

# Solar Steam Irrigation

*Irrigating the land with heat from the sun*

## Product Sheet

With access to small scale irrigation, marginalized farmers are able to secure their yield and in many cases grow an additional crop in the dry season. Compared to fossil fuel-powered irrigation pumpsets, this solar powered pumpset saves farmers running costs and is environmental friendly.

### The context

Many farmers in developing countries use type of irrigation, varying from spray can application to diesel pumpsets. Access to such irrigation helps farmers secure their regular crops and to grow additional crops in the off-seasons. Mechanized irrigation is dominated by petrol or diesel pumpsets. Although wind-powered irrigation has potential, it requires sufficient wind, which makes it only applicable in for example coastal areas with stable wind regimes. Although sun is often plentiful, current photovoltaic pumping systems have proven to be too expensive for cost-effective irrigation. Due to the high value and multiple uses of the PV solar panels, these are also prone to theft.

To overcome these problems and to make solar powered pumping financially feasible for small scale farmers, PRACTICA is developing a range of small solar thermal irrigation pumps, in suction (to 8m) and deepwell (to 40m) versions.

### The technology

The technology of the irrigation pumpsets is simple and easy to maintain and repair. Both versions consist of two components: a solar collector and steam engine pump.

The solar collector heats a water buffer to produce steam, which drives a steam engine connected to the pump. For the solar collector, vacuum tube collector, linear Fresnel concentrator and disc concentrator types are currently being tested to evaluate steam production, longevity and cost.

The engine uses a diaphragm instead of a piston. All parts that come into contact with the steam are made of durable plastic to minimise wear and reduce condensation losses which can decrease the overall efficiency of the system.

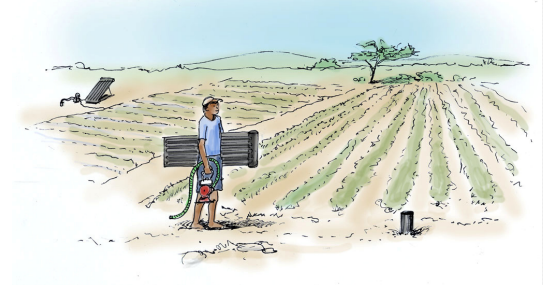
Small steam engines being used for this application have traditionally had a problem with low efficiency, which has hampered the application of these engines with solar power. Through many years of R&D, PRACTICA has been able to improve the efficiency, making this application financially viable for farmers.

The facts	
Costs	€150 (small suction) to €700 (larger deepwell) (est.)
Capacity	2m <sup>3</sup> per day to 100m <sup>3</sup> per day, depending on type of pump and water depth
Water depths	Up to 8m for the suction and up to 40m for the deepwell pump

### The application

The unit can be installed at the beginning of the irrigation season and stored at the end of the season. The smaller sizes are portable and the bigger units are semi-permanently installed. The design point of the pumps is to irrigate 2ha of land. The actual area will depend on the water depth, collector and pump types, crop grown and the soil permeability.

PRACTICA encourages organizations and individuals to support this development of solar thermal irrigation. We are in testing and prototyping stage, with very promising results so far. This technology could increase the incomes of millions of currently marginalized farmers with little environmental cost.



### Progress

Two prototype solar steam pump versions are currently being tested: a deep well pump designed for 4m<sup>3</sup>/day at 15m lift and a suction pump designed for 4m<sup>3</sup>/day at 5m lift. The deep well pump has been tested in the Netherlands and Burkina Faso. The suction pump has been tested in Ethiopia. Both pumps will be scaled up for higher capacities.

Collector developments include prototypes of a linear Fresnel concentrator, a disc concentrator and a vacuum tube collector.

PRACTICA Foundation develops and disseminates low-cost appropriate technology in water and renewable energy in developing countries. We focus on technology that responds to local cultural contexts, can be locally produced and maintained, and leverages existing market systems.

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