Increase climate resilience in Africa with water buffering and the SMART approach

The SMART Centre Group
Training the local private sector in Simple, Market based, Affordable and Repairable Technologies

Examples from Nicaragua and Tanzania

Challenges in Africa and other continents include;

1. Increase resilience to climate change in rural areas
2. Reduce poverty, increase food security
3. Reach SDG6 in small communities, "*The last mile*"
4. Create employment for youth

Water buffering

One effect of climate change is irregular rains so it is key to buffer rainwater. A very cost-effective option is storing water in the ground. There are several concepts for buffering including 3R (Recharge, Retention, Reuse) as promoted by organisations like Acacia, Aqua for All, MetaMeta and Rain foundation. See https://www.acaciawater.com and https://bebuffered.com. Other concepts include *"Green Roads for Water"*, "*Spate irrigation*", "*Justdiggit*" and "*Sponge Cities*". An option that can be applied at the household level is the "*Tube Recharge*" that can recharge shallow aquifers. Depending on the size of the system, this system can yearly store 50 to 500 cubic meters of rain water in the ground and through this avoid that hand dug or drilled wells dry up. The cost of a Tube recharge system is $10 - $20 for materials and labour. After a short training families can construct one by themselves.

The SMART approach

The Tube recharge is one of the so called SMARTechs (Simple, Market based, Affordable, Repairable Technologies). Other examples are manual well drilling techniques like Rotary jetting, SHIPO or Mzuzu drill, hand pumps like Rope and EMAS pumps, wire-brick rainwater tanks, corbelled latrines, household water filters. Drill sets and handpumps can be produced locally which can reduce cost by 70% or more compared to imported drill and pump technologies. The SMART approach combines SMARTechs with innovative approaches like "*Self-supply"* and "*Family Based Management"*, where families own the pump, "*Farm well clubs*" where farmers themselves drill wells, "WASH training for faith leaders", and household water filters. Dissemination goes via so called SMART Centres, being knowledge centres that train local technicians and entrepreneurs in technical and business skills. Besides impact on income, food and water, this approach also creates employment for well drillers, pump producers and masons. Each well used for livestock, irrigation, car washing, etc., generates work for 1 to 3 people. Some trained entrepreneurs have drilled 300 - 1000 wells in the past 10 years. There are established SMART Centres in Tanzania, Malawi, Zambia and Mozambique and starting in 6 other countries.

Farm wells, the water ladder

A key for rural development are farm wells. In the period 1850-1950 basically all farms in Europe and USA had their own well and a handpump. For example over 45 million handpumps were sold in the USA. Depending on geology and depth of aquifers, wells were hand dug or drilled by hand or machines. The water was for domestic use but also for watering of cattle and garden irrigation. With the economic development farmers replaced the handpump by an engine pump, wind mill and more recently with solar pumps, also for irrigation. The same logic goes for developing countries.

The example of Nicaragua

An example of impact of a SMARTech is Nicaragua. Here a "smart" hand pump (the Rope pump) was introduced in 1985. It was technically improved, made into a commercial product and was produced by small local companies who were trained and coached by development workers who also assisted

with first marketing. By the year 2000 there were some 70.000 pumps installed. The cost of a pump and installation was $120 - $250 depending on transport, and combination with a well cover.
Some 20.000 of pumps were installed on hand dug wells or boreholes for communal supply. Over 50.000 were for household used in the patio and farm wells mostly on hand dug wells.
Out of these 50.000 some 20.000 pumps were supported by NGOs ("If you make a well we give a pump"). A survey in 2000 by the Upoli university at 4716 farms indicated that a well in the patio drastically increased incomes and if combined with a Rope pump increase was on average $225/yr
By 2020 the total increased incomes (20 yrs x 50.000 fam. x $225/yr x 70%) were >**$150 Million**
The donor investment for training, marketing and other cost was about **$ 2 Million**
The investment of NGOs who subsidized pumps was 20.000 x $250/pump **$ 5 million**
So the impact after 20 years was > $ 150 Million for an investment of $ 7 million!
The impact on employment was ca **50 people in pump production** but work for **40.000-50.000 people** in productive use of water like water for cattle, patio irrigation, etc. This effect was a result of a popular and locally produced handpump, long term training and support of donors.

The example of Tanzania
A similar development started here. The Rope pump and manual drilling were introduced in 2005. The SHIPO SMART Centre trained technicians and well drillers, pump producers and entrepreneurs. By 2020 there were an estimated 13.000 Rope pumps of which some 3000 for communal wells (subsidized by NGOs) and 10.000 for family wells mostly paid for by families themselves (self-supply) and used for domestic purposes, animal watering and small scale irrigation. The total donor investment was ca $1.5 Million mostly in training and subsidized communal wells. One impact is that about 200 young people have a (parttime) job in pump production etc. but also ca 5000 people, often (young) women work in productive uses of water. Over time this last number will increase. Local production guarantees availability of both knowledge and spare parts, essential for sustainability. The low cost of SMARTechs make them also affordable for families and small farmers.

Conclusions
1. The combination of 3R & SMART approach has much potential to increase Climate resilience and contribute to water related SDGs for rural poverty, food, health and employment.
2. A farm well / pump is key for rural development.

Recommendations
1. **Large scale building of local capacity in innovations in water and agriculture.**
   For instance a South-south exchange of failures and best practices
   New proven technologies in one country are often unknown in another so support south-south exchange on smart water options and farm technologies.
2. **WASH/ Agri knowledge centres in each country, each region**
   Include knowledge in national education systems like universities, vocational schools. Create centres of excellence with training capacity and demonstration of innovations so Government, NGOs, farmers can choose what fits them. Examples are WET Centres and SMART Centres in 10 countries.
3. **Improve supply chains of market based and affordable water and farm technologies.**
   Train artisans in the local production of water technologies and entrepreneurs in business skills. Train farmers in harvesting, soil conservation, rodent control, chicken breeding.
4. **Create demand and support self-supply, farm wells**
   Stimulate that farm /rural families invest themselves in a sustainable water source by demonstration in "show case areas" with real functioning technologies support part of the cost like in Nicaragua. Aim at "a well on each farm"

Information on buffering, 3R , Green roads for water etc. www.metameta.nl
Information on SMART approach; www.smartcentregroup.com
Example of training welldrillers, Farm wells, Tube recharge; www.smartcentrezambia.com