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SPOTLIGHT SERIES

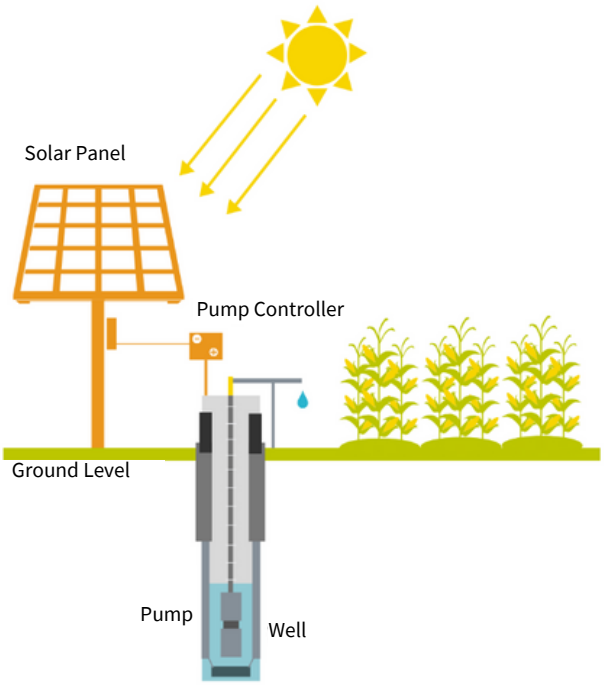
SOLAR IRRIGATION

This technology spotlight provides latest market insights for emerging applications that unlock productivity through decentralized renewable energy technology.

Solar irrigation converts solar power into electrical energy to power a pump that lifts and carries water. Leveraging the cost decline of solar technologies, solar irrigation pumps are increasingly adopted by smallholder farmers in emerging markets to improve yields, reduce vulnerability to rainfall variability and to enable multiple cropping cycles. Although the upfront costs are about 3-4x that of their diesel pump equivalents, the total lifetime costs of solar irrigation are already competitive.[1, 2, 3] Currently, the industry is at an inflection point, where the technology is mature enough for scale, which will continue to put downward pressure on cost.

Solar Water Pump Types

Submersible Pump



"Solar Pumping Systems." Digital Image. Accessed October 25, 2018. http://galaxyenergysystems.in/solar-pumping-systems.html.

Figure 1. Illustration of a solar-powered submersible pump, which is used to pump underground water from a borehole

Surface Pump

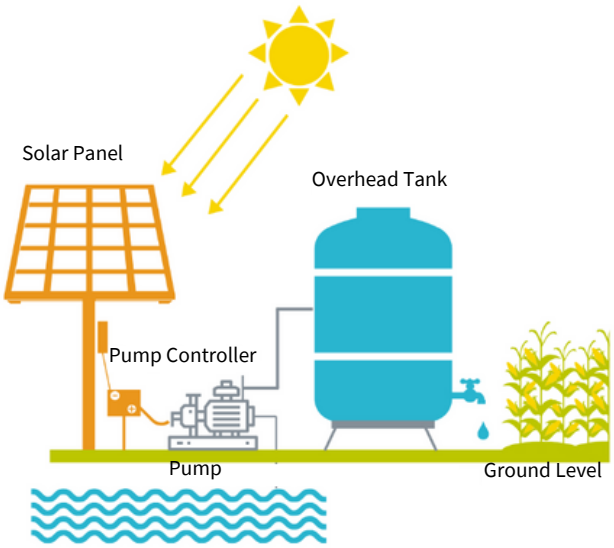


Figure 2. Illustration of a solar-powered surface pump, which is used when surface water is available

Market gap

- 500 million: Number of smallholder farmers around the world lacking access to modern irrigation solutions. (S1, p.9)
- 95%: Cultivated land that relies on seasonal rainfall in sub-Saharan Africa (SSA) (S1, p.9)
- 60%: Cultivated land that relies on seasonal rainfall in South Asia (S1, p.9)

Current market estimate

- 150,000: Solar water pumps that are in use today in India (S1, p.6)
- 5,000: Solar water pumps sold in SSA in second half of 2018 (S1, p.6)

Pump system capacities[4]

- 2–4kW: Solar water pump capacities in India (S1, p.9)
- <500W: Solar water pump in SSA (S1, p.9)

Average price[5]

- US$1,000–3,000: Cost range of solar water pumps India (S1, p.10)
- US$600–2,000: Cost range of solar water pumps SSA (S2, p.9)

Addressable market[6]

- India: 4.2 farming households, US$ 15.1 billion (S1, p.12)
- SSA: 700,000 smallholder farmers, US$ 456–500 million (S1, p.11, S2)

Market projection

- India: 3.7 million households, US$ 9.4 billion in spending[7] by 2030 (S1, p.6)
- SSA: 2.8 million households, US$1.6 billion in spending by 2030 (S1, p.11)

Impact potential

- 141–195%: Maize yield uplift from small-scale irrigation in SSA (S3, p.11)
- 2x–3x: Cabbage and tomato yield increase in Zimbabwe (S2, p.35)
- 50%: Profitability boost for smallholder farmers in India (S1, p.9)

Resources

1. "The Market Opportunity for Productive Use Leveraging Solar Energy (PULSE) in Sub-Saharan Africa." IFC, 2019. **(Herein S1)**
2. "The Market Opportunity for Productive Use Leveraging Solar Energy (PULSE) in Sub-Saharan Africa." IFC, 2019. **(Herein S2)**
3. "Water-Wise: Smart Irrigation Strategies for Africa." Malabo Montpellier Panel, 2018. **(Herein S3)**
4. Smaller pump capacities indicate smaller average plot size. India's larger pump capacities are also due to government subsidies.
5. Cheaper price range in SSA than India may be due to smaller system capacities demanded.
6. Addressable market is estimated by the cost of appliances, number of smallholder farmers and production volume, without considering grid access, affordability and other market constraints. (S1)
7. Number of households multiplied by the average cost of appliances. (S1)