Introducing Solar Water Pumps to Female Farmers in India

Today, 20% of the world’s population lack access to electricity. Most of them live in developing countries and rural areas (web.worldbank.org).

In non-electrified and poorly electrified regions, renewable energy and especially solar technology offer a particularly great potential.

Harnessing Solar Energy for Irrigation

The critical issue in rural areas is affordable water availability for crop production during the dry season. Manually-operated pumps and treadle pumps (Fig. 1) are extremely labour-intensive and diesel is expensive.

![Fig. 1. Manually-operated pump (left) and treadle pump (right).](image)

Where villages are connected to the grid, electric water pumps are used, but grid electricity is often unreliable. Photovoltaic water pump systems offer an advantage as they use sunlight as the major energy source.

To Make it Work, Make it a Business

A small power (40W-120W) photovoltaic pump system was developed at Bern University of Applied Sciences (BFH) in Switzerland. Operational field-tests of the prototype pump were carried out in 2012 with a female farmers’ association at Mulanthuruthy, Kerala, India (Fig. 2).

![Fig. 2. Field tests with female farmers at Mulanthuruthy in 2012.](image)

User’s feedback triggered a system’s upgrade of the pump with an infrared communication interface for “pay-per-liter” and microfinance options.

The photovoltaic water pump system was updated and extensively simulated in the laboratories (Fig. 3).

![Fig. 3. System’s efficiency and links between pumping height, water flow rate and solar module power.](image)

In a new test bench (Fig. 4), the pumps are now measured according to Swiss standard EN 62253. Of particular interest are the power as a function of flow rate at a constant pump height and the start-up power.

![Fig. 4. Test bench for photovoltaic water pump measurements.](image)

The photovoltaic water pump system of BFH is now at production stage and manufactured by an ISO 9001-2008 certified solar panel company in Bangalore, India (Fig. 5).

![Fig. 5. Local manufacturer in Bangalore, Karnataka, India.](image)

Female Farmers Validate Business Model

Indian women play a predominant role in earning a livelihood for their families. Affordable solar water pump technology may offer new economic perspectives for female farmers and adolescent village girls. The now locally produced photovoltaic water pumps are hence deployed to the female farmer’s association in Kudumbashree in Kerala, India (Fig. 6).

![Fig. 6. Photovoltaic water pump technology introduced to and discussed by female farmers at Kudumbashree in 2014.](image)

Pump operations are now tested in the field as part of an irrigation system with mobile water tanks and micro sprinklers (Fig. 7) to validate a possible business model.

![Fig. 7. A pine apple field needs to be watered once a week during the dry season, keeping four people busy for two days a week. The female farmers at Kudumbashree thus look forward to the support provided by photovoltaic water pump systems.](image)

Further Information

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