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Reliable, low-cost maintenance handpumps are the key for sustainable rural water supply

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In Africa, out of the 350.000 handpumps installed, on average 35% is not working; some 150.000 handpumps are disfunctional and still counting. Every day more handpumps are abandoned than new ones are installed. In areas with deeper groundwater the situation is even worse and often 4 out of 5 are not working. Governments and NGOs are trying to find solution to be more effective and to stop wasting funds. However, more people trained for doing repairs and establishing spare part supply systems, did not decrease the percentage of abandoned handpumps. Up to now, new and more sustainable technologies have not yet been considered as a possible solution to improve sustainability. This article describes the BluePump, developed by FairWater Foundation, a new handpump that has specifically been designed for long lasting & reliable operation, also for water levels up to 100m deep. FairWater promotes this new technology and uses the durable BluePump in the FairWater Foster handpump program, in which people donate to replace an abandoned handpumps in Africa with a durable BluePump.

Handpump breakdowns were considered normal

For more than 25 years water projects in Africa mainly installed "Public Domain" handpumps that are mass produced in India. Although it was known that these handpumps break down regularly, it was expected that "Community Management" would keep these pumps in operation. This was based on the assumption that as long as spare parts are cheap and available, communities could maintain their handpumps without external support. This VLOM O&M model was heavily promoted and did work in some cases where communities had the means and patience to do so. However, evaluations showed that in general, the VLOM public domain handpumps are not sustainable in the harsh African reality and that most VLOM handpumps are abandoned within a few years. Statistics shows that 1 out of 3 installed is disfunctional, while the 2 still remaining are often recent installed handpumps. Clearly, this situation is alarming. Communities have no means to rehabilitate the complete handpump themselves and have no other option left as to wait for a new donor project that will again install another VLOM pump for some years and the cycle starts again. With the current VLOM approach a constant flow of about 2.000 new pumps per country, or 15 million US$ each year, will be needed to maintain a reasonable coverage of rural water supply.

Already over a decade ago, Governments and NGOs realized that VLOM handpump water supply was not sustainable in Africa, with even more problems in zones with deep groundwater. Therefore additional management approaches were studied and tried out with the hope that handpump Operation & Maintenance (O&M) could be made more sustainable. Approaches and policies such as standardization, bottom up, demand responsive, decentralisation, privatized maintenance, etc. were tried, but with little results. However, all these new approaches had one important missing factor in common: the influence of the quality or durability of the handpump itself was not taken into account; all approaches were still based on using the same VLOM type handpumps, in spite of their poor performance.

Unfortunately, these VLOM handpumps needed on a regular basis many spare parts to keep them in operation. But instead of looking for more reliable handpumps that needed less spare parts, the focus of attention shifted again to different models of spare parts distribution systems. It was thought that handpump sustainability could be significantly improved by making spare parts more available. However, it became clear that implementing a reliable supply system was rather complicated and also expensive. Even worse, evaluations studies showed that even with more spare parts available, the percentage of dysfunctional handpumps handpump was not significantly less.

The key problem with VLOM handpumps is their regular breakdowns

VLOM handpumps break down regularly after some years, due to the heavy load that communities put on to them with day in day out pumping. The frequent repairs become more and more complicated and expensive, while often spare parts are also not available. After some time, communities cannot afford this anymore and the pump remains disfunctional. The next stage is that people go to the remaining pumps in the area until all handpumps are broken down. Finally their future will be to go back to traditional sources that are often polluted and far away, in spite of all the efforts and donor funding.

For instance in Malawi, 40% of about 19.000 handpumps (8.000) is abandoned, although spares are available throughout the country due to the standardization on one handpump type only, the Afridev. Also introducing a more simple technology, the rope pump, was tried out in several countries with the assumption that communities would repair it with local available materials. But also this option did also not work in community water supply, simply because the frequency of breakdowns is even higher compared to the already problematic Afridev. Initially rope repairs and weldings were done by volunteers in the community, but with time they also got tired of repairing all the time for free, while the communities were losing their patience because of the many days without water, awaiting repairs. In fact, the rope pump suffered the same O&M restriction as the public domain VLOM pumps from India. Although in some locations people didn't mind repairing their rope pumps, there is now general agreement that the rope technology is a good option for a family garden well, but is not the way forward for sustainable community water supply. What other options are possible now?

A new horizon: Quality matters

The only remaining option that has not been seriously tried so far, are management models that uses more reliable handpumps. It is in fact a simple ABC; when breakdowns are less frequent, fewer repairs and less spare parts are needed and O&M becomes cheaper, so also more sustainable. A longer lasting handpump would also create a better service because of the continuous water supply and therefore create more motivation to pay. Studies show that people are more willing to keep paying if the service is more reliable, an O&M model with more reliable handpumps therefore looks promising and the best way forward.

The Fairwater BluePump

The bold idea to develop a reliable low-cost-maintenance handpump started in 2003 as a private, personal initiative of the author, when he was the Project manager of the Rural Water Development (RWD) project in Kenya. By that time, is was already clear that in most African countries the handpump breakdown rates were alarming and many regions were suffering from water shortages due to disfunctional handpumps. There was a high need for a more reliable handpump. One of the most reliable handpump at that time was the Volanta handpump. However, also the Volanta handpump needed spare parts and had some persistent O&M problems, especially when it was used in deeper boreholes. With his long term practical experience with handpumps in general and especially with the Volanta in Burkina Faso and Mozambique, the author already had suggested and implemented several important improvements for the Volanta. Based on these suggestions and with many data of handpump technical problems, the next logic step was to develop and test a new, simple and sturdy hybrid handpump that would have all the advantages of the Volanta handpump and avoids the problems of the typical VLOM handpumps.

The basic criteria for the BluePump were simple: one simple model should be able to pump from 1 m to 100m deep, with low-cost minimal maintenance and basically without the need for spare parts for a very long time. After the initial test in Kenya, a pilot model was developed and tested in South Angola with the help of the local Provincial Water Department. More field test followed in Malawi, Kenya, Burkina Faso and Mozambique with the help of NGOs that were willing to try out the new pump and to give technical feed back for improvements. In 2008, the author established with his partner Sureyya Gök the FairWater Foundation, with the objective to start rehabilitation projects in Africa and to coordinate the R&D and production of the new pump. The BluePump design proved to be very reliable indeed. Incorporating all results of field tests in deep boreholes in Mozambique and Northern Kenya from 2008 to 2010 the FairWater BluePump model 2011 was finalized. The BluePump is already considered by many international experts as the most versatile handpump available and is now rapidly becoming popular amongst users and many NGOs, including the UNDP Millennium Villages Project, to be installed up to 100m. deep

In the initial stage, the pilot model was named "Afripump" and the manufacturer of the Volanta handpump was approached to produce the test models. However, there was confusion with the VLOM "Afridev" handpump and it was decided to re-name the new pump into FairWater "BluePump" and not use the name Afripump anymore. The production and distribution of the BluePump is now with BOODE B.V. in The Netherlands.

Figure 1. FairWater BluePump in Tanzania UNDP Millennium Village Project

The heart of the BluePump is the strong, stainless steel and maintenance free Beers Pump System" (BPS), which allows easy & efficient pumping up to 100m. deep with a bottom support. The cylinder is basically maintenance free because the piston has no rubber seals. The rest of the BluePump design is simple and straight forward, any technician can put it together without the need of an installation manual, while all components are made from strong materials that last; therefore the BluePump is reliable, cheap & easy to maintain. Regular maintenance is limited to only tightening of nuts & bolts; it is estimated that under normal conditions no spare parts are required for 10 – 15 years. Furthermore, most parts are locally available or can be made locally. The BluePump is definitely not the cheapest handpump, but it offers durability and satisfies the users with easy pumping and a large water output. In the end, that is what Government and NGOs also do care about.

The FairWater cost-effective Foster handpump program

A handpump in an African rural community will serve on about 50 families, or 250 persons per day. Normally, water projects spend on average a total of € 15.000 for a new borehole with a VLOM pump. This costs € 300 per family or € 60 per person for a water point that lasts about 5 years, which is a capita

investment of € 12, - per year. FairWater is not making new boreholes with VLOM pumps, but has developed a more cost-effective and sustainable program by replacing abandoned pumps with a BluePump + maintenance contract for € 2.500,-. Because the BluePump will last 10+ years, this is a capita investment of € 1,00 per year. Rehabilitation with the BluePump is therefore at least 10x more cost-effective compared with making new boreholes with VLOM pumps. Studies show that rural communities do value durable water supply and families are willing to pay 10 to 20 US$ per year for a reliable service. A community can easily bring up a yearly budget of 300 US$ for maintenance. For 40 pumps this will create a yearly turnover of 12.000 US$, that is sustainable business with the BluePump. A maintenance contract in which communities only pay transport but not for the repairs is therefore profitable for both parties.

The Fairwater program is transparent and evidence based with a bottom up approach. That means that all rehabilitated handpumps will be shown on the FairWater website www.fairwater.org, and the communities apply themselves for rehabilitation. In the past, communities could only wait and pray for a new donor to come by, now they can take matters in their own hands. The FairWater Foster Pumps project is also highly cost-effective because FairWater has no expensive local offices and uses the infrastructure and local stock of BluePumps available with the local BluePump distributors.

Figure 2. Situation 2009
Central African Republic

Figure 3. Situation 2010 with FairWater
BluePump replacement

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