ The U2 and U3 handpumps are effectively the India Mark II and India Mark III pumps. They are the Government standard handpumps for deep wells and boreholes.

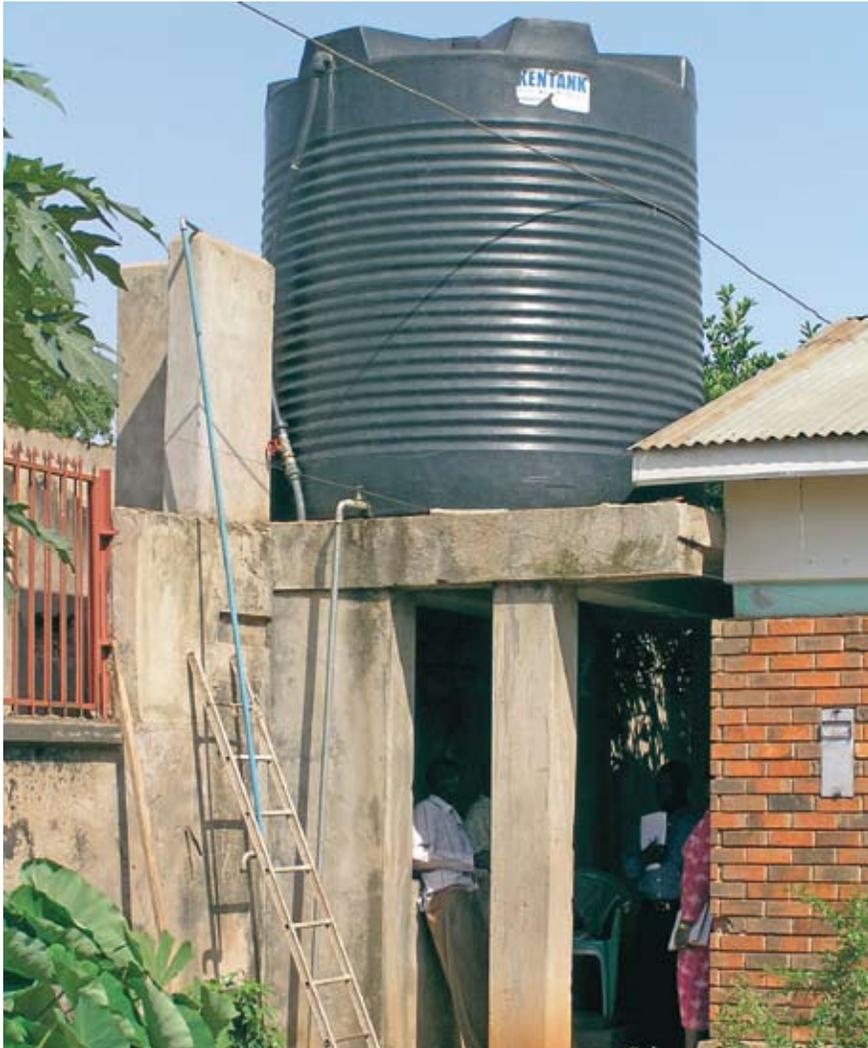
community, local Government could focus assistance on the owner as the one responsible for source repair and maintenance, obviating the need for water user committees. Communities would need to be sensitized to the importance of paying for water, preferably by the initiator of the source, rather than an outside agency.

- The skills of well construction exist in central and eastern Uganda, but the artisans involved have limited technical and business training, capital, equipment and access to credit. Support to artisans in all or some of

these aspects could be of great value in stimulating the supply side of the market.

Take an incremental approach:

Government and NGOs should see water source improvement as an incremental process, in which unsafe, inconvenient, unreliable, distant and polluted water sources, can be transformed step-by-step into safe, convenient, reliable, close, manageable water points. The present dualism of



Self supply borehole and overhead tank

'safe/unsafe' or 'improved/unimproved' needs to be replaced by a ladder of improvements leading to minimum acceptable coverage and beyond.

Recognize the community role of individual providers: In assisting self-supply Governments and NGOs need to recognize that they are not targeting support at individuals, but at more extensive water user groups.

Explore appropriate support mechanisms to develop new sources:

Government and NGOs should consider how they might assist or encourage the construction of new self-supply sources, by partial subsidy, technical advice, or other means.

Find useful ways to support management:

Government and NGOs should consider how they might assist

or encourage the management of self-supply sources, by technical advice, enabling personal investment, assisting in community mobilisation or other means.

Identify ways to develop well

diggers: Government and NGOs should consider how they might assist or encourage private well diggers (artisans), by training, provision of equipment, access to credit, or other means.

The Uganda Government shows a strong sense of ownership in relation to this 2005 study with the findings welcomed with considerable interest by both Government and the NGO network. It is probable that recognition of the challenge faced by Uganda in reaching its coverage targets through conventional approaches positively influenced attitudes to self-supply.

Since the completion of the study, further discussions have taken place, especially in central Government, and at the time of writing this field note a pilot intervention had just begun. The overall aim of the pilot is to determine, through action research, the scope for incremental self-improvements to existing water sources by the users themselves, through improved knowledge, technical support, and very small (less than 10 percent) subsidies of construction costs.

The National Steering Committee which guided the case study (chaired by the Assistant Commissioner of Rural Water in the Directorate of Water Development,



Water sale kiosk at self-supply borehole

and with representatives of the NGO sector and the main bilateral donors) has selected a small number of Ugandan NGOs to promote and support self supply. In the pilot, water users will be encouraged to make incremental improvements to their existing water sources. The implementing NGOs will assist communities through provision of technical skills and small subsidies in cash or kind. The technical adviser will provide orientation and back-up support to the NGOs. The NGO network (UWASNET) will channel funds to the NGOs, and sit on the Steering Committee. WaterAid will be a member of the Steering Committee. The Directorate of Water Development will

fund the implementation and chair the Steering Committee. The pilot will be guided and supported over the period September 2006 to December 2007, during and after which further decisions will be taken concerning the possibility of scaling-up.

Numerous barriers to the adoption of the self-supply approach exist in Uganda, although according to Mills (Mills 2006), most of these are based on the misconceptions of sector professionals. It remains to be seen whether the equally numerous opportunities and enabling factors in favor of self-supply will outweigh the difficulties of introducing this promising new idea.

RWSN is a global knowledge network for promoting sound practices in rural water supply. It grew out of the need to focus greater attention on the challenges in rural water supply development and to encourage cooperation and sharing of lessons learned and knowledge between governmental agencies, multilateral organisations, bilateral donors, NGOs, and private sector. The exchange of ideas and information give catalyzing and energizing effects, which are vital for reaching the ambitious MDG goals.

The study outlined in this field note was managed by WaterAid Uganda, under the direction of a committee chaired by Assistant Commissioner Rural Water, Aaron Kabirizi, of the Directorate of Water Development (DWD). The committee comprised DWD, the Uganda Water and Sanitation (NGO) Network (UWASNET), and the Water and Sanitation Program-Africa (WSP). The efforts of all those who initiated, steered and managed the study are gratefully acknowledged, as are the many inputs from key informants and community members.

The study was implemented by WaterAid as an activity of the Rural Water Supply Network, RWSN, and was funded by WSP-Africa. The study team comprised Richard Carter (Team Leader), Joyce Magala Mpalanyi and Jamil Ssebalu. The full report is available on the RWSN website at <http://www.rwsn.ch/documentation/skatdocumentation.2005-11-17.7461089382>

- Carter, R. C., J. M. Mpalanyi, and J. Ssebalu. 2005. *Self-help Initiatives to Improve Water Supplies in Eastern and Central Uganda, with an Emphasis on Shallow Groundwater*. WSP/RWSN/WaterAid. <http://www.rwsn.ch/documentation/skatdocumentation.2005-11-17.7461089382>
- Carter, R. C. and R. Rwamwanja. 2006. *Functional Sustainability in Community Water and Sanitation: A Case Study From South West Uganda*. Diocese of Kigezi/Cranfield University/Tearfund.
- DWD. 2004. *National Framework for Operation and Maintenance of Rural Water Supplies*. Directorate of Water Development, Ministry of Water, Lands and Environment, Kampala.
- DWD. 2005. *Accelerated Domestic Roofwater Harvesting in Uganda, Action Plan*. Second Draft, 27th May 2005. Directorate of Water Development, Ministry of Water, Lands and Environment, Kampala.
- Mills, O. 2006. *Stakeholders' Perceptions of Self Supply in the Ugandan Rural Water Sector*. Unpublished M.Sc thesis, Cranfield University, Silsoe, UK.
- Ministry of Water & Environment, 2006, *Water & Sanitation Sector Performance Report*, Ministry of Water & Environment, Kampala
- Morgan, P. 2003. *Zimbabwe's Upgraded Family Well Programme*. Paper for World Water Forum, Kyoto.
- RWSN. (undated). *Self Supply – Small Community and Household Water Supplies – Concept Note*. RWSN/SKAT Foundation.
- Schouten, T. and P. Moriarty. 2003. *Community Water, Community Management: From System to Service in Rural Areas*. ITDG Publishing.
- Sutton, S. 2002. *Community-led Improvements of Rural Drinking Water Supplies*. Knowledge and Research Project (KAR) R7128, Final Report, UK Department for International Development.
- Sutton, S. 2004. *Preliminary Desk Study of Potential for Self Supply in Sub-Saharan Africa*. Report for WaterAid and the Rural Water Supply Network, October 2004.
- Sutton, S. and H. Nkoloma. 2003. *Encouraging Change: Sustainable Steps in Water Supply, Sanitation and Hygiene*.
- WSP. 2002. *Upgraded Family Wells in Zimbabwe: Household Level Water Supplies for Multiple Uses*. Field Note No 6, Water and Sanitation Program, August 2002.
- WSP. 2004. *Self Supply: A Fresh Approach to Water for Rural Populations*. WSP Field Note, November 2004.

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The Water and Sanitation Program is an international partnership for improving water and sanitation sector policies, practices, and capacities to serve poor people



The Rural Water Supply Network RWSN is a global knowledge network for promoting sound practices in rural water supply.

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