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Rope pump technology revamped in Uganda

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This paper shares the strategies, experiences and lessons learnt by World Vision Uganda (WVU) after implementing a market-based low-cost water project using locally-made rope pumps. The previous rope pump pilot projects in Uganda had not been so successful. In 2012 WVU introduced three new rope pump models that cater for communal and family water sources and costed one-tenth of the cost of the conventional U2 hand pumps. The locally-made rope pumps were implemented under a self supply approach to rural community. Experience from this project showed that the failure of previous rope pump projects was due to the approaches used. The current rope pumps were installed in two communities and three schools with high population numbers and are still functional because the rope pumps were implemented as a self supply technology. Successful introduction of new rope pumps requires a self supply approach; first promote it at household and then community.

History of rope pumps in Uganda

The first rope pump in Uganda by WaterAid was implemented in 2006 as a fully subsidised communal hand pump at Sempya village in Namayumba subcounty in Wakiso district. The project staff and private sector entrepreneurs were equipped with skills and knowledge to implement the rope pump technologies, while water user committee members were given on-site training on operation and maintenance (MoWE, 2012). These pump models were used on hand dug wells up to 10m depth but a report from WASHTech (2013) stated that rope pumps can pump water from depths of up to 40m. The Ministry of Water and Environment (MoWE) regards the rope pump as an appropriate technology for self supply, catering for a lower number of users (40 to 60 people) than community supply hand pumps such as the U2 that support about 300 people (WASHTech, 2013).

Photograph 1. A section through the fully covered rope pump, designed only for a hand dug well.

Photograph 2. The fully covered rope pump model used in Uganda until 2011.

Stakeholder concerns about earlier rope pumps

Previous rope pump models

The rope pump installations examined were introduced in 2005 by Busoga Trust and the Directorate of Water Development (DWD) of Uganda in collaboration with WaterAid Uganda. Busoga Trust promoted a rope pump model that was fully covered (see photograph 1 and 2) to reduce chances of water contamination (WASHTech, 2013). This model was suitable for use only in large diameter wells (hand dug wells) and only suitable for a depth of about 15 meters.

Implementation approaches used

Many of the earlier rope pumps were introduced as a subsidised communal hand pump. In Otuke, Alebtong and Amuru districts for example, communities were provided with hand dug wells installed with rope pumps without any financial contributions from the users. Yet according to WASHTech, after multiple pilots it was evident that the rope pumps were best suited for use in a self supply context rather than deployment at community level; and that although user demand was present, very limited effective promotion and market research was conducted during pump introduction.

Number of users per rope pumps

WaterAid implemented two rope pumps at Sempya (Namuyumba subcounty in Wakiso district) and Sigi village (Kamengo subcounty in Mpigi district), installed as communal hand pumps that served 120 and 300 people respectively (MoWE, 2012). In Otuke district these rope pumps are serving communities of 200 people, on average. The WASHtech report specified a maximum number of 60 users per pump; hence these rope pumps were serving very high user numbers beyond their design capacity; leading to more frequent breakages.

Quality of water from the rope pumps

Although there are different opinions on the quality of water from various models of rope pumps, this rope pump model is fully covered and so stakeholders perceive the water quality as safe for drinking. The water quality of various water sources was tested at commissioning, and the results showed good quality although no routine surveillance is being done.

Sustainability and affordability of this rope pump

Ownership of the pumps was weak as it was fully subsidized. The rope pumps being promoted were costing about UGX 600,000 (USD 240) to buy and install (WASHTech, 2013). This cost is on the higher side considering the low income levels of rural households in Uganda. Although the rope pump is constructed from locally available materials, communities said that it was still difficult to access spare parts as only one entrepreneur, based in Kampala city was involved in producing them. There were no supply chains in place in the districts were these pumps were implemented.

Uses of water from rope pumps

A number of non-governmental organisations (NGOs) have piloted the rope pump in their water projects around the country. Most of the rope pumps were installed on communal water sources and purposely used for domestic water supply.

Capacity of stakeholders - skills and knowledge

The user communities had not received adequate training on how to carry out operations and maintenance (O&M) of the rope pumps. Therefore when breakdowns occurred they sought assistance from the Busoga Trust who supported the introduction of these rope pumps. District governments also lacked the skills to provide support to rope pump installations. Water Sector capacity to follow up implementation of the rope pump was deemed weak and hence the failure of the rope pumps (WASHTech, 2013).

Rope pumps revamped in Uganda

Background

World Vision Uganda (WVU) is active in Water, Sanitation and Hygiene (WASH) sector in Uganda. In Gulu district, part of the WASH project focused on stimulating the private sector enterprises to provide low cost market-based water products and services for domestic and productive uses; including development of

manually drilled tube wells and the fabrication of locally-made rope pumps. The rope pump now introduced by World Vision Uganda is an updated model that can serve both communal and family water sources.

The new rope pump models

Recently three new rope pump models have been locally-made in Gulu district. They are the communal, family and short-base models. These models have semi-opened (i.e. wheel and rope systems are partially exposed) and are suitable for small diameter drilled tube wells as small as 50mm in diameter. Thus the new rope pump models can be installed on a machine drilled (100mm diameter) well, just like any U2 hand pump. The good news is that every rope pump fabricator can invent improvements to the rope pumps to suit the local context. Community models are robust and use large diameter galvanised steel pipe (3/4") for the pump handle, it has a hub and a removable bushing on a base plate (3mm thick steel bar) that allows the wheel to be detached from the rest of the pump parts, when needed. The new models now have a locking system to prevent theft and incorrect rotation of the wheel.

Photograph 3. The new family rope pump model at Watmon's home. His wife, Peri is selling the water to customers

Photograph 4. The new communal rope pump model at Abili East Village

World Vision's implementation approach

To promote ownership and sustainability of the rope pumps, the WASH pilot project promoted a self supply approach for both households and community (groups of more than 150 people). Households and communities expressed demand through a written application, received at the subcounty offices. The interested person signs a contract and pays a trained private sector enterprise to manually drill (under supervision by WVU staff) a well (up to 150mm in diameter) and install it with a locally-made rope pump of suitable model. Experience from WVU shows that when introducing a new WASH technology (with little support from government), you must first start at a household level (family models) and then expand it to small groups or community (community model) while seeking support from the local or national governments.

Effective number of users per rope pump

Despite fears that the rope pump only works well at household level where there are fewer users; our experience is that the rope pump models now produced in Gulu district (three different models) support up to 200 users per pump. There are examples however where these rope pump models are serving up to 400 people after 10 years (Holtslag, 2013). In Gulu and Amuru districts, rope pumps are being used for communities with an average of 200 people and schools with over 500 students and are still functional.

Water quality from these new rope pumps

The experience in Uganda shows that the water quality from wells installed with fully-covered rope pump models met the national water quality guidelines. The water quality from the new partially-covered rope pump models was tested by Gulu District Water Office (DWO). The results from all 29 rope pumps tested met the government's national standards for drinking water (MoWE, 2013 pg. 62). Investigations in

Tanzania and other countries indicated that, if installed well, water from partially covered rope pump has similar quality as that of pistons pumps (Holtslag, 2013; Coloru, 2012; MoWE, 2012; Harvey & Drouin, 2006). A pump therefore does not change the quality of the water but just lifts the water up.

Photograph 5. The Gulu DWO staff collecting water sample from a new rope pump models.

Photograph 6. DWO staff analysing the water samples collected in the laboratory.

Sustainability of the new rope pumps

For any project to be sustainable, it should be owned by the users. The current experience in rope pump implementation shows that when prices are affordable and users have purchased the "right" rope pump model, *nothing can hinder them from sustaining it*. Mzee Ojara Thomas, a 60 year old male caretaker of one of the communal rope pumps assured visitors of their commitment to sustain their rope pump saying, *"Nothing will ever happen to this water source as long as I am still alive"*. This was during a learning visit by Ministry of Water and Environment (MoWE) officials and WASH partner NGOs to Abili East village in Koro subcounty, Gulu district. This was to learn how WVU has revamped the rope pump technology to address local water problems.

Photograph 7. Fifth from left is Mzee Ojara, the caretaker of the communal water source

Photograph 8. Ministry officials and NGO partner staff interact with the water source committee of Abili East.

The new rope pumps have lasted longer compared to earlier rope pumps even at a communal level is because they were bought by the users who also paid for their installation. Even if a fully subsidised rope pump was used only by one family (smaller user numbers), it may take longer before breaking down but would most likely be abandoned after a breakdown. On one well in Gulu town, where the family rope pump model is serving over 10 households (about 60 users), the pistons and polypropylene ("nylon") rope have not been changed since it was installed in July 2012 (Holtslag and Kaduma, 2013). Given the right rope pump models, the right user training and the right approach (i.e. zero subsidy), up to 90% of rope pumps remain in operation also in Africa (IRC, 1995).

Affordability of rope pumps

Although fully-covered rope pumps produced in Uganda before 2011 costed over US$ 240 (UGX 600,000), those of Nicaragua costed between USD 30 and USD200. The rope pumps introduced by WVU cost quite low. Refer to table 1 below for the costs of the various models of the rope pumps.

Table 1. The cost of the various rope pump models in use within World Vision's Uganda project

Description	Description	Cost (USD)	Costs (estimate) UGX	Users
Rope pumps (Family model)	Old care tyre and metallic materials	54.4	136,000	10 households
Rope pumps (Community Model)	Old care tyre and metallic materials	64.8	162,100	up to 200 people
Rope pumps (Short base)	Old care tyre and metallic materials	50.1	125,250	For hand dug wells serving household or communal model

Rope pumps require frequent repairs to the rope, replacing pistons and oiling that are done by the users. Experiences from Nicaragua show that the bushings can last up to 20 years and polypropylene ropes ("nylon") up to six years; with operational costs estimated between USD 5 and USD 30 per year (Holtslag, 2013). Experience with the new rope pumps so far shows that operational costs are between USD 2 and USD 6 per year; while rehabilitation cost is conservatively estimated at USD 28 per year with a change of occurrence of once in 20 years.

Stakeholder's capacity for scaling up rope pumps

Under the pilot project, awareness and market-demand creation was conducted in each village. Private sector enterprises, Gulu district and partner NGO staffs were trained on fabrication, operation and maintenance as well as installation of rope pumps. WVU and the local government of Gulu district have recognised the efforts of rope pump producers and continued to monitor and mentor them to ensure regulation of quality product and services. A memorandum of understanding (MoU) was signed and witnessed by the District Water Officer to ensure that the unsuspecting poor households are not overcharged. To create supply chains for the new hand pump options, fabricators were trained on rope pump production and installation in July 2012 and were linked to three hardware shops for PVC pipes and other materials for the fabrication of these rope pumps.

Lessons learnt

- It is important to align projects with government strategy to benefit from government support. This is the reason WVU was invited onto the national self supply steering committee of Uganda.
- For the private sector to engage in a market-based approach to WASH implementation, they require a mind shift to understand the concept of "bottom of the pyramid" as they promote technologies that are affordable by the rural poor. Pricing of services and products is a key marketing determinant.
- As demand increases, many private enterprises will join the rope pump fabrication business without any formal training. Forming an association of rope pump fabricators will encourage self regulation and prevent fake fabricators who will produce substandard work to damage the reputation of rope pump technology.

- The self supply approach, if used effectively either for household or communal water sources, leads to improved ownership and sustainability of the rope pump technology.
- Record keeping is very crucial in documenting success and failures. The private sector enterprises do struggle with record keeping hindering the analysis of performance of rope pump technologies.
- Introducing a technology like a rope pump will require a small subsidy mainly for installation of rope pumps as a demonstration. Subsidy should be carefully used by enterprises, only to attract demand.
- The rope pump design should not be cast in stone. The first rope pump models introduced have struggled to perform over the years. Many professionals simply criticized it for its inappropriateness as a communal hand pump; what the rope pump needed was simple alterations of design to meet the demand of its users. Technologies should be adapted to people and not the reverse.
- Introducing rope pump technology (with little support from government) should first be done at a household level and then expanded to small groups or community while seeking support from the local or national governments.

Conclusion

The technology of the rope pump is very reliable and sustainable both at household and communal level; for example all the three pump models comprising of 29 rope pumps are functional and well maintained. For communal use, stronger models have been made. Although the rope pumps need frequent maintenance, these are relatively simple activities that have been performed by the water source caretakers. Functional private sector enterprises now exist to address operations and maintenance issues. The WVU's approach to develop private sector entrepreneurs combined with self supply approach is very promising in terms of sustainability and improving access to safe water in rural areas that should be further supported.

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