Boosting rural economies and creating sustainable water supplies for the most difficult to reach

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TRANSFORMATION TOWARDS SUSTAINABLE
AND RESILIENT WASH SERVICES

Boosting rural economies and creating sustainable water supplies for the most difficult to reach

R. Haanen (Zambia) & S. Sutton (UK)

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Reaching people in sparsely populated areas is a challenge in achieving SDG6.1. The investment per person is very high using existing community approaches and equally importantly so few users per water point cannot raise enough money to maintain it. This document tries to present an answer to: 'How are we going to provide protected water sources to areas with low population density?' and 'How are we making sure these communities will be able to sustain them?' These communities present opportunities: People in sparsely populated areas have a stronger social bond and depend on rain-fed agriculture or small scale businesses for income. If water from an easily repairable pump is used to generate income and there is no confusion about ownership then evidence shows the pump is more likely to be maintained. Money is the biggest motivator. People share water for domestic use even if the pump is privately owned.

Background

The bulk of rural water supply provision in sub-Saharan Africa is based on conventional hand pumps, particularly the Afridev and the India Mk2. From a technical point of view there are two major design criteria to make sure a water point is sustainable (functional): **1. Robust design (usually Imported)** and 2. E**asy Repairability (Locally produced)**. Unfortunately these two do not necessarily go together well. Spare parts for a robust design are often relatively expensive. On the other hand, if spare parts are affordable, they might not be that robust.

The two do not need to go together, in that there are situations where a robust system is essential but others where a locally produced easily repairable system provides a more effective service.

Robust designs works well in areas with high density population where O&M costs are shared by many people. An often- used standard for community pumps is 250 users in a radius of 500m equivalent to 318 people/km². However in sub-Saharan Africa as a whole average population density is 22/km² and in Zambia it is only 12/km².

Aiming for SDG6 ("Ensure **Availability** and **Sustainable** management of **Water** and sanitation for All") with Africa's population density (see Fig.1) strongly suggests that we can't reach that goal only using robust community-owned pumps.

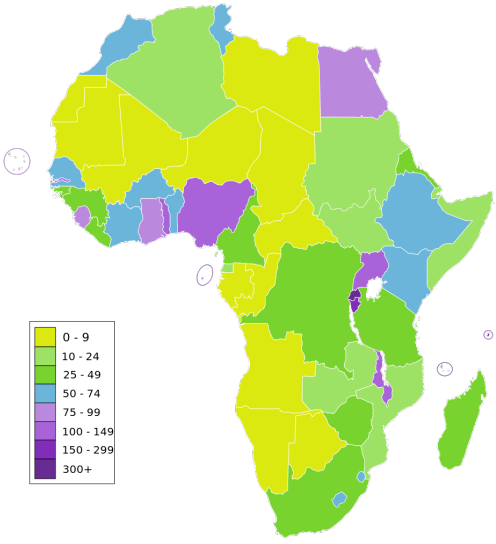

Figure 1. Population density in people/km²

Source: Wikipedia, Feb 2018

Zambia is a case in point, where, over the past 25 years the number of unserved rural people has grown by 25% (JMP 2016) but in many districts, for example Milenge (Luapula Province) a third of communities are of less than 100 people and 7% with less than 50.

The question is how is it possible to create sustainable water supplies for the numerous small isolated groups of houses (less than 15) scattered in the bush in a way that is affordable to a donor, the state and households themselves?

- How are we going to make sure they **get a protected water source**?
- How are we making sure they will be able to **sustain that source**?

This paper analyses the early stages of a project which is looking at ways to tackle this problem, and discusses the lessons learnt so far.

Theory

From a technical and economic point of view it seems more realistic to implement easy-to-repair, locally-made systems in sparsely populated areas because:

- It is difficult to find the initial investment to setup expensive robust systems for just a few people, as the unit cost remains the same as for a big community but the user numbers are far smaller, leading to very high per capita costs.
- The financial pressure for maintenance (although it may be less frequent) must be shared by just a few people.
- Spare parts and technicians for robust systems have to come from bigger villages/towns. Costs for transport and travel time will add significantly to the maintenance bill.

Nevertheless, even for an easily repairable system, money is still needed to pay for repairs even if the required amount is less. How do we make sure a little money for O&M becomes available and more important: "How do we motivate people to spent money on a water system?"

The answer to both questions is:

"Make sure water is also used to generate income."

Unfortunately this is not yet common practice. One of the reasons is that people are used to communal water supply and are seldom able to use communal water for productive use because of problems of land tenure, high demand, queuing for water and fears of wear and tear on the pump.

It doesn't mean everybody in the (small) community needs to make an income with water. Not all will have the right skill-set to be an entrepreneur.

Areas with low population density have some useful well known characteristics:

- On average people in lowly populated areas have a stronger social bond. People tend to help each other more often compared to people in larger communities.
- There are no big companies or institutions that provide jobs. People in sparsely populated areas depend largely on farming and to a small extent on other small scale businesses for income. Opportunities for business development and employment are rare.

If for example one family in a small community owns an easily repairable locally made pump and generates a consistent income with it through small scale businesses then that system will be maintained and neighbours are allowed to fetch water for their domestic use, usually for free.

Any type of small scale business that is using water is relevant; for example water vendors, livestock keepers, poultry farmers, gardeners but also those processing foods or running a guesthouse. From a risk and competition point of view it is best to have a wide diversity of water-using businesses in an area. The main point is that the supply owner has a high interest in keeping the supply working or else he will lose income. Rarely will the income be directly from selling water as the owner cannot usually ask his neighbours to pay since many of them are family, and also water is widely regarded not as a commodity but as a God-given resource for sharing. It is a brave person who asks others in their small community to pay, unless there is an obvious cost such as additional fuel needed to pump the water.

Practice

This logic was combined with experiences such as the findings of similar approaches in Nicaragua. Here a study (van der Zee et al 2002) on over 2200 households showed that having your own well increased family income by as much as a third, and adding a rope pump raises it once again by as much as 18%. Research by J.H. Alberts (2001) monitoring of 1806 households concluded that "...families with a rope pump on average generate US$225 additional annual income..." and "The income generating capacity of the rope pump has been an important reason for its acceptance and successful introduction." Seventeen years later, a visit to that area shows that most of these early rope pump adopters were able to take a next step on the water ladder (H. Holtslag press.comm 2017). Rope pump users appeared not only to understand the importance of maintenance, they also looked to move onward and upward and had a practical way of dealing with relatively complicated financial concepts like depreciation and investment.

With this lesson learned and experience in Tanzania, Jacana SMART Centre Zambia is now implementing water projects targeting small scale entrepreneurs who use water for their business. This includes both SMEs providing water services and small scale entrepreneurs who need water to run their business.

The process

The aim of Jacana is to build up enterprises which will last. This means involving not only those providing water supply services but also those businesses who will be their clients. First of all affordable pumps and borehole drilling services have to be made available in the area, to serve those who already have wells and those looking to construct new ones. Therefore Jacana SMART Centre trains experienced welders in pump and drill-set production and well diggers in manual drilling (course duration 21 days). Jacana implemented a strict monitoring system to ensure quality so that trained entrepreneurs will experience that providing quality work pays valuable dividends and taking cheap short cuts destroys business.

Figure 2. Uveren'gapi small scale farmer

Source: https://jacana.help/projects

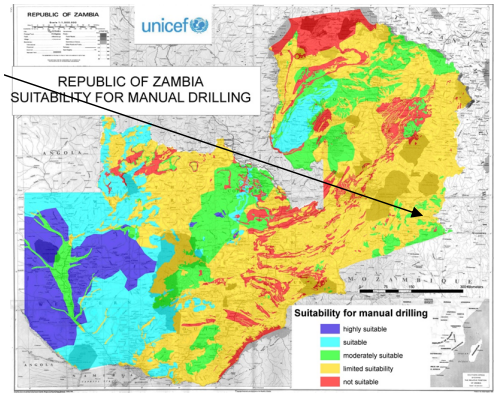

Figure 3. Suitability map for manual drilling

Source: Unicef 2011

After that it is time to go to rural communities.

- This starts with a community meeting where everybody is invited and learns the concept. In these meetings, people can experience a few easy to repair locally made pumps. Manual drillers explain their work. It is explained that the project is looking for people who have realistic small scale business ideas with water. Anybody with such an idea is invited for an interview.
- After interviews, the (somehow) realistic business ideas are separated from the un-realistic once.
- Usually funds are not sufficient to provide pumps and boreholes to everybody with a realistic business idea. But Jacana can train all of them in business skills for a few days. Participants make their own business model, cost price calculations and sometimes even their very first own financial plan. Business ideas are diverse and the Jacana trainers need some one-on-one time to work with the participants. That is why groups are kept small with only 8 to 12 people. This will also help Jacana to decide who is most motivated, willing and able to learn, shows perseverance and other entrepreneurial skills. Based on this

experience, Jacana selects the individuals who will receive a partly sponsored pump with if needed a new manually drilled borehole.

Results

In 2016 Jacana Business Empowerment moved to Eastern Zambia -an area indicated as of limited suitability for manual drilling (UNICEF 2011)- to implement its water projects and start the SMART training centre. Because the area has different types of soil formation the centre can train drillers to deal with different types of challenging conditions. If a driller can drill in Chipata he will most likely be able to drill in 80 to 90% of the country (not red coloured areas in Figure 2).

The first 8 rural drillers and 7 pump producers were trained in March 2017.

In April the trained drillers drilled at their own houses and workshops and learned a great deal more. In the next 8 months they have so far drilled 28 boreholes and installed 45 pumps (see Figure 4).

21 Boreholes and 33 pumps were partly sponsored for water using entrepreneurs.

Surprisingly quickly private individuals begun to pay the full cost (Self-supply) and already 7 boreholes ($500 each) and 13 pumps ($80 pump + $370 installation, transport, ...) have been purchased directly from the trained entrepreneurs within the first 8 month. The number of Self-supply pumps will continue to grow even when projects end since it is fully independent from donors, and largely involves face to face promotion. This widens the opportunity for people to see the options available and to get face to face explanation of the advantages and disadvantages found by owners and the process to follow. It offers the strongest channel for marketing, if the contractor has done a good job.

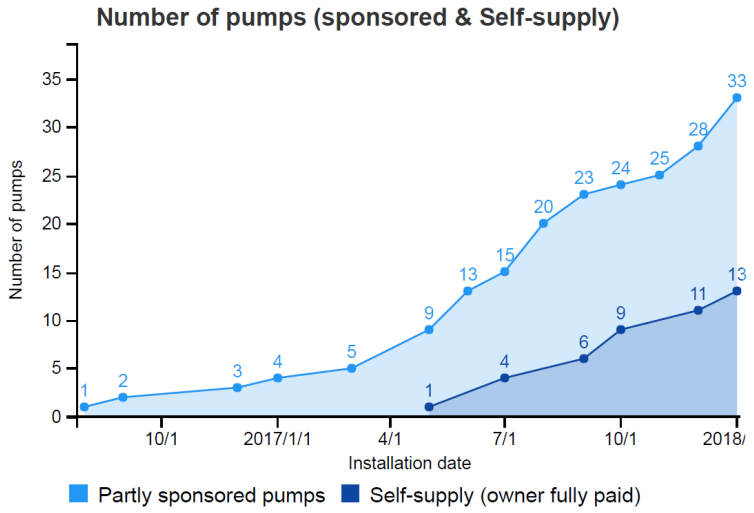

Figure 4. Partly sponsored - Fully owner paid (Self-supply) pumps

Source: Monitoring data https://jacana.help/mwater 2018

Although all these pumps and boreholes are privately owned, 82.2% (of both partly sponsored and Self-supply) are used by more than 1 family.

Table 1 shows how partly sponsored (Jacana project) and Self-supply private pumps differ in type of use and how many households are served by them.

Unfortunately, it is a bit early to say a lot about long term sustainability in Zambia since the programme is young. Although all pumps are functioning and except one pump from a chairman all partly sponsored pumps generate income. Water point mapping results in Tanzania (more than 5000 pumps in 2011) showed that easily repairable pumps scored much higher in functionality, even after 5 years. These were all community-owned which creates many problems private ownership avoids. Combining easily repairable technology with private

ownership and the added stimulus of loss of income with pump breakdown implies even higher levels of sustainability.

Table 1. Use of private pumps

	Pumps					Households served	
	Total	Generating income		Domestic use		Total	Average / pump
Partly sponsored	33	32	97%	33	100%	348	10.5
Self-supply	13	4	31%	13	100%	35	2.7
Total	46	36		44		383	

Data is constantly collected & published. Have a look at https://jacana.help/mwater for the latest update.

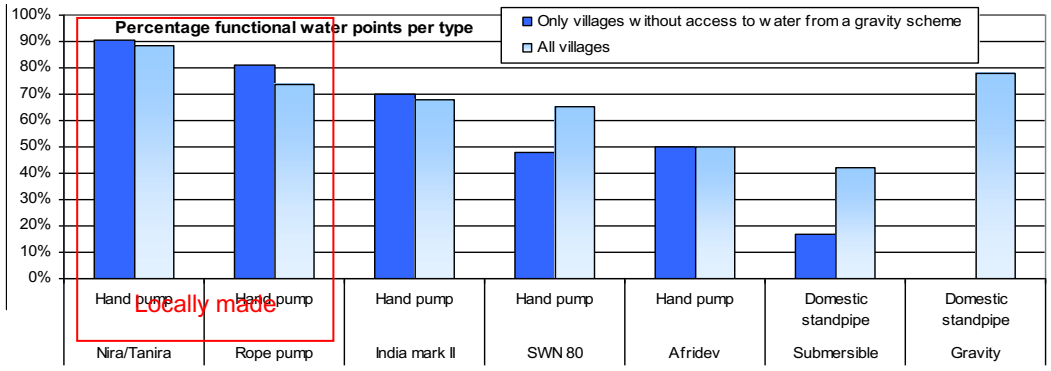

Figure 5. Functionality rate per pump type

Source: Water point mapping Iringa, Tanzania Water department 2011

Indicative costs

Of course cost varies from place to place and from situation to situation. Here is some experience from Jacana SMART Centre just to give some indication:

Initial phase including training and guidance of water providing-entrepreneurs and setting up a monitoring system costs $ 105,967.

Selecting beneficiaries including meetings, interviews, business training and onsite inspection cost $ 248 per selected family.

- Each locally produced pump $ 80 or less depending on the type of pump, donor pays max $ 72(*).
- Pump installation $ 370, donor pays $ 333(*).
- Deepening of a well when needed $ 200, donor pays $ 180(*).
- Drilling a new borehole when needed $ 500, donor pays $ 450(*).
- These include everything: labour, materials, transport and depreciation of tools.

(*) Beneficiary pays 10% contribution for production, installation and drilling costs.

Plus about 10% project overhead.

Average repair cost for the owner is between USD 10 to USD 20 per year, which is covered many times over by his/her increase in income.

Table 2 sets out the cost calculation for 7500 people in a sparsely populated area, allowing for high mobilisation and transport costs.

At $35 per head, for a small community of 50 to 100 people, this approach is far cheaper than the $- 370-180 respectively it would cost for a conventional imported pump and community supply (see Fig 6).

Table 2. Project cost estimate for 7500 people in USD

Phase	Unit cost	Quantity	Total
Initial	105,967	1	105,967
Selection phase	248	150	37,200
Pump	72	150	10,800
Installation	333	150	49,950
Well deepening	180	50	9,000
New borehole	450	50	22,500
Overhead (10%)			23,542
		Total	**258,958**

Table 3. Output, quantity, project costs

Output	Quantity	Project cost per ...
Pumps	150	1,726.39 / pump
Beneficiaries	7500	34.53 / user

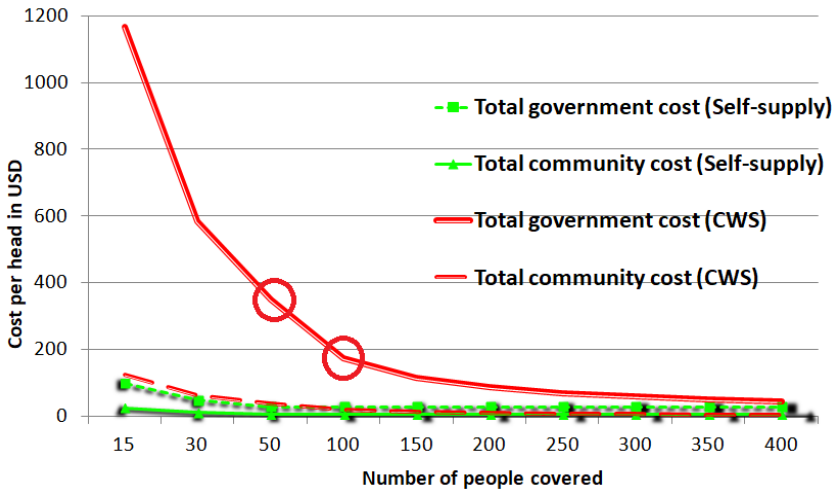

Figure 6. Cost per user of common pumps versus the number of users

Source: UNICEF/SKAT 2015

Conclusion

If we dare to change our approach in water supply, we might be able to reach SDG6.1 (even in sparsely populated area) for a fraction of the cost of the conventional approach.

Keeping in mind that with the suggested method we are not only providing water but also income and the project money is not used to buy foreign pumps, this money is also injected into the rural economy of the target area.

It is still early days in the life of the project and also in developing the potential of the approach. However the first phase has established well-trained artisans eager to make a living from providing support services to both those wanting to generate income from water and those wanting water for domestic purposes. Combining the development of expertise in low cost water supply with that of other businesses which depend on water seems to be generating good demand. It is also providing water supplies with high potential for sustainability to communities where conventional community supplies are neither cost effective nor sustainable, and doing so at a fraction of the per capita cost. This combination is an approach with wider application, and one which can invigorate rural economies in areas hardest to reach and in which it is most difficult to provide a reliable service. However it is not an instant fix and requires time to develop. Jacana plans to provide the necessary support and monitor the results to ensure maximum sustainability but also to analyse the lessons learnt in an approach which has much to offer for universal access and SGD6.1.

Figure 7. James small scale farmer

Source: https://jacana.help/projects

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Contact details

Eng. Rik Haanen is currently managing the Jacana SMART Centre Zambia and has managed the SHIPO SMART Centre in Tanzania between 2008 and 2011.
Dr Sally Sutton is a consultant in conventional rural water supply and sanitation, but also with special interest in self-financed water supply in Africa and the Middle East.

Rik Haanen
Moth Extension, Chipata, Zambia.
Tel: +260-967586588
Email: rik.haanen@jacana.help

Dr. Sally Sutton
Shrewsbury UK
Email: sesutton17@gmail.com