

Solar Irrigation System

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Introduction

Agriculture is the single largest employer in the world, sustaining the livelihoods of 40% of the world's population. And irrigation is among the measures that can improve yields, reduce vulnerability to changing rainfall patterns and enable multi cropping patterns. As such irrigation is often seen as the engine that helps to ensure food security, generates income, provides jobs and drive rural development. Energy is the key input for irrigation services. In a solar powered irrigation system, electricity is generated by solar photovoltaic panels and used to operate pumps for the abstraction, lifting or distribution of irrigation water. Solar powered irrigation system can be applied in a wide range of scales from individual or community vegetable gardens to large irrigation schemes. The technology option of solar irrigation system is rarely taken into consideration due to lack of pertinent experience and the comparably high investment cost of the past.

A solar irrigation system needs to take the account of the fact that demand for the irrigation water will vary throughout the year. Peak demand during the irrigation season is often more than twice the average demand. This means the solar pump for irrigation can be under-utilized for the most of the year although there can be a reduction in strength of the sun during these reducing supply side of the equation. Solar technologies are becoming a feasible option for both large and small-scale farmers. Solar irrigation system provides reliable and affordable energy potentially reducing energy cost for irrigation. In rural areas where diesel fuel is of quite high price or where there is less reliability on access to the electricity grid is lacking, they can lay out a relatively flexible and climate friendly different energy source. Solar irrigation system can be used in large scale irrigation system as well as decentralized small-scale irrigation.

The essential components of solar irrigation system includes:

- A solar generator, i.e. an arrangement of panels to generate electricity.

- A mounting structure for PV panel, fixed or equipped with a solar tracking system to maximize solar energy yield.
- A pump controller
- A surface or submersible water pump, and
- A dispersing system or retention tank for irrigation water.

The respective solar powered irrigation system components can be combined in different configurations, depending on the site specific biophysical and socio-economic conditions. Solar irrigation system can be practiced in any location where the following requirements are fulfilled:

- Sufficient solar radiation i.e. solar power collected per unit area of the land surface.
- Land availability: sufficient untouched land to keep up the PV panels and accommodate water infrastructure such as storage tanks.
- Water availability and legal grant/ license to draw water: Abundant water to persuade the pre-determined irrigation water need of the crop.
- Appropriate water quality: e.g. adequately less of salinity or heavy metal gathering.

There are many benefits of practicing solar irrigation system such as they have some direct potential to reduce greenhouse gas emissions in irrigated agriculture by replacing fossil fuels for power generation with renewable energy source i.e. solar energy. Solar irrigation system can help buffer the effects of drought and overcome water stress during dry season when groundwater is the only available water source. It can help to stabilize, increase and diversify production. Excess produce can be sold on market and generate income. Solar irrigation system has proven to be technically viable and competitive option with attractive return on investment. However, the high initial cost for equipment and installation and the lack of suitable funding schemes are big challenges to the adoption of solar irrigation system. There are already a number of financial, investment and business models that offer different options for solar irrigation system users to overcome potential funding gaps. Further challenges lie in the lack of skilled personnel for the design, installation and maintenance of solar irrigation system and the lack of codes and standards. Promotion of solar irrigation system should therefore comprise support to the development capacities and business opportunities in the supply chains and a sound legal framework.