Solar-powered irrigation:
Food security in Kenya's drought areas

Droughts in East Africa, spring 2017 - what to do?

Drought catastrophes due to outage or low crops occur regularly in East Africa and have a variety of causes. Some of them cannot be influenced by the Stiftung Solarenergie - Solar Energy Foundation, such as political conflicts, climate phenomena or food speculation from international corporations.

However, using solar energy, the risk of drought disasters can be alleviated by improving the yields of crops through the use of solar water pumps for irrigation. Solar water pumps allow a permanent, regular and adequate irrigation of the fields, especially for small farmers fields.

March 2017 in East Africa

Farm, irrigated by a solar pump

Background and context

Small-scale farming is largely rain-fed, thus highly vulnerable to climate-change related challenges e.g. unreliable rainfall and frequent episodes of drought. Within the context of ever-growing climatic variability in sub-Sahara Africa, heavy reliance on rain-fed agriculture results in low yields, not to mention even lower and highly unpredictable income streams for a typical small-scale farmer in rural Kenya.

Moreover, the lack of access to reliable and affordable energy services means that for a typical small-scale farmer, farming is a manual and laborious activity with limited opportunities for improving efficiency, value-addition and achieving scale; attributes essential for transforming scale-scale farming into a viable and sustainable agribusiness in rural Africa.

Target group:

In April 2017 already 23 of the 47 districts in Kenya are affected by the drought! Our project is directed at those farmers, who are currently suffering particularly from the ongoing drought and are in an often desperate struggle for survival.

For these small farmers, the coming harvests are crucial to rebuild their livelihoods. We offer them individual help. Fortunately the Stiftung Solarenergie - Solar Energy Foundation has experienced local partners in rural areas of Kenya who can ensure the implementation of the project.

Selected product:

After thorough research and a wide range of practical tests, we decided to use the product SF1 from Futurepump (UK / India).

The SF1 has three main parts: the PV panel, an 80W solar panel to convert sunlight into electrical energy; the motor, a specially designed DC motor to use the electrical energy to turn the flywheel; and the pump, a reciprocal piston pump to draw water out of a well, river or lake.

The SF1 can lift over 12,000 litres of water a day, with best performance at low pumping heads, and slower flow rates with increasing head. A manual switch allows for pumping early in the morning and late in the day.

Designed by British engineers and produced in India, the pump has been specially designed for irrigation of small and medium areas. It has been successfully implemented in Kenya for several years (see appendix). Our local technicians in Kenya have also successfully tested it.

Funding by Revolving Fund:

As a result of the drought, the farmers have no way of paying the pumps in advance. The foundation provide farmers in this emergency situation financing by means of a revolving fund. The principle of the Revolving Fund has been successfully implemented by the Foundation in several countries in East Africa since 2013 in the field of solar power supply for households. The principle is simple:

- The Stiftung Solarenergie - Solar Energy Foundation finances the acquisition costs of the water pump and also provides training for the farmers for the best possible use of the solar water pump.
- The farmers pay for the pump in instalments, which are paid following the annual crops (depending on the cultivation 2-4).
- As soon as the pump has been paid, it will become the property of the farmer.
- The funds from the instalments are used by the Stiftung Solarenergie - Solar Energy Foundation to import additional pumps and provide new farmers with an improved harvest.

In this project, the foundation assumes the pre-financing of the pump as well as the credit risk. In addition, with its local partners, it ensures that the decisive conditions for optimal operation are also met. These include in particular:

1. Installation of the pump by local qualified personnel
2. Training of the farmers in efficient use
3. Maintenance and service on site, including stock of spare parts.

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APPENDIX: Customer case studies (Kenya)

Lillian Ogindi is a typical small-scale farmer in Western Kenya. For most of her life, Lilian's small-scale farming has been labour-intensive, using buckets to irrigate two acres of her four-and-a-half-acre farm. She was hiring three people twice a week to do the work and watering on the farm. The costs added up to 1,200 KES ($12) a week. Despite the high costs of labour, this was, in her assessment, still cheaper than using a petrol pump, especially during prolonged droughts.

To her delight, has recently acquired a solar powered irrigation pump and two sprinklers. Even before she has made any harvest, she is excited the pump is already making a big difference in her farming operations. "First of all, I save 1,200 KES ($12) per week because the pump is portable and I don't need to hire any labour," a relaxed Lilian notes with a smile on her face. Apart from the immediate savings on labour, Lilian reckons the real transformation will come from the flexibility to define and schedule her planting and harvesting timelines independent of the highly erratic rainfall seasons but dependent on the market demands for her crops such as green maize, watermelon, tomato and kale. She concludes "in this farming business, proper timing is absolutely essential to align with the best prices in the market. It is impossible to achieve this if one is fully dependent on the rains. But with a solar pump, I can now plan and exercise good control of when I plant and harvest to maximize my returns."

Bob Ouma in Ndiwha, Western Kenya started irrigating previously redundant land which had been too wet in the rainy season and too dry in the dry season. Now he uses his Solar pump to pump water from the adjacent river to irrigate kale (0.2 acre) and maize (0.25) in the dry season. He sold approximately 70% of the kale for around 30,000 KES ($300) in the market. Fresh, 'green' maize can fetch 100 KES ($1)/10 cobs, compared to 40 KES ($0.4)/10 cobs of stored up dry maize. By irrigating, Bob can supply green maize to the market during dry season, earning an extra 12,000 KES ($120) for his crop.

James Macklago farms a one-acre plot in Homa Bay, his main crop is banana, but he also grows some papaya and maize. For years James relied on rainfall or a petrol pump to irrigate his crops. Last year his yields were poor due to a drought, and then early March rains ruined the remaining plants. Before he bought the Solar pump, his petrol pump cost him 600 KES ($6) a week in fuel, every week. When James sells his produce, papaya can earn 2000 KES ($20) per month and bananas by the bunch can give him 500 to 600 KES ($5-$6) un-ripened, 700 to 800 KES ($7-$8) ripened.

Jacob Minudi lives in a remote area, far away from electricity and fuel sources, so cannot rely on a fuel pump for irrigation. As farming is his fulltime job, he has a lot of work to do, so he wanted something to make at least the irrigation work easier. In addition, he wanted to grow tomatoes and cabbages all the time and not have to wait for the rain to come. He decided to buy a solar pump and 3 sprinklers. He currently uses them 3 times a week to water his tree nursery or kales vegetables. As the pump is irrigating, he has the time and freedom to attend to other activities. One mature, he reckons he will earn roughly $6,500 from his tree crops and vegetables.

(Credit for the photos and case studies: FuturePump Kenya)