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Topic: Service delivery systems in Africa.

Title: Subsidized self-supply / farm wells
A promising service delivery model for rural Africa. The case of Zambia

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Target audience: Policymakers, Local and national governments. NGOs

Proposition;
To reach SDG6.1 in rural Sub Saharan Africa it is more cost-effective to subsidize farm wells that serve 50 people than subsidize communal wells that serve of 250 people.

Context
Some 80% of the SDG6.1 target group in Sub Saharan Africa live in rural areas (UNICEF 2021). Water points in these areas often consist of a machine drilled borehole and an imported handpump or solar pump and cost $2500 to $7500 or more. Systems with handpumps are supposed to serve 250 people so the investment cost per capita (Capex) is $10 - $30. The average population density in rural areas in most countries in Africa including Zambia is 10 to 50 people per square km. To even get a basic service (an improved water source at less than 500 metre from home) for communities of 50 people with the machine drilled wells and imported pumps would cost $50 -$150 per person for the Capex (Sutton. 2021).

The Capex (borehole & pump) of almost all rural water systems in rural Africa is subsidized by an NGO and /or Government. The community is supposed to pay for maintenance and future repairs but many of the communal pumps in Africa are not functioning often due to lack of funds for repairs and replacement. Due to the high Capex cost to serve small rural communities NGOs, Donors and government hardly install systems for small communities.

A promising approach to reach part of the SDG6.1 target group is subsidizing farm wells. An example. The Jacana SMART Centre in Eastern Zambia trains local entrepreneurs in manual drilling of boreholes and the production of rope pumps and small solar pump. These systems cost $800 to $1200/site (excl. the cost of selection, monitoring, etc.).
Jacana seeks funds from a donor and then subcontracts trained drillers to install relatively small boreholes (20- 38 m deep) and rope pumps in so called "show case areas" at the premises of one family. These families help with drilling, feed the drillers and pay a small amount in cash. The remainder is subsidized with donor funds. The selection of the families who will receive a well at premises is a simplified business plan showing the water will generate income. In Zambia over 400 wells were drilled with the so called SHIPO manual drilling method and equipped with locally produced rope pumps. The wells were made in areas where many said that manual drilling was difficult but with technical improvements it was possible to drill these wells.

The experience is that families with a well share water (for domestic use) with neighbours, as a result on average these systems serve 50 people with water for domestic use and 6 people with increased food security and income, which is usually the household where the well was drilled (IRC. 2022). The Capex of this approach is $20 - $25 / person, similar to the Capex of larger machine drilled boreholes with imported hand pumps for 250 people.

[1] https://www.ircwash.org/all-systems-go-africa
[2] The presentation can be downloaded from: http://smartcentregroup.com/wp-content/

Gewijzigde veldcode

Concerns
There are concerns with farm wells like:
1. Water quality;
Is water from farm wells safe and who will monitor the water quality?
2. Depletion of groundwater
What will happen if many or even all farmers in Africa will have their own well. Will groundwater not be depleted like in parts of India?

Regarding point 1
In Zambia the farm wells are drilled with similar quality norms as larger boreholes so there is a good hygienic seal and wells are installed as far as possible from latrines. Water from 15 - 30 m deep in general is safe to drink. In case there is doubt the SMART Centre strongly advises point of use treatment like Chlorine, Boiling or Household water filters. In general filters are most effective due to consistent use (Wolf. 2018). In case of presence of chemicals like fluoride in the groundwater an option is to store 1000 litre or more of rainwater and use a treatment option to make sure it is safe to drink, the water from the well can then be used for other (domestic) purposes.

Regarding point 2
In general farm wells are small and will only extract 1 to 8 cubic meters per day. Many small wells have less impact on lowering water tables than fewer large wells.
Another action planned is that farmers learn about “the water balance”. No more water can be pumped out than goes in somewhere. There is a range of relatively low cost infiltration options including, contour bunds, Vetiver plants or Tube recharge. The latter costs $10 in materials, can be made by families and can recharge 100 to 200 cubic meters /year and avoids for shallow wells dry up. Another option is Deep Bed Farming as practised and promoted by Tiyeni in Malawi. This option can infiltrate all water that falls on the farm land. The impact is increased yields of rain fed crops like maize but also the eventual recharge of shallow groundwater levels. Over 20.000 farmers use this concept and the Malawian government wants to scale it up to national level. See www.tiyeni.org.

Results
1. Sharing;
   Experience in 5 years is that families with a well share water for domestic use with others (av. 50 people/well) so family owned becomes community served.
2. Low cost;
   With a Capex of around $25/cap the cost for a donor is the same as machine drilled well & imported hand or solar pump for larger communities of 250 people.
3. Maintenance:
   This approach solves the “eternal headache” of pump maintenance. A recent evaluation of the SMART approach by IRC indicated that > 90% of family owned pumps were functioning. Reasons include clear ownership, convenience for the family that has the well and increased income with water for productive uses (livestock, garden irrigation, construction, etc.)
4. Self-supply;
   In Zambia the 400 subsidized low cost farm wells created a market for full self-supply and over 130 families already invested in wells and or pumps for 100% themselves.

A relative new development is small solar pumps. Jacana imports solar pumps from China and trains pump producers in assembly with locally bought solar panels, electric cables and hoses. The cost of a complete solar pump system for open wells or boreholes is $200 - $500

depending on pump size and number of pumps and panels. Pump volumes range from 1 to 8 cubic meters per day with a pump head of 10 metre.

Impact
This approach has impact on several water related SDGs including;

- **SDG6.1 for yet unserved**
  400 farm wells serve 20.000 people (improved water source <10 minutes from home).
- **SDG1 and 2, Food & income**
  Family with the pump increase food security & income. Replacing a rope and bucket with a hand pump increases family incomes by $225/yr (Alberts 2003 in Briemberg 2022).
- **SDG3. Gender**
  Less or no need to walk to communal wells so time saving and safety for women/ girls.
- **SDG8. Employment**
- **SDG13. Climate adaptation**
  The combination of infiltration of rain water like “Deep Bed Farming”, Tube recharge etc. with low cost wells and pumps has much potential that also small farmers can adapt to climate change and have a sustainable water supply.

Conclusions;
Subsidizing farm wells have;

1. Much potential to reach part of the SDG6.1 target group, the yet unserved in rural areas. In many cases this is possible with the same subsidy ($25/cap.) as subsidized communal supply
2. Impact on SDG 1, 2, 3 and 8 (Poverty, Food, Gender, Employment,..)
3. Potential to be applied in an estimated 50% of the areas in Sub-Saharan Africa with similar hydrogeology conditions as Zambia (areas without rocks).

Recommendations:

1. Drillability maps
   For each country, maps for “suitability of manual drilling” like UNICEF Zambia.
2. Select best technologies
   Compare different options for best, most cost-effective, market-based options fit for the local situation. Also taking in mind the best options for small businesses.
3. Create awareness with demonstration
   Install real functioning options in demonstration plots in each country or even better in each region. This can be done in Centres of Excellence for water and /or agriculture. An example are WET centres by CAWST or SMART Centres by MetaMeta.
4. Enabling environment;
   Regulation, payment systems, subsidies for unserved,…
5. Build local capacity.
   Invest in South-south exchange on best technologies and approaches. Large scale invest in the 3 Ts. Training, T…...…, T……Training Simple, Market based, Affordable, Repairable Technologies

Take away
Reach water, food and poverty SDGs in Africa? Think about shifts
A shift from;

- Water for drinking/domestic use to also… productive use; food & income
- Community Based Management to also… Family Based Management

- Imported Hi-tech to also… …… locally produced Lower tech

Key is sustainable access to groundwater so a combination of rainwater infiltration + low-cost wells & low cost pumps

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