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35th WEDC International Conference, Loughborough, UK, 2011**THE FUTURE OF WATER, SANITATION AND HYGIENE:
INNOVATION, ADAPTATION AND ENGAGEMENT IN A CHANGING WORLD****Exploring the bottom end of the water ladder***S. Sutton, E. Mamo, J. Butterworth, D. Dimtse, UK***BRIEFING PAPER 1212**

The revised Universal Access Plan of the Ethiopian government, encourages low cost individual/community initiatives in improved rural water supply. This should provide a major contribution to the target of 98% coverage by 2015. However federal and regional governments are worried about water quality implications and what level of household initiative should count within coverage statistics. In response to this concern, RiPPLE has carried out a comprehensive study of low cost water supplies, from unlined wells with rope and bucket, to protected handpump supplies in one region, SNNPR. This paper presents some of the preliminary results of the study, particularly in terms of water quality, quantity and reliability. It combines the concerns of users and government in proposing a simple method of source assessment which can be as effectively applied to the bottom rungs of the water technology ladder as to conventional supplies and suggests a continuum between them.

Background

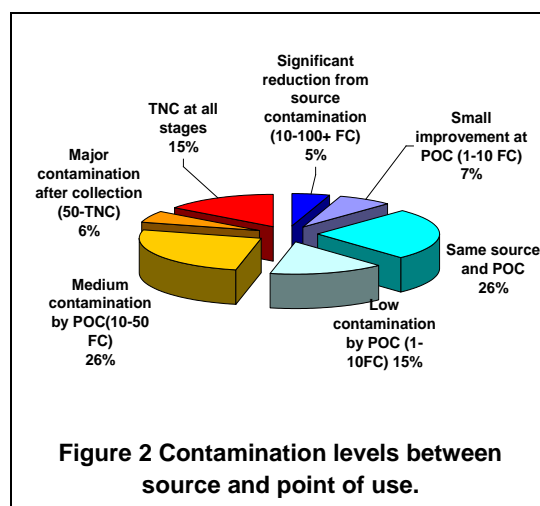
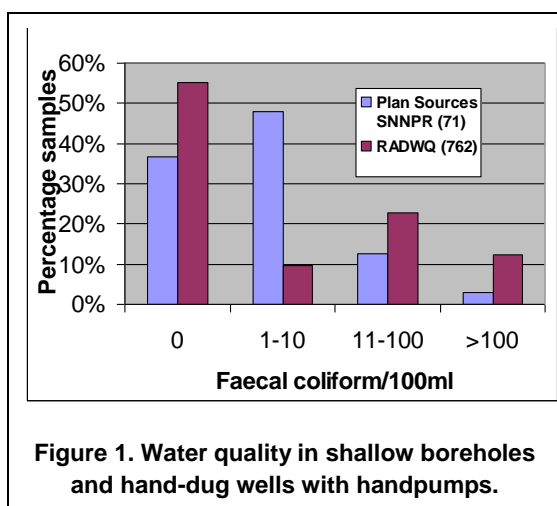
In 2008 the Ethiopian government revised its Universal Access Plan (UAP, 2008) to put more emphasis on low cost solutions. Such solutions are planned to provide 63% of the increased coverage in rural areas, using only 35% of the rural water supply budget. Low cost options are those costing less than around \$US6 per head to central or regional funding in terms of capital investment. This means a major proportion of the cost being covered by users themselves in those areas where groundwater is relatively easily available and farming provides a reasonably secure income. The strategy is for government to provide most funding to community supplies in areas where such solutions are not possible, and mechanically drilled shallow wells or boreholes or fully lined hand-dug wells are necessary. Communities and households in other areas will be encouraged to develop their own solutions with advice and possibly micro-credit or subsidy available from government.

However government is concerned that these lower levels of service will not provide an adequate quality or quantity of water to count towards coverage figures. RiPPLE is working with the Regional Water Resources Bureau in SNNP region, (the second largest regional population in the country) , to ascertain the level of service that present Self Supply wells provide, and how these compare with conventional community supplies. The survey is being carried out using government personnel at regional, district and sub-district level in water, health and finance sectors, both to raise awareness of issues relating to low cost options and to build capacity for monitoring and research. Whilst there has been a limited amount of data collection on conventional rural water supplies previously, this is the first time that any data has been collected on the 'lower rungs of the ladder'. Information was collected on 400 supplies and 150 householders, including well-owners, rope pump owners and sharers (RiPPLE, 2010).

The yardstick of conventional supplies

Family and small group traditional wells can be compared in their performance with conventional supplies which most commonly consist of shallow boreholes or lined hand-dug wells with hand pumps or protected springs. The comparison is not just of water quality but needs also to be balanced with the reliability/continuity with which each supply type delivers water, and the convenience of the supply. Existing water

quality data from the Rapid Assessment of Drinking Water Quality (RADWQ 2010) and from a study for Plan International (Plan 2006), provide a picture of quite variable water quality (see Figure 1) from ‘protected’ sources. These supplies only deliver water of this quality if the hand pump is working of course. A recent inventory by the Regional Bureau of Water Resources indicates that only 66% of hand pumps of hand-dug wells (1,439) are working and 70% of those on boreholes (2,723). 75% of spot springs and those with reticulation (5,389) are functional. The length of time hand pumps are out of operation was not surveyed during the inventory. A limited survey by RiPPLE of 47 conventional handpumps on hand-dug wells (25) and mechanically drilled shallow boreholes (22) found 28% had broken down in the previous year, with an average down-time of 81 days. User satisfaction with the supply was reported to be 91%.



Reliability and availability of water from family wells

Traditional family wells

Despite the general lack of any lining at depth, 80% of traditional family wells were found to have provided a constant supply of water for the past five years. These wells are generally little more than holes in the ground, 4-40 metres deep, with timber, a bottomless clay pot or masonry at the top. Many such wells have been dug in the last few years, as interest in growing cash crops has increased, and having your own well makes it possible to irrigate seedlings like pepper or ‘chat’ (high value cash crop), and to spend much less time collecting water. There has been very limited training of artisans or health technicians on well head protection and little interest from well-owners to make major efforts in it. Only 8% of family wells were found to have any concrete apron and parapet to reduce the return of dirty surface water to the well. Most of these are wells which have been up-graded with NGO support, or through the Water Supply Safety Net programme run by the Ministry of Agriculture. For semi and un-protected family wells user satisfaction was 82%.

The different stages in well-head protection do show small but significant improvements in water quality.

FC/100 ml	Conventional handpump (47)	Rope pump	Apron (26)	Drum (80)	No protection (229)
0	43%	22%	19%	15%	5%
1-10	30%	30%	15%	16%	14%
11-50	15%	14%	46%	45%	39%
>50	11%	35%	19%	24%	42%

According to our survey a conventional hand pump falls in much the same range as those point water sources surveyed by the Rapid Drinking Water Quality Assessment and the Plan Study. Starting from those wells with no protection from contamination (5% with zero faecal coliform) a gradual improvement is seen

with provision of a metal drum to protect the well mouth and then an apron to reduce seepage back into the well (see Table 1). There was no significant difference in water quality between wells which had been chlorinated in the past six months and those that had not.

Family wells with rope pumps

A few farmers are now installing rope pumps as an intermediate step between pulley and diesel pump (or more rarely a conventional Afridev hand pump), but this is still in its infancy and being promoted more for agriculture than domestic supplies. Rope pumps offered only about half the proportion of supplies with no faecal coliform compared with a conventional piston hand pump (see Table 1). This may reflect the fact that few have been constructed or managed as well-protected drinking water supplies, but surveys in Mozambique by Wateraid show a similar profile for both types of pump where both are communally owned and used and are situated on similar well types. Rope pumps in SNNPR were 84% reliable with an average of 70 days out of action before being repaired. However only operating pumps were visited and several had not been repaired at all. For those operating, even with significant down-time, user satisfaction was 100%. This was partly because they were mostly used for irrigation as well, and users liked the improved water quality. This means they often then shared their well with more households than they had before the pump was installed.

Water quality and water treatment

Much emphasis is always put on water quality, and while this is an important aspect, greater emphasis on household water treatment may, over time, reduce its dominant role. In SNNPR, only 9% of households treated water all the time, but 54% treated it in times of highest risk. Of these some used more than one method, half saying they boiled it, half saying that they used chlorine products. 18% filtered it with a cloth, reducing turbidity and so also the bacterial load, and making chlorination more effective. Promotion of water treatment is in its infancy in terms of getting it to be a regular practice. Many of those who have used chlorination sometimes, have used it when it has been given free by health centres during outbreaks of 'acute watery diarrhoea'. This has made it difficult to establish a market for treatment products in the past, but PSI are reporting significant growth now. Although water treatment is not yet widespread, in only 6% of cases did quality appear to deteriorate grossly through collection and storage, (See Figure 2). Similarly only in a small percentage was there a major reduction in contamination (5%).

Water source performance profiles

The international choice of technology options which are acceptable for coverage is based very much on the idealised perception of what will provide safe water (Sutton 2008). However to users it is of equal importance to have an adequate, reliable and convenient supply. The actual probability of technologies or options in delivering safe water should also be considered. These aspects are at present largely neglected in considering what options should be promoted to reach either MDG targets or universal access.

It is proposed that a simple assessment of options should not be based on the single axis of water quality, but should consider a triangular profile, with axes for reliability and adequacy of water as well. In this way the joint interests of users and of authorities can be included and can identify the main elements which need attention. This system can provide a generic assessment (eg how do rope pumps compare with conventional pumps?) or a simple measure for individual supplies (is this system performing at below average levels and if so, what is the main area of concern?).

The basis of the value used can depend on the type of information available. In the case of water quality (the vertical axis) it may be an expression of the proportion of supplies which conform to a norm (eg zero faecal Coliform, or less than 10), or the percentage of supplies exceeding a specific sanitary inspection score. For individual sites it would be the actual value measured.

The reliability axis for a generic assessment can be the proportion of systems which are operating and for individual sources the proportion of time they have operated in the past year (or more). The adequacy axis may be influenced most by the data available. If well yields are available, these may be compared with required amounts to satisfy the domestic demand (or demand for productive uses), or well storage where that is not available. The most subjective measure, but the one which may most indicate sustainability, would be the level of satisfaction of users with the amount of the performance of the supply. The resulting axis values can be viewed as comparative triangles, in table form or as a composite score.

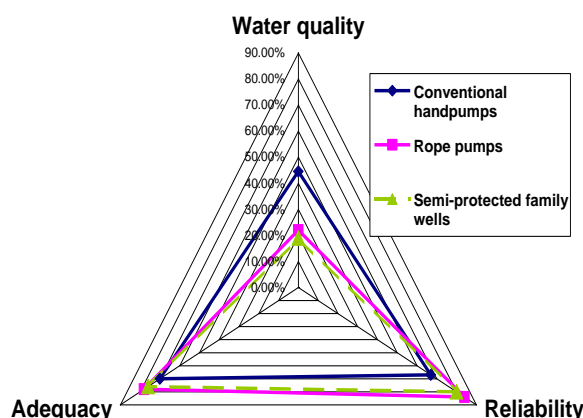


Figure 3. Performance profiles for three supply types

As Figure 3 shows, all three selected supply types fall short in terms of water quality, but the two household level supplies (rope pump and traditional wells) exceed the conventional supplies in terms of reliability and adequacy expressed as user satisfaction.

The overall picture suggests that the options available all need more attention paid to site hygiene and ways of collecting water. In the imperfect world within which hand pumps function, they offer an improved level of service in water quality terms, towards which other options can progressively move. However the aspects of reliability and adequacy indicate the real values of including these lower options within rural water supply strategy.

Conclusions.

Preliminary results from the study on low cost water supply alternatives highlight the generally poor performance of all technologies in terms of water quality. It also highlights the degree to which poor rates of functioning of conventional communal supplies mean that many users have to resort to alternative sources for considerable periods of time. If efforts were put into improved site hygiene and awareness of wellhead protection for household supplies, the latter could possibly form an adequate and reliable alternative for many without access, temporarily or permanently to conventional protected supplies.

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