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Review Paper on Solar (PV) Water Pumping System Using Crop Application

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ABSTRACT: Agricultural methods are changing rapidly because of recent advances in renewable energy technology. The recent advancements in renewable energy can be effectively employed in the agriculture sector to reduce dependency on conventional crops irrigation techniques and fossil fuels. Fields and crops irrigation are usually performed by water pumps (runs on fossil fuels) which can lead to environmental damage and high agricultural costs. For the agricultural use such as irrigating the crops, Photovoltaic (PV) water irrigation system is the best technological solution. Photovoltaic powered water pumping system help in water pumping and is usually composed of solar panel arrays and AC/DC water pump. In such system, a solar cell generates DC current which is then converted to AC current (using DC-AC inverters) for operating the water pumps. It is also worth noting that the generated DC power by PV panels can also be stored in batteries for later use in night or darkness. This work presents a novel design for the solarpowered water pumping system with irrigation control feature. The humidity sensors and global system for mobile (GSM) module are installed for automation and wireless control of irrigation to reduce manpower needs. Overall, this article presents a novel, wireless, and automatic solar-powered water pumping and controlled irrigation system.

KEYWORDS: Solar Panel, Regulator, Inverter, Pump, Humidity Sensors, GSM, Agriculture

I. INTRODUCTION

The expanding interest for energy, the consistent decrease in existing wellsprings of petroleum derivatives and the developing alert in regards to climate contamination, have pushed humankind to find new non-regular, environmentally friendly power assets, for example, sun based, wind energy, and so on for the creation of electrical energy [1]. Since Oman gets daylight every one of the a year of a year. Thus using it in the various fields is an astute thought. Sun powered energy is the most abundant wellspring of energy on the planet. Photovoltaic age is a powerful methodology for utilizing the sun oriented energy. Photovoltaic siphoning frameworks (PVPs) are not difficult to be introduced in any spot and they require less upkeep perhaps every 5 to 10 years spans so that decrease the general expense, simply the expense of the photovoltaic cells and the other gear required which consider as the underlying capital expense [1] [2]. Additionally, they doesn't need non-inexhaustible wellspring of ability to work on the grounds that the ward of sun oriented force. Since the sun based siphons doesn't depends to the diesel or oil so they consider as a quiet and clean framework with no air contamination or commotion [3]. Along these lines, this such framework is useful for individuals who live in distant from the water and power organizations and in any event, for the individuals who live in urban areas [4].

The expense of sunlight based boards has been persistently diminishing which supports its utilization in different areas. One of the uses of this innovation is utilized in water system frameworks for cultivating [5]. Sun oriented fueled water system framework can be a suitable option for ranchers in the current situation with energy emergency in Oman and different nations [1]. In this paper we propose a shrewd water system framework utilizing sun based force which drives water siphons to siphon water from bore well to a tank and the power source valve of

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tank is consequently controlled utilizing Arduino UNO, GSM and dampness sensor to control the stream pace of water from the tank to the water system field which advances the utilization of water [6]. An Arduino-based robotized water system framework use Android advanced cell for controller, is recommended by A.N. Arvindan and Keerthika. D [7]. They said that this framework will be conservative and simple to utilize.

This framework comprise of Arduino Uno processor gets its info voltage signal from the dirt dampness sensors which measure the dampness content in the dirt. The Arduino analyze the information came from the sensors with foreordained limit esteem. The Arduino associated with the Android advanced cell by a remote by means of HC-05 module. The got information in the Android PDA is shown on the (UI). The UI give simple controller of water system for the client include turning ON and OFF [7]. Srishti and Rawal [8], recommended that making brilliant farming by utilizing IoT (Internet of Things) innovations. The possibility of their task has three concerns, right off the bat it's anything but a sound caution used to distinguish any gatecrasher into the ranch climate it's anything but a human or animal. Also, the task was to keep the yields from harm during precipitation. The downpour water additionally being reused for water system productivity. Thirdly, was for brilliant water system. The activities performed by interfacing sensors, Wi-Fi module and GSM module. This venture expect to tackle numerous issues like decreasing wastage of water, human exertion and give the rancher refreshed data about the field through his cell phone. The keen water system framework is firmware based. Figure 4, show the venture framework arrangement [8].

II. LITERATURE REVIEW

[1] A survey of flow status of sun oriented photovoltaic water siphoning framework innovation examination and applications is introduced. The investigation centers around update on sun powered water siphoning innovation, financial assessment, natural perspectives and late advances in materials and productivity improvement of photovoltaic innovation and experience of utilizing sun oriented PV siphons around the world. Rural procedures are changing rapidly due to current progression in environmentally friendly power innovation. The current progressions in sustainable power can be effectively applied in the horticulture area to limit reliance on regular harvests water system strategies. Fields and yields water system are typically performed by water siphons (runs on non-renewable energy sources) which can prompt ecological harm and high horticultural expenses. The stickiness sensors and worldwide framework for versatile (GSM) module are introduced for robotization and remote control of water system to decrease labor needs.

[2] The paper has examined about the chance of carrying out a sun oriented based brilliant water system framework which has been tried in lab and is to be taken to a town in Coimbatore, India. A framework with a sunlight based board, dampness sensor, Arduino Microcontroller Unit and battery is executed and tried in the lab. The force prerequisites for the space of the water system field we are covering is determined and appropriately number of sun powered boards, battery, microcontroller units, remote interface modules and dampness sensors are chosen. In light of the variable climatic circumstance these conditions now and again may differ from one spot to another in the immense farmhouse that makes exceptionally hard to keep up with the consistency at entire spots in the farmhouse physically. It is seen that interestingly an android telephone control the Irrigation framework, which could give the offices of keeping up with uniform natural conditions are proposed.

[3] In this proposed framework we use the sun oriented energy from sun based boards to siphon water from drill well straightforwardly into a ground level stockpiling tank dependent on the power of sun beams. The water is siphoned into a ground level tank from which a straightforward valve component administer the progression of water into the ground. This recoveries tremendous measure of energy and effective utilization of sustainable power. A valve is controlled utilizing smart calculation in which it manages the progression of water into the ground contingent on the dampness satisfaction of the ground. In this framework we utilize a dirt dampness sensor that identifies the measure of dampness content in the dirt. Transportation of environmentally friendly power framework, for example, photovoltaic (PV) siphons, is a lot simpler than different sorts since they can be moved in pieces. The existence cycle cost investigation that covered both the frameworks demonstrates that the PV water siphoning framework is more efficient earlier over the diesel water siphoning framework. This technique was reasonable for

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deciding the size and hence material for these sun based fueled water system frameworks since the expense of photovoltaic (PV) frameworks is genuinely high.

[4] In this venture we created Solar Tracking for a computerized water siphon in this undertaking water siphon consequently get worked by utilizing soil dampness sensor, here the sun oriented board is auto following which pivot according to the heading of sun. This sun powered following framework utilizes the daylight for siphoning the water to rural grounds and homestead, while siphoning activity not occurring the energy can be put away in battery for other application. [5] This paper presents a minimal expense robotized sun based water siphoning framework for water system in

agricultural nations. The customized sensor module perceive the temperature, stickiness, soil dampness content and sends the data to ESP32 microcontroller. A water level sensor likewise recognize the water level and sends the information to the microcontroller unit. In light of the data and limit conditions, the microcontroller concludes either to begin or to stop the siphon engine. This paper likewise depicts how to choose soil dampness limits for a specific sort of soil. The ESP32 microcontroller likewise sends data to the web worker so the client can see. The client can work the water system framework a long way from the field by a straightforward snap on a phone. A manual switch ON/OFF framework is additionally incorporate into the proposed plan.

[6] As we realize that horticulture innovation is changing quickly so applications appropriate are various. Fundamentally these applications have blend of individual establishments and framework introduced by utility. Each sun powered cell has arranged layers of semiconductor material produces DC.

[8] Scarcity of power with that significant expense of diesel influences the water supplies and water system. In this way, Solar energy for water siphoning is promising alternatives as far as ordinary energy. Utilizing PV innovation we can save water as without legitimate strategy we squander bunches of water. Alongside that different financial parts of environmental factors items are dealt with.

[9] This paper is intended for minimal expense water system siphoning framework. The modified sensor module recognizes the temperature, dampness, soil dampness level and sends the data to ESP32 microcontroller. This paper additionally portrays how to chooses oil dampness limits for a specific sort of soil.

[10] The issue of physically working the water siphon is likewise settled with the assistance of the RTC (Real Time Clock) and Microcontroller circuit. We can handle the siphon by predefined schedule openings. that makes the controlling simple and dependable than the current framework. This framework can be worked on through executing GSM and soil dampness sensor into the overarching framework. Parts This venture must be done both on programming and equipment. The necessary segments are as per the following: Solar Panel, LDR sensors Battery, Arduino, Relay, Motor driver, Stepper engine, GSM Module, Soil dampness sensor, LCD Display Solar Panel: It is the gadget which changes the photon energy into electrical energy. The energy by the board get put away in battery.

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III. BLOCK DIAGRAM

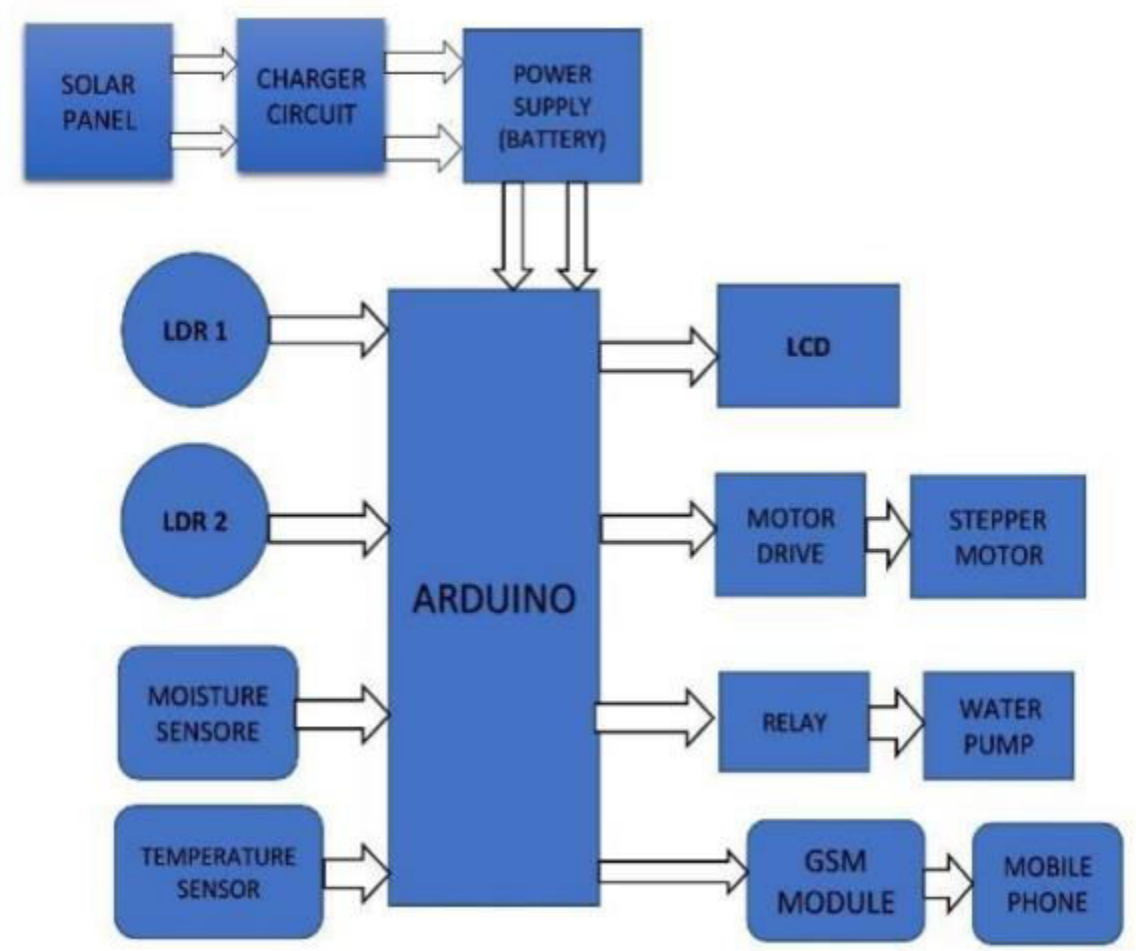

Fig. 1. Block Diagram

The fundamental structure of the system is divided into two basic circuit. The first one is the circuit that supply the required power to the system by the use of solar tracking. Another circuit is related to sensory network required in the system. Initially, as soon as the photovoltaic panel exposed to sunlight the two LDR sensors use in the circuit becomes active through microcontroller. Both LDR senses the luminous intensity and decides which sensor receives maximum luminous intensity. The panel starts moving according to the maximum intensity receiving sensor through stepper motor driven by motor driver which is connected through microcontroller. The maximum power received by the photovoltaic panel is stored in battery. But for the protection of battery, the variable electrical energy received through panel passes through the charger circuit. The energy stored in battery is used for running submersible pump. In the second part we are completely focused on making irrigation system automated. For this we have used GSM module and Soil Moisture Sensor. For the automation, the soil moisture sensor is placed in farming land and is connected through microcontroller. Sensor senses the moisture in the soil and sends the data to microcontroller. Microcontroller activates the GSM module which sends the SMS to the user for turning ON or turning OFF according to the moisture value. Here user have the option for OFF and ON of pump by just sending an SMS to the module from any location.

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IV. CONCLUSION

An automatic irrigation model is proposed and successfully implemented using various circuits as shown in various figures. Considering the low cost, reliability, alternative power and automatic control, we designed and implemented this model. Since the proposed model is automatically controlled, farmers can water their fields smartly. The model always provides enough water in the paddy to avoid overfilling and under filling. Farmers can use mobile phones to remotely turn off and turn on the engine while moving. Further, the solar energy provides enough energy for the system to make it sustainable. In order to overcome the demand for electricity and smart irrigation, the proposed model may be an appropriate alternative. It is quite evident that the proposed smart irrigation system with better control provides sustainability and water saving by simple approach. The proposed model is not only going to benefit famers in smart irrigation but also tackles the water scarcity issues. This method provides wireless information on soil condition by sensors which can help farmers in seeding and harvesting of crops timely along with man power saving. The continuous water level monitoring and water pump automation are salient features of this research. In short, this solar powered sustainable system provides solution for over irrigation, under irrigation, soil erosion and wastage of water

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