Course – WASH Technologies for Self-supply

Period: 6 to 24th of September
Organisers; CCAP SMART Centre, EMAS International, SMART Centre Group

Context
Many people in rural areas in Malawi and other countries do not yet have "basic water service", so an improved water source within 15 minutes walking one way (SDG6.1). Of the handpumps for rural water supply some 30% is not functioning for several reasons. Other challenges include food security and poverty in rural areas. A way to improve this situation are **family water systems**. Some 50% of the rural families in Malawi live where geology permits manual drilling.

- Mzuzu drill, can go to 20 m deep in relatively hard layers
- EMAS drill, can go to 50 m deep in softer layers

Rainwater can be stored in EMAS underground tanks made with 5-6 bags of cement.
To make sure water for drinking is safe, it is strongly recommended to combine self-supply with a good quality household water filter.

Family water systems can serve 2 groups

1. **The target group of SDG6.1.** Rural families without basic water service. This group can do pump maintenance but in general are poor and need a subsidy for CAPEX (investment cost of borehole and pump). Subsidies needed are 20-30US$. This is similar to subsidies /capita of people who already have a communal water supply with a machine drilled borehole and an (imported) hand or solar or electric pump.
2. **Medium income families.** Families in peri urban and rural areas who can pay for a well themselves, so self-supply.

Family water systems have many advantages compared to communal systems, like;

1. **Family owned pumps serve small communities.** Experiences in Zambia indicate that families who have a well share water with 10 to 50 other people so "family owned becomes community served". See also https://www.smartcentrezambia.com/mwater/
2. **CAPEX as low as 20 - 30 US$/capita.** If SMARTechs are used. This is similar to the subsidies for communal rural water systems
3. **Maintenance is guaranteed.** Ownership is clear, families have the convenience of a pump nearby and income so money for repairs. Cost of maintenance of pumps is 5 to 20US$ yr. Experience is that functionality of family owned pumps is over 95%
4. **Increased food security and income**. Family pumps are often used for chickens, goats, fruit trees, vegetables etc. In short family systems gives rural development.
5. **More safety for women and girls**. Walking distance to the water source is minimum

Training
With this context in mind a training in Malawi was organized and 15 technicians, entrepreneurs and program officers participated including participants from Zambia, Tanzania and Kenya. The training in the EMAS options was realized by Mr. Wolfgang Buchner and materials were supported by the EMAS foundation.

Training in other technologies was realized by James Mhango, manager of the SMART centre and Henk Holtslag, advisor of the SMART Centre group. The training in the VES technologies was realized by Mr. Phiri via the SMART Centre Zambia. A conclusion was that EMAS and other options can realize family water systems. 1 time cost 20 - 30 US$/person
An indication of cost of a 12 m borehole with;
- a casing of 1.5 inch and an EMAS pump ca 150 US$
- a casing of 2 inch and a rope pump model 4 ca 200 US$
- a casing of 2 inch and a small solar pump ca 300 US$

Week 1
Had a focus on hands on training in the EMAS technologies especially construction of the drill set and 2 EMAS pump models, the EMAS drilling and other EMAS technologies like the EMAS underground tank and the wash basin and 80 litre storage tank

Week 2
This week included finishing the EMAS technologies and the demonstration of the Mzuzu drilling, the Rope pump model 3 and 4. A new technology was VES; an option for site selection before drilling. With a good VES test the risk of a failed borehole can reduce by 50% or more. Other technologies (SMARTechs) included;

- **Tube recharge;** A household level technology to recharge wells that dry up
- **Wire-brick cement tanks**; Storage tanks with bricks, wire, cost 20-25US$/cubic mtr
- **EMAS underground tank**s; Storage tanks made with 0.7 bag cement / cubic metre
- **Underlining and tube bailing**. Deepening hand dug wells without collapsing
- **Solar pumps**. Brushless pumps Cost 35 and 90 US$ excl. panel
- **Household water filters. R**emove 99.9% of all pathogens. Cost 12 - 20 US$
- **Satopan latrines;** Latrines with a closed outlet, no smell. Cost 8 US$
- **VES;** Vertical Electric System; Site selection of boreholes to reduce failures in drilling

Open day
To demonstrate the several technologies and discuss the potential of water supply at family level an open day was organized on 29 of September were 18 people participated from church organisations, NGOs and local water board. There was a PP with all technologies and a discussion on the proposition; "*For rural development, it is more cost-effective to invest in family water systems than in communal water systems*".

CCAP SMART Centre
To build supply chains of affordable WASH technologies, CCAP with support of the SMART Centre Group started a SMART Centre in Mzuzu in 2011. Activities include selecting cost-effective technologies, training technicians and entrepreneurs in technical and business skills and demonstration of SMARTechs. Info; www.smartcentremalawi.com

The CCAP SMART Centre in Malawi where trainings took place

Pictures of the training

Opening by the general secretary of the CCAP

Training in the EMAS drill

All parts of an EMAS drill set

Drilling a borehole, 5 metres per hour

Preparing a filter screen

Installation of the casing pipe, 1.5 inch (40mm)

	
Installation of an EMAS pump in a borehole of 20 metres deep. Time needed 5 minutes	The standard EMAS pump
	
EMAS pump with foot pedal	EMAS storage tanks of 80 litres and wash basin
	
Mzuzu drill set	Drilling with the Mzuzu drill

Rope pumps model 4 installed on a borehole of 2 inch (60 mm)

Training in water storage tanks, Calabash, Wire brick and EMAS underground tank.

Training in the VES method

Training in the construction of a Tube recharge system.

Participants of the training

Open day on September 29.

Annex

Family water systems

Convenience, safety, income, food, water and employment

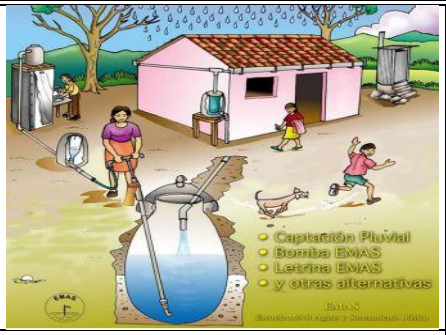
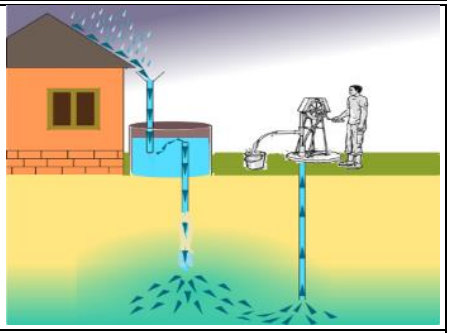
Context

Over 1 billion people worldwide in both developed and developing countries have self-supply.(Sutton 2021) and a large part of this are farm water systems, mostly wells, funded by farmers themselves (self-supply). A range of technologies that are affordable and so are fit for self-supply and farms are called **SMARTechs,** being **S**imple, **M**arket-based, **A**ffordable, **R**epairable **T**echnologies. Examples are underground rainwater storage tanks, ground water tube recharge, hand drilled wells, locally produced hand pumps, handwash tools, household water filters, innovative latrines etc. Depending on the depth, geology, casing, pump type the cost of a hand drilled well and pump ranges from $100-500. For example an EMAS or Rope pump on an existing well cost $60-120. An EMAS drilled borehole of 10-50 metre deep cost $10/mtr. so for 20 m deep cost $200, incl pumps. If water is pumped from shallow wells it is strongly recommended to use a household filter to make sure water used for drinking is safe. Cost of water filter; $20-50. Material cost of a latrine with a SaTopan can start from $10. All options need training of the local private sector in technical and business skills.

Water at premises has impacts and effects like:

- **SDG 1 & SDG 2, income & food**. With livestock, irrigation, fish etc.
- **SDG 6, WASH**. Water at or near the house is convenience for women. More water = more hygiene. 1 family shares with average 50 people so “Family owned becomes Community served. High functionality; clear ownership, families repair the pump.
- **SDG 8, employment.** Drillers, pump producers, farmers, others**.**

Affordable technologies for families

		
Wire brick cement tanks. Material; wire, bricks, cement. Volumes 1 to 50 Cubic metre Cost materials; $20-40/ c.metre	**EMAS underground tank** Egg shape hole of 7000 litres plastered with cement Cost materials; $100-200	**Tube recharge.** Prevents dry wells. Can recharge 100 -500 cubic meters /yr. Cost materials; $10-50
		
Water from open wells Can be improved with a well cover and hand pump	**Well cover & hand pump** Cost materials; $100-200	**Tube bailer** Technology to make existing wells deeper Cost mat.$20-100

		
Mzuzu manual drilling Soft, medium hard geology Casings, 1.5 - 4 inch Depth; 5- 25 m. Users can drill Cost materials/well; $50 - 200	**EMAS, manual drilling** Soft geology Casings 1.5 - 3 Inch Depth; 10- 50 mtr. Skilled drillers .Cost; $10/mrt	**SHIPO manual drilling** Soft, medium hard geology Casings 1.5- 4 inch Depth; 0-50 m. Skilled drillers Cost/well; $400 -1000
		
EMAS pump. Pump depth max 40 m deep. Can pump up to 30m high. Cost/pump $ 40-80	**Rope pump model 4.** Models, for hand dug. hand drilled wells. Cost/pump $ 60 - 120	**Solar pumps 12-24 VDC** Pump head 5 - 30 m Pump volume 15 - 5 l/min Cost pump+panel $100 – 300
		
Table top filter, cer. elem. Water from shallow wells should be treated. Options like Nazava, Tulip, Cost; $15-40	**Table top filter, membrane element** Aqua clara, Cost; $30-40	**Membrane filter** Options like Sawyer, Business connect, Tulip Cost; $25-40
		
Latrines. SaTo pan several models. Cost $10 - 40	**Irrigation of cash crops.** Here 1000 m2, irrigated by 1 family and a Rope pump. Yearly extra income; $ 100 – 1000	**Simple is not easy**. SMART Centres train / coach the local private sector. Guarantee quality. Build supply chains.