



Photo: Aggrico

SOLAR WATER PUMPS

Solar Appliance Snapshot

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EFFICIENCY FOR ACCESS COALITION

Approximately 95% of farmland in Sub-Saharan Africa and 60% in South Asia is rainfed and reliant on unpredictable weather patterns. Solar water pumps—a clean, modern irrigation solution—have the potential to increase yields by two to three-fold, depending on the crop and climate.

MARKET INSIGHTS

The solar water pump market is highly variable across regions. In Sub-Saharan Africa, the market is nascent with low penetration, but has a high potential for impact. The serviceable market represents [700,000 African households](#) and is worth USD 500 million. It has the potential to reach [2.8 million households](#) by 2030, a value of USD 1.6 billion.

The serviceable market for solar water pumps in South Asia is large due to more widespread use of mechanical irrigation and government incentives. In India, the serviceable market is approximately [USD 15.1 billion](#). The market is expected to decrease to [USD 9.4 billion](#) in 2030 as current subsidies are phased out.

CONSUMER IMPACTS

Water pumping can increase yields as much as three-fold, providing households with a more predictable source of disposable income. Solar water pumps also build resilience to droughts and can help farmers to more easily adapt to changes in weather patterns as the climate changes.

A [2020 survey](#) of energy access practitioners ranked solar/electric water pumps first in perceived development impact. A survey of 375 solar water pump customers in East Africa found solar water pumps had improved the quality of life of [81% of respondents](#). Farmers report more confidence in their farming outcomes, improved productivity and income generation, and an increase in the amount of land farmed.



USD 15.6B

Estimated serviceable market for solar water pumps in India and Sub-Saharan Africa, roughly 4.9 million units.



3X

The serviceable market for solar water pumps in Sub-Saharan Africa is expected to triple to USD 1.6 billion by 2030.



91%

of solar water pump customers surveyed in East Africa reported reduced expenditure on water acquisition.



81%

of solar water pump customers surveyed in the same study reported an improvement in their quality of life.

CURRENT SUCCESSSES

The small-scale solar water pump market has grown significantly in the last three years. There has been a notable increase in funding to the market and companies are tailoring business models to improve access to end-user financing and improving customer experience through pump add-ons. 12 of 16 [Efficiency for Access Coalition](#) members support solar water pumps and many large pump manufacturers are now adopting their products to meet the needs of smallholder farmers.

From an efficiency perspective, many solar water pumps use brushless DC motors. These motors are 10-40% more efficient than brushed AC and are easier to repair and optimize through programmable controls.

REMAINING CHALLENGES

Solar water pumps have yet to realise their full market and impact potential. Affordability remains a large challenge—only [0.1% of smallholder farmers](#) in Sub-Saharan Africa can afford a pump. In India, 60% of pumps retail over USD 1,000. Consumer financing is important to bridge the affordability gap, but mechanisms like PAYGo financing are more challenging to implement as pumps are generally used seasonally and can require other agricultural inputs and training for farmers to use successfully.

Solar water pump quality varies significantly in the market. A survey of 375 solar water pump users found [51% of respondents](#) reported a decline in pump performance over time. Addressing quality and durability concerns will be vital for the market to reach its full potential.

RECOMENDATIONS AND PATHWAY TO SCALE

Solar water pumps for smallholder farmers are commercially available, but have not yet reached large-scale deployment. Improving affordability, consumer financing, business models, and partnerships - in concert with other interventions - will be critical to growing the market.



Address Affordability

Economies of scale and rising incomes will help long-term, but improved access to consumer financing, subsidies, concessional financing, and risk guarantees are needed to bridge the immediate gap.



Cultivate Consumer Awareness

Government or donor-funded awareness campaigns that provide credible demonstrations for smallholder farmers can familiarize potential consumers with solar water pumps.



Innovate on Business Models

Current examples include PAYGo, rentals, bundling pumps with household appliances, partnerships with off-takers to improve access to markets and de-risk lending, and using mobile pumps to sell water by the litre.



Leverage Big Data

Big data analytics can identify high potential markets. For example, Efficiency for Access is developing a model to predict the productive potential of Kenyan farmers who adopt solar irrigation weather, soil, vegetation, and remote sensing data.



Support Innovation

R&D in sensors and IoT to monitor pump performance, coupled with improvements in pump performance, efficiency and repairability, are needed.



Foster Partnerships

Partnerships that allow pump companies to offload financing tasks such as evaluating customer creditworthiness and collecting payments are also critical.