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**ENSURING AVAILABILITY AND SUSTAINABLE MANAGEMENT
OF WATER AND SANITATION FOR ALL**

**A market-based approach to scale up sustainable rural
water supply: experiences from Tanzania**

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BRIEFING PAPER

In order to reach universal and equitable access to safe and affordable drinking Water for All (SDG 6), SMARTechs such as Manual well drilling and Rope pumps may be a good option to scale up rural water supply and reach also the small and remote communities. A recent study looked at ways to scale up the use of these technologies in Tanzania. Trained local entrepreneurs sell the product for Self-supply (private use) and communal use. For efficient scale-up, they need to be supported in all aspects of the supply chain to reach the maximum number of households and to establish a national distribution network.

The best way to create demand for Self-supply is bottom-up: by means of good-working examples and close relationships, clearly showing the socio-economic advantages for the user. First results show that SMARTechs are sustainable: production by local entrepreneurs, high functionalities due to ownership and low maintenance costs.

Background

The main sources of drinking water in Tanzania are improved sources like piped water systems, gravity fed systems, protected wells with electric or hand pumps and unimproved sources like open wells, springs, rivers and lakes. Access to these sources is very unequally divided, not only between rural and urban households, but also between the different regions. The majority of the population lives in rural areas, but over half of the rural population does not have access to improved water sources (National Bureau of Statistics and Ministry of Finance 2013, WHO and Unicef 2015).

By the year 2030, Tanzania should achieve universal and equitable access to safe and affordable drinking Water for All (Sustainable Development Goal 6). People who do not yet have an improved water source often live in small communities where gravity systems or machine-drilled boreholes are not possible or too expensive. One way to reach the yet un-served and to improve rural and peri-urban water supply is to use other and lower cost technologies such as Rope or treadle pumps that are produced and sold by the local private sector. Customers may be private households (private use) or NGOs (communal use). In Tanzania, these so-called SMARTechs (**S**imple **M**arket based **A**ffordable and **R**epairable **T**echnologies) are amongst others promoted by the SHIPO SMART Centre in Njombe, where this study was carried out. SHIPO SMART Centre introduced the Rope pump ten years ago in Tanzania and is still the main training centre for SMARTechs in this country. Currently some 10.000 pumps have been installed of which 50% is used for communal and the rest for private water supply funded by families themselves.

The Rope pump (Figure 1) can be used on hand-dug or hand drilled wells up to a depth of approximately 35 meter. According to several authors, the per capita investment and maintenance costs of a Rope pump are much lower than those of a conventional piston pump such as an Afridev pump or India Mark II (Harvey and Drouin 2006, Acra 2012, iWASH 2013). ‘Affordable and Repairable’ means that hand-dug or drilled wells and Rope pumps reduce the cost of communal supply and are very suitable for private use by middle and lower income groups or families who in general fully or partly finance the pump themselves (Olschewski et al 2015, Holtslag and McGill 2015, RWSN 2015). Because Rope pumps for

Self-supply are often used for multiple purposes, such as drinking, washing, cooking, gardening and irrigation, the purchase may result in a substantial increase of the family income.

Current objectives of SHIPO SMART Centre are to scale up the use of Rope pumps for sustainable rural water supply in Tanzania and to introduce new suitable SMARTechs into the market. This article presents the results of a study on how improvement of the business of the local entrepreneur may support accelerated distribution of Rope pumps throughout Tanzania: how is the business of the entrepreneur organized and what are the needs and demands of their customers.



Figure 1: Communal Rope pump installed on an existing hand dug well (source: Reinier Veldman)

Methodology

In order to collect information on the business of the entrepreneurs, open interviews were held with employees of the SHIPO SMART Centre and 12 local entrepreneurs in Njombe,, Iringa and Morogoro region, who were selling Rope pumps and/or digging wells according to the SHIPO method. For information on the demand of the Rope pump user (the direct or indirect customer of the local entrepreneur), 71 semi-structured interviews were held with Rope pump users (65% private use and 35% communal use), in Njombe and villages around Njombe, Songea and Mafinga.

Results

The business of the local entrepreneur

The local entrepreneurs who were trained by SHIPO to produce and sell Rope pumps (sometimes in combination with hand dug or hand drilled wells) are welders or diggers by profession. Some of them already owned a company before they were trained, others were trained as employee at one of these companies and started their own business.

In addition to these entrepreneurs, there are also a number of workshops who sell Rope pumps without being trained (not interviewed). It is estimated that in Tanzania there are between 5 and 20 workshops producing (sometimes bad) copies of Rope pump.

Most entrepreneurs did not face heavy competition though, except for the workshops in Makambako. They have their own geographical area or have a good long-lasting relationship together.

For most entrepreneurs who were interviewed, sales of SMARTechs became a significant part of their business (50-100%) after they received one or more trainings from the SHIPO SMART Centre.

In the interviews, the entrepreneurs mentioned a couple of issues that need to be addressed when SHIPO wants to scale up the use of the Rope pump.

First of all, the raw material supply is pretty well developed but can still be optimized. In principle, the entrepreneur can buy all materials at the local market or in Dar es Salaam (less expensive and for bulk supply). Regionally, the market seems to be best developed in Njombe and Mafinga. In Makambako, Iringa and Morogoro, however, not all materials are available and have to be obtained in the capital city. Some materials are also cheaper in Dar es Salaam, which is interesting for larger quantities.

Secondly, some (smaller) entrepreneurs mentioned that it is difficult for them to grow due to insufficient capital to invest in material for new Rope pumps or in more advanced equipment. Without exception they would like to have more chances to get microcredit to grow their business.

Thirdly, most workshops not only have customers in their own region, but also far outside their region. This may have to do with the bottom-up way of finding their customers: potential customers approach them because they see the technology (and phone number) at family or neighbors and would like to implement it themselves. However, each entrepreneur has a limited capacity, most of them supplying between 20 and 150 Rope pumps per year. For a nationwide coverage, new entrepreneurs need to be found and trained.

Among the entrepreneurs there is a large difference in business and marketing skills. Only a few entrepreneurs had a clear marketing strategy how to approach new customers. They understood that examples were needed to convince people to purchase a pump. To enter a new village or area, for example, they gave a rebate to the first user so the pump could be used as a demonstration model. Another point raised by the entrepreneurs was that it costs a lot of effort (and money) to convince people to change over to an improved water supply. This 'social marketing' may be a task for NGOs until a critical mass has been achieved. Insufficient insight in how to market Rope pumps more efficiently caused a stagnation of the business for some of the entrepreneurs. Some entrepreneurs returned to their old business because they could not make enough profit on Rope pumps.

Customers

Accelerating scale up with a market-based approach can only take place when it is known what drives the people buying a Rope pump (what is the need or the demand of the customer, what is their motivation).

From the interviews with the entrepreneurs and their customers, two types of customers could be defined. The first customer segment is the so-called Self-supply customer. This is mostly one family or a small group of households, and sometimes a school and health clinic, who (partly) finances the well himself, (partly) upfront or with financial support such as microcredit. In rural areas, many people do not have access to a functioning water point near or at their premises. In peri urban areas, where there is a piped system, families have it as a pump for the garden or as a back-up in case the piped system does not function.

In practice, the number of households financing the well and pump with microcredit is low (less than 5% of the households interviewed). Reasons for this were amongst others insufficient promotion by microcredit banks (SACCOS) and the awareness of the households about the economic benefits of an own Rope pump.

Families do not seem to shop around to find the cheapest supplier, but select the one who installed the Rope pump at his neighbour or nearby public location.

Self-supply users invested in an own well and Rope pump to have a reliable water source and abundant water nearby the house. They did not want to be dependent on other families or neighbours, on waiting time because of limited amount of water available, on irregular functioning of a communal hand pump, or on (dirty) river water or other unprotected source far away. Before the installation of the Rope pump, these families were mainly using a communal conventional hand pump such as an Afridev pump, a communal Rope pump or the Rope pump at their neighbour, an open well with bucket, unreliable piped water or the nearby river.

The main reasons Self-supply customers mentioned to choose for a Rope pump and not for another technology were the easy handling, low maintenance costs, no access to electricity (for a submersible pump) and improvement of water quality. Main evidence for the perception of good water quality was that the water looked clean, people argued they did not get sick from the water and the logic of less contamination with a covered well. This study did not assess the water quality of the visited wells. Households chose for a certain supplier on basis of examples at neighbours, health clinics, etc. There is a maximum price, though, families can afford (or are willing) to pay. Not many families choose for the (in general more expensive) manually drilled well for example.

Because of the reliable water supply and easy access to abundant water, the water point could also be used easily for other activities than cooking, cleaning, drinking and washing, such as construction, gardening and commercial use. On basis of interviews and observations it was estimated that investing in an own Rope pump could bring a family an annual additional income between 90 and 1350 USD or even more.

According to a study of Haanen and Kaduma in 2011, the Rope pump resulted in additional income for 89% of the households studied (Haanen and Kaduma 2011). The numbers also confirm other data from literature: an extensive study in Nicaragua showed that private Rope pumps improved the economic situation of families. On average their annual income increased with US\$225 (Alberts and Zee 2002). A recent study on Rope pump users in Malawi showed an estimated increase in annual income of 180 USD (Rosendahl 2015).

Striking from the interviews was that in case of private use, the number of households using the Rope pump varied between 1 and 35 households (5 to 175 people). In case of communal supply, one Rope pump was shared by 6 and 40 households (30 to 200 people) Thus, even when one family purchased a Rope pump, often many households used it! Most owners provided the water for free to neighbouring families, a minority sold the water for 50 to 200 TShs (0,20 to 0,50 Euro) / 20 l bucket. A reason to provide the water for free was that it was a favour for the neighbours, a habit in the village to share, or fear for the neighbours.

The second customer segment is NGOs and government, who install hand drilled wells and Rope pumps at communities, health clinics and schools. In general, these wells and pumps are partly or completely subsidized. Users are mainly based in rural areas and do not have access to another improved functioning water point.

The NGOs want to ensure sustainable access to safe drinking water for as many people as possible. For all communal pump users interviewed, NGOs or government decided about the technology, not the user. Motivations for them to choose for the Rope pump instead of other technologies were sustainability (easy maintenance, availability of spares, low cost), the market based approach and directions from donors (iWASH). Donors preferred to work with those entrepreneurs for which they had facilitated the training or who had a proven track record.

In contrary to Self-supply, some communities could only use the Rope pump for domestic use because of limited amount of water from the well. In other communities though there was more water and people could also apply the water for other activities such as gardening and construction. However, economic activities with water from the communal well were much more limited than for the private users.

Entrepreneurs normally do not supply to communal supply users directly, but supply wells and pumps via NGOs. Reasons are that financial risks for them are too high (not sure to get the money after the pump has been installed) and initiatives from the communities themselves to purchase a well and pump together are few..

During the years, there has been a shift in pump sales from communal use to private use. When SHIPO started in 2004, some 1500 Rope pumps were subsidized and installed for communal use which created awareness on this new technology and a so called “critical mass”. After a few years, people started to order the pumps for private use because of the advantages mentioned above. In addition, SHIPO and other organizations (iWASH consortium) started to stimulate private use in greater extent because of sustainability of the water supply. Also, some of the entrepreneurs got more independent from SHIPO and further developed their own business, which was mainly for private households. In the period from 2011-

2015, approximately 60-70% of the installed Rope pumps were installed for private use and this number is still increasing.

Maintenance and functionality

The section before described why people choose for own affordable small-scale water supply. One of the reasons for private users was the reliability of water supply. Some data were collected on the functionality of the Rope pumps. The numbers below are a first indication only, because data collection was limited, 40% of the Rope pumps were installed less than one year ago and answers showed large fluctuations.

In the interviews people indicated that maintenance costs were few and affordable. Most common was exchange of the rope (every few months up to two years, depending on the user). 92% of the private wells / Rope pumps visited were functional. The wells / Rope pumps were installed between 2008 and 2015, with 2013 as the average installation year. Two wells were not deep enough and therefore there was no water (dry season), two Rope pumps were not in use due to technical problems but were supposed to be repaired soon. Because most workshops trained their customers on maintenance, people could do small repairs themselves. The entrepreneurs also offered maintenance services upon call, which seemed to work in most cases. Maintenance service costs included material and transport costs plus sometimes a small profit.

For communal use, the functionality was 80% (installation year 2004 to 2015, average 2013). Some of the older pumps were still functioning, others were not. Main reasons for non-functionality were rope break, guide block problems and delay in payment. Also here, there were no major O&M issues. Money was collected as a monthly fee or when maintenance was required.

A maintenance insurance program, such as Pumps for Life, promoted by the NGO MSABI, might be beneficial to enhance sustainability of the Rope pump, especially for communal supply (N. Holbro, H. Choyo et al 2013).

Discussion

It has been shown in this study that accelerating scale up of Rope pumps for peri urban and rural water supply in middle and low-income markets is possible via a market-based approach. Local entrepreneurs sell pumps both for Self-supply market (private use), and to NGOs. NGOs are the drivers for communal supply and for awareness raising of the use of the Rope pump (or any other small affordable scale water supply).

There is a number of issues to be addressed to scale up: one of these issues is more support for entrepreneurs to market their product. From the study it was seen that the best marketing is a bottom-up approach, as has also been described by both Viswanathan and Hystra (Hystra 2013, Viswanathan 2015). Good-working examples with a certain critical mass, and clearly showing the advantages for the user (convenience and economic benefit) are the most efficient way to create demand and to realize a shift in the customers' decision making in favor of this small scale water supply technology. Low-income households in general do not like to take risks and incline to choose the same technology and supplier of their neighbor.

NGOs play an important role in the first stage of scaling up because both subsidy and social marketing are needed to establish a critical mass, to raise awareness at consumers and to convince the early adaptors of the new technology. For Self supply a strong tool may be the economic benefit which can be reached having an own water supply near the house. NGOs may also play a role in facilitating microcredit for people who want to buy a Rope pump. Issues such as social marketing and giving credit to customers are very difficult for local entrepreneurs, as they have insufficient capital and knowledge to do this. After a critical mass has been reached, entrepreneurs can work independently to grow their business.

Another issue is support of the business of the entrepreneur. Giving entrepreneurs a good technical training and support afterwards (certification, monitoring, repeated trainings, etc.) is essential to ensure quality and sustainability of the Rope pump. A broken pump or dry well is bad publicity and will prevent further scale up. But NGOs also need to facilitate entrepreneurs in the development of their business: ensuring that there are enough material suppliers, training in all kinds of business aspects, and facilitating loans for equipment and material...

To scale up the use of SMARTechs, it is not sufficient to support existing workshops only. New workshops need to be trained continuously, until a complete distribution network has been reached. Workshops not trained by SHIPO or another training center but already making Rope pumps should be found, convinced of the need to produce good quality and be trained to ensure quality of their products.

A third issue is the sustainability of the water point when using a SMARTech such as a Rope pump. The study showed a high functionality of the water points mainly due to a high degree of ownership, the low maintenance costs and the nearby availability of spares and knowledge. People perceived a better water quality when using a pump instead of a bucket, but if the quality was really better was not assessed in this study.

In addition, the model of market-based water supply via Self-supply proves to be very sustainable for middle and upper lower-income households. Local entrepreneurs will go on producing and selling pumps even after NGO funded projects stops..

For lower income households, NGOs or government are still needed for (partial) funding of the water points as these households cannot afford to buy a Borehole and Rope pump or other pump themselves. Smaller communities (less than 250 people), where conventional machine-drilled boreholes and imported hand pumps often are too expensive. may still get access to an improved water source with affordable SMARTechs. A choice for SMARTechs may not only be made because of lower investment costs but also for a higher sustainability due to the easy maintenance.

As seen in the study, lower income households do not always have to depend on NGOs, but they can also profit from their richer neighbors with a private water point, as these neighbors often supply them the water for free or for a small fee.

Conclusion

The SMART Centre approach can be used to successfully scale up sustainable rural water supply in Tanzania. Critical success factors are the commitment and skills of the local entrepreneur, a bottom-up approach and a social marketing campaign to reach customers, the availability of materials and, in case of communal supply, a good maintenance plan.

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