



Mini Review

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Solar Power Pumping in Agriculture: a Review of Recent Research



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Abstract

This study aims to review on solar-powered water pumping in agriculture from recent available scientific journal. The review results found that, solar power pumping extension is enhancing rapidly worldwide due to easy acceptance, cost effective and profitable for stimulating socio-economic improvement. There are various researches have been done on solar pumping system, model development and simulation, social instance, performance and economic profit assessment etc.

Introduction

Demand of agricultural power is now becoming scars due to mechanized farming and sharing in industries, domestic and other uses particularly in the developing countries of the world. Water and electricity are prized resources for agricultural production system, which are corresponds to each other because of parallel significance in this sector [1], besides this around 40% of world populace sustaining their livelihood on agriculture, some are living in poverty [2]. There is a right way to fight against poverty and stimulating socio-economic improvement need to increase agricultural production, which can be possible by supplying more power in agricultural pumping space. Because, required irrigation is mandatory for improve yield by multi-cropping due to changing climate and variation of rainfall patterns [3]. Introducing of solar power to meet extra demand of electricity can boost the agricultural production and production system as well. This has already became popular and increasing fast due to enhanced cost-competiveness, environmentally suitable, energy security, convenience, socially acceptable, supporting with dedicated policy and applicable marketplace [1,4]. As food security is required in limited access to conventional energy resources, dependency of solar power water pumping nowadays increasing for small to medium scale farms and farmers, especially in developing countries [5].

According to these debate question ascends that, is solar power irrigation system a great opportunity in agricultural

improvement? It may responses from many studies in this research area. This mini review reported status of solar power pumping study and practice for irrigation from some recent research.

Discussion

Solar power pumping is principally based on PV technology which convert solar energy to electrical energy for lifting water at least 7 m head. A PV solar power pumping system consist of a PV array, a DC/AC motor, pump, water storage tank, Electrical wire and water outlet [6]. The benefits of solar pumping for farms and farmers are: easy energy supply and enhanced access to water for irrigation, improved yields and enlarged profits, enhanced crop resilience and food security and extra benefits for human health, education and poverty reduction [7]. Solar powered water pumping technology are boosting smallholder income in recent, while it has been positioned for decades due to cost reduction and potential benefits of this technology. Recent statistics exposed that, Bangladesh, India Morocco has set a mark to install 50000 solar-powered irrigation, pumps by 2025, 100000 by 2020 and 100000 by 2022, respectively [7]. Many researchers conducted study on solar power and pumping system. Kumar & Kaur [8] developed an Artificial Neural Network (ANN) based model which used for identify theoretical potential of solar radiation for solar energy applications in solar heating, agriculture, solar lighting system and solar power plant erection etc. Korpale [1]

assessed performance of water pumping system using solar photovoltaic power and electrical power in which solar power obtained maximum flow rate was 69 l/min against 65 l/min for

electrical power [9-11]. Several research and practices result of solar power and pumping system in agriculture are described in Table 1.

Table 1: Status of Solar power and pumping system for farms and farmers.

Research Topic	Country	Output	Reference
Solar water pumping system	India	Developed a model and simulation of asolar powered drive pump for irrigation	[9]
Performance assessment of solar water pumping	India	Efficiency of solar water pump is higher than conventional power water pump	[6]
Solar water pumping	Kenya	Status of small holder solar irrigation	[8]
Solar water pumping	Nepal	Status of Solar PV Water Pumping	[8]
Solar water pumping advantages	Mexico	80% price reduction in solar PV modules over diesel from a case study	[4]
Diesel fuel and solar pump assessment	Egypt	Solar pump is environmentally suitable than diesel fuel pump	[1]
Solar water pump technology	Pakistan	Factors that inspire the acceptance of solar water pump technology	[12]
Modeling and analysis of solar and conventional power pump	Finland	Comparison of thermal load balance using dynamic simulation software Apros. 20% fuel and emission savings by achieving higher peak solar share.	[10]

Conclusion

In this paper, review and discuss concluded on solar power pumping research and practices from recent research. This study concentrated on status of solar contribution in agricultural water pumping.

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