

**38th WEDC International Conference, Loughborough University, UK, 2015**

**WATER, SANITATION AND HYGIENE SERVICES BEYOND 2015:  
IMPROVING ACCESS AND SUSTAINABILITY**

**Improving self-supply water sources as a key  
to reach the water related SDG**

*H. Holtslag & J. Mc Gill (Malawi)*

**BRIEFING PAPER 2288**

---

*One way to reach the Sustainable Development Goal (SDG). "Safe and affordable water for all" is improving Self-supply water sources. For instance millions of open hand dug wells in Africa can be improved with simple and low cost interventions. With subsidies and / or micro credits families can be stimulated to make their own wells for domestic and productive use. Support Self-supply is not instead of the conventional subsidised Communal water supply but an additional approach with the advantage of the income generating effect of water at family level and families willing to invest. A range of new, innovative and low cost technologies have made Self-supply affordable, so where technically possible, it makes sense to stimulate Self-supply. By using household water treatment, water from Self-supply sources can be made safe to drink. The right Self-supply approach will result in safe drinking water, more water for productive use, local business development, increased income for users and more food security.*

---

**Water ladder**

In both urban and rural areas there is a need for clean and safe water for drinking and hygiene and in rural areas, water for productive use like irrigation is needed. In many parts of the world rural families use a "Water ladder"; incremental improvements of the water sources. For example hundred years ago many farmers in Europe had a hand dug well and extracted water with a bucket. Step 2 on the Water ladder was the installation of a hand pump on these hand dug wells. Step 3 was a borehole with an electric or engine pump. Step 4 was a connection to communal piped water supply. So there were 3 steps on the Water ladder with Self-supply technologies before families had communal supply with piped systems. The costly piped water systems were funded with government subsidies. With the increased incomes, among others as a result of the access to water, farmers could afford the cost of operation and maintenance of the piped water system and the improvements of their Self-supply system. The situation now is that the water from piped systems is used for drinking and domestic use but most farmers still use Self-supply wells for productive use like life stock and irrigation. Circumstances in Africa are different from Europe but the same "Water ladder" logic can be applied in many areas in Africa.

**Why self-supply?**

The 740 Million people still without an improved water source for a large part live in Africa and have Self-supply water sources like rivers, lakes or open hand dug wells. With small improvements like a well cover and a hand pump these Self-supply sources can be become an improved water source. Besides access to safer and more water an effect of improving and scaling up of Self-supply is economic development and food security. Over 50% of the families in rural areas are small holder farmers. They could increase the food production if they would have access to markets, simple farm tools and affordable irrigation. Some examples of Self-supply under.

### Experiences and effects of Self-supply

- **Bolivia:** Over 30.000 family wells made with EMAS and Baptist drilling. Cost of a 15 - 50 metre deep borehole, including pump 150–400 US\$ resp. ([www.EMAS-international.de](http://www.EMAS-international.de))
- **Nicaragua:** Of the 70.000 Rope pumps installed some 50,000 are used for Self-supply. The total income increase with these pumps was \$100 million in the 12 years. This because families with a pump had increased incomes of 220 US\$/year. (Alberts H. 2004)
- **Bangladesh:** 17 Million people from poor farmer families came out of poverty with Low- cost pedal pumps (Treadle pumps) for irrigation. [www.ide.org](http://www.ide.org)
- **Zimbabwe:** Over 200.000 families improved their hand dug well with a cover and a wind lass system. Government and NGOs supported families with a few bags of cement. (Family upgraded well program Zimbabwe. A. Waterkeyn )
- **Ethiopia:** The government of Ethiopia is stimulating Self-supply and want to reach 20 million people in the next 7 years with o.a. hand dug wells and pumps. Over 10.000 Rope pumps produced until now. [www.cmpethiopia.org/self-supply-news](http://www.cmpethiopia.org/self-supply-news)
- **Tanzania:** The shift from machine drilled boreholes and imported piston pumps to manual drilling and locally produced Rope pumps reduced the cost of communal water points in southern Tanzania from \$4000 to \$1500. The Rope pumps for communal systems generated interest from families and of the total of 5000 Rope pumps some 2500 pumps are for Self-supply. They are paid by families mostly in peri urban areas but now starting in rural areas with microcredit systems. Of the Rope pumps for Self-supply, 95%, are functioning. ([www.shipo-tz.org](http://www.shipo-tz.org))

#### In summary reasons to stimulate self-supply are:

- Improving and scaling up Self-supply is essential to reach the water related SDG. This because with the increasing population and limited funds the conventional approach is not sufficient.
- Families invest themselves, eventually with a subsidy and /or funding support like micro credit.
- Eliminates the “eternal headache” of pump maintenance, families maintain their pump.
- Self-supply = Money. It leads to productive use, more income. A pump in the garden “automatically” increases incomes as has been proven in Nicaragua and other countries. In general communal supply is only used for domestic use.
- Self-supply “automaticly” becomes communal supply. Families will often share water with their neighbors.
- Water near the house reduces the workload of women and children.
- Self-supply combined with rainwater harvesting can reduce the negative effects of climate change.
- If Self-supply is combined with Household Water Treatment, water quality can be the same or even better than water from communal systems.



**Photograph 1. Improving an open hand dug well with a well slab**



**Photograph 2. An improved well with a well slab and a low cost hand pump**

#### Smart water solutions

More than before Self-supply is possible thanks to Smart Water Solutions (SWS); being a range of innovative, affordable and simple technologies for water and sanitation that can be produced with local materials. Many of these options are affordable for middle income families. Poor families who cannot afford

technologies could be supported with partly subsidies and or group loans. Some examples of conventional and new technologies for Self-supply are:

- **Small diameter wells** The cost of hand dug wells can be reduced by reducing diameters to 0.9 metre. The volume to dig out of 0.9 metre is 45% less than that of a well with a diameter of 1.2 metre.
- **Underlining & Well pipe;** simple technologies to make wells deeper without the danger of collapsing.
- **Tube recharge;** Another option to avoid that wells dry up in the dry season is a *Tube recharge*, (a 10US\$ system to inject up to 500 m3 rainwater in the ground near wells).
- **Well cover, apron, soak away.** At all times it should be avoided that water flows back into a well. This can be realised with a well cover, and apron and a soak away of splash water. Cost of these are 30-80US\$. With these options, open wells become an “improved water source”.
- **Manual drilling.** This is safer, can go deeper and sometimes is cheaper than hand digging. For instance with the EMAS technology in Bolivia tube wells are made of 15 metres at a cost of 150US\$ for 10 meters deep and 400US\$ for 40 Meters deep, including drilling, casing and a hand pump.
- **Manual drilling** Besides Augering and Bailing, new manual drilling options are Rota sludge, Baptist, SHIPO, EMAS, Rotary Jetting which have much potential for the local private sector to become a business.
- **Hand pump** A bucket and rope is a major cause of the (re)contamination of a well. Just installing a hand pump, even without a well cover, can improve water quality by 60%. (Gorter 1998).
- **Hand pumps.** From water levels of 35 meters and less, water can be pumped up with low cost and locally produced hand pumps like EMAS, Canzee or Rope pumps that cost 50 to 150 US\$.

### Water quality from self-supply sources

Most Self-supply wells are in shallow water layers which increases the possibilities of contamination. To avoid to a maximum that water from Self supply wells becomes contaminated it is advised to have and apron, a well cover and a soak away so water does not flow back into the well. Although guidelines for wells is that latrines are 30 meter or more from water sources, the reality is that many family wells are near latrines or other sources of contamination. To make sure water from a Self-supply source is safe to drink, it is strongly advised to use some kind of Household water treatment like boiling, chlorination or water filters and treat the part used for drinking. New effective household water filters now are available at retail prices of 15 - 25 US\$.



**Photograph 3. Making a well deeper with the well pipe technology**



**Photograph 4. Manual drilling with the so called SHIPO method**

### Capacity building, SMART centres

The new technologies in general are simple but experiences indicate, “Simple is not easy”. Small errors in a well cover or hand pump can cause large problems and a bad image for the new technologies. So it is essential to guarantee good quality of the technologies in production, installation and maintenance. This requires good capacity building and a long term follow up on quality control. One option to do this is via so called SMART Centres. These are Water and sanitation innovation centres which concentrate knowledge in one place, demonstrate conventional and new options and train local entrepreneurs in production, quality control, marketing and business skills. Almost all technologies can be produced with local materials and the

private sector can sell to NGOs but also to families. This creates employment and a “profit based sustainability” since actions will go on after training or projects stop. There now are SMART Centres in Tanzania and Malawi and one starting in Mozambique. The results after 7 years of the SHIPO SMART Centre in Tanzania are;

- 30 Manual well drilling and pump companies trained and functioning
- 5000 Rope pumps installed of which 50% for Self-supply
- Cost reduction of rural water points from \$40 to \$15 per capita

### **In conclusion, self- supply**

- is essential to reach the water related SDG
- is affordable with new low cost technologies (SWS)
- increases water for domestic use
- increases water for productive use
- automatically increases family income
- increases food security
- is a promising option for water and food for millions.

### **Recommendations**

To improve existing Self-supply sources and to make new systems some recommendations are;

- **“Cover the wells”**: national campaigns to upgrade existing wells with a well cover, apron, soak away and a windlass or hand pump.
- **Awareness**: publish lessons learned, not just on success but also on failures. There are “Simple is not easy” lessons from Ghana, Ethiopia.
- **Demonstration**: show real examples of SWS to families, NGOs, Governments etc.
- **Supply chain**: build up supply chains of a range of technologies and products including options that are affordable for poor families.
- **Training**: the 3 main actions to build up supply chains are; 1e Training, 2e Training, 3e Training. NGOs and Governments could support South-South knowledge exchange on lessons learned and new technologies. Essential is quality control of products and services for instance by means of certification of producers.
- **Vocational training**: new options could / should eventually be included in the curriculum of the national vocational training so it is embedded in the structure.
- **SMART centre**: each country should have at least one WASH centre where knowledge is centralised. Examples are SMART Centres in Tanzania and in Malawi.
- **Financing**: consider subsidies like in Zimbabwe. Provide payment options like micro credits for those who cannot pay in one time.
- **Field studies**: independent studies on social, health and economic impact of Self-supply projects.
- **Cooperation**: to scale up Self-supply cooperation of NGOs, governments and private sector is essential. Together they need to work on awareness, inform families that safe water = money, develop Supply chains, train the local private sector in production, repairs, quality control etc. Support is needed for certification of producers, developing of policies, monitoring and evaluation.

---

### **Information**

Ideas on scaling up safe water [www.300in6.org](http://www.300in6.org)

Information on Smart Water Solutions on [www.akvo.org](http://www.akvo.org) Manual drilling; [www.rwsn.org](http://www.rwsn.org)

Information Rope pumps : IRC 1995 Nicaraguan experiences with the Rope pump.

<http://www.washdoc.info/docsearch/title/113703>

Booklet “Smart Water Solutions” of Netherlands Water Partnership. [www.nwp.nl](http://www.nwp.nl)

Other booklets in the Smart series on Sanitation, Water harvesting Hygiene, Finance and Disinfection

[www.akvo.org](http://www.akvo.org) , [www.irc.org](http://www.irc.org)

The business solution to poverty, P. Polak.



**Photograph 5. Upgrading a well with a windlass like in Zimbabwe**



**Photograph 6. Self-supply water can be made safe to drink with low cost filters like this Filter produced in Malawi**

---

### References

- Alberts. H. , Zee. J van der 2004. A multi sectoral approach to sustainable rural water supply in Nicaragua: The role of the Rope handpump. [www.ropepump.com](http://www.ropepump.com) [www.ropepumps.org](http://www.ropepumps.org)
- Gorter. A. 1998 PhD Thesis Childhood diarrhoea and its prevention in Nicaragua. University of Maastricht.

---

### Contact details

Henk Holtslag  
De Zeis 60 7335KB Apeldoorn Netherlands  
Tel: 031-555414156  
Email: [henkholtslag49@gmail.com](mailto:henkholtslag49@gmail.com)  
www: [www.mzuzusmartcentre.com](http://www.mzuzusmartcentre.com)

Jim Mc Gill  
Po Box 112 Mzuzu Malawi  
Tel: 0026599951860  
Email: [mcgillwatsan@gmail.com](mailto:mcgillwatsan@gmail.com)  
www: [www.mzuzusmartcentre.com](http://www.mzuzusmartcentre.com)