Kenya Smallholder Solar Irrigation (KSSI) Project

Technology Profile and Pump Assessments

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ASD Role in KSSI project

- Independent technical review of retailers’ solar pumps
- Site visits and pump testing with Winrock

Parameters taken:
- Overall quality of pump and panel installation
- Pump flow rates
- Irradiation, W/m²
- Total dynamic head
- System current and voltage
SWP System Components

PV Array

Well and Pump

Controller/ Inverter

Water Storage

Controller

Storage Tank

Well
SWP System Components

- Pumps are rated according to their Total Dynamic Head (TDH) and Flow (Q).
- TDH is the total equivalent height that a fluid is to be pumped, taking into account friction losses in the pipe.
- Flow is the amount of water flowing per unit of time.
Pump Types

Helical rotor pump

Centrifugal pump

Piston pump
Pump Controllers

SWP are designed to work with pump controllers. Without the controller/LCB it will not pump under overcast conditions.

Maximum Power Point Tracker (MPPT):
Allows the pump to operate at the point where the voltage and current give you the maximum power.
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<th>Type of PV Water Pump</th>
<th>Advantages</th>
<th>Disadvantages</th>
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| Submersible centrifugal | • Simple, with one moving part.  
• Regular maintenance not required.  
• Efficient at high flow rates or low lift.  
• Good tolerance for moderate amounts of sand and silt.  
• Most conventional, widely available. | • Poor efficiency at low volumes (<30 liters per minute) or high lift.  
• Capacity is reduced disproportionately at low speeds (in low-sun conditions).  
• Impellers can fill with sediments and may require periodic cleaning. |
| Helical rotor, submersible or surface | • Simple, with one moving part.  
• Regular maintenance not required.  
• Can manage high dynamic heads  
• Good tolerance for moderate amounts of sand and silt. | • Lower flow rates |
| Diaphragm, piston, rotary vane | • Relatively low initial cost.  
• Efficient at very low flow rates (4-20 liters per minute).  
• Maintains full lift capacity at all speeds. | • Requires preventive maintenance.  
• Poor tolerance for sand and silt.  
• Requires filtration (rotary vane pump). |
| Surface centrifugal | • Relatively low cost.  
• Efficient for low lift and high flow rates.  
• Easy to inspect and maintain due to surface location.  
• Good tolerance for moderate amounts of sand and silt. | • Suction limit is about 6 meters or less.  
• Requires priming (filling the intake).  
• May be damaged by running dry if it loses prime. |

It is very important to correctly size the pump!
SunCulture - Nyandarua
Taifu pump- Kiambu
Maji Pump - Kitui
Kickstart- Machakos
Futurepump – Kendu Bay

Image of a person holding a solar panel, a water tank, and a graph showing the performance range of the Futurepump.

www.winrock.org
SWP drip irrigation for onions
Lessons learnt

• Farmers expectations of the solar pumps were generally met
• Most farmers intend to expand their farms due to the improved water access, reliability and reduced energy costs
• There is need for local capacity building at technician level to improve the quality of installations and maintenance at the counties
• Security is a concern which often leads to more portable module configurations i.e temporary module installations placed in the dirt.
• Purchase power continues to be the main barrier to acquisition of solar pumps. The farmers are open to credit options; this will further grow the solar water pump market
• There’s need to further increase farmers awareness and build confidence around SWP technologies available in the market. Retailers are doing this through their after sales support
SWPs can work for decades
DOE/USAID Estación Torres, Sonora: 20+ years

480 Wp PVWP system still working after 20 years!
Only 1 pump replacement by rancher after 14 years