

# Design and Development of Solar Powered Agriculture Water Pump Irrigation System

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## Abstract

For the ecological concerned, the solar energy framework offers benefits in that, it spreads no contaminations in to the air as they are with the burning of petroleum derivatives. Subsequently, as a drawn out choice solar energy framework can be considered as another fuel framework. The lifting of water for drinking or water system reasons for existing is critical in generally appropriated towns with almost no provincial and where underground water is accessible. Solar energy is changed over to mechanical energy to drive little water pumps it would be of incredible assistance to the rustic restraints. The expense engaged with solar powered water pumps is extremely less when contrasted with traditional frameworks. A solar water pump is planned and tested and fulfilled outcomes.

**Keywords:** Solar Energy, Water Pump, Sensor, Photo Voltaic Modules, DC Motor

## 1. Introduction

The creative innovation in considering the different approaches to inundate the agrarian land utilizing solar power since the farming assumes the huge part in improving the nation's economy, an improvement ought to be applied to build the efficiency and extend the nature of yields.

In this paper Solar PV cell are utilized for pumping water. The PV modules convert daylight direct to power which is utilized to run a dc engine pump for bailing of water. It comprises of solar PV modules, power conditioner to shield stockpiling batteries from over charging during non-sun sparkle and a dc water pump. A solar energy-powered water pump is a water pump running on the power that is created by solar PV modules. Solar PV (PV) frameworks can be an appealing integral energy source sent close by diesel pumps in regions with a lot of daylight and where the expense to run power lines is high. PV frameworks have the advantage of being versatile, with limit going from a couple of watts for applications, for example, computerized ranch doors or clocks, to many kilowatts for the property and homestead sheds. Maybe than having one enormous unified framework, various circulated PV frameworks can be sent at pump locales. Solar pumping frameworks are most appropriate for move activities (to pump water out of bore, for example, or move it from dam to capacity tank) in which

pumps run constantly for a large portion of the day. Applications that expect water to be pumped around evening time are not also fit to solar powered pumps, as capacity arrangements, for example, batteries and capacity tanks can add essentially to the expense of the framework. Albeit these energy stockpiling arrangements can be costly, they consider more prominent use of the PV framework.

Solar energy is as a rule broadly utilized in various applications, due to its effortlessness and climate cordial element quite possibly the most fitting and least complex employments of PV power is water pumping or field water system through PV (PV framework) solar boards. The solar-powered water pumping framework is widely utilized in harvest or field water system these days in country regions. The significant benefit of this water pumping framework is straightforwardness and decrease in the general expense of the framework by disposing of petroleum derivatives. This framework is dependable, financially savvy and can raise levels of agrarian efficiency.

In this work, the mugginess sensor is introduced in the yield fields with the end goal of computerization and remote control. The mugginess sensors give the data on stickiness state of the dirt. In light of criticism from sensors, the Arduino turns "on" or "off" the pump naturally. Water pumping and flooding the fields is the essential prerequisite of cultivating however significant expense due to petroleum derivatives has based water pumps. PV powered water pumping has been internationally verified savvy. These solid frameworks have expanded horticultural usefulness on a worldwide scale by diminishing power and energy costs for huge scope. It is likewise significant that solar frameworks can be introduced on distant areas and help to decrease reliance on non-renewable energy sources and matrix power [11-13]. Pakistan is a non-industrial nation and our economy structure rotates around horticulture and rural items. Sadly, water assets are draining at quicker rate and there is need to lessen water wastage and compelling utilization of the water with better control [10].

To plan a solar-powered water pump framework, you should evaluate the accessible solar energy. It is hence significant for you to be comfortable with the definitions and differentiations between the three related terms "solar radiation," "solar irradiance," and "solar insolation." The solar advances valuable in horticulture are water lifting and pumping with solar PV frameworks. The reasonableness of solar power for lifting water to inundate plants is irrefutable in light of the correspondingly between solar irradiance and water prerequisites of harvests. The more seriously the sun is sparkling the higher is the power to supply water system water while then again on blustery days water system is neither conceivable nor required. Limited scope water system is perhaps the most possible utilizations of solar power. The principle advantage is that solar radiation is extreme when the requirement for water system is high.

Petroleum derivative makes incredible harm the climate as they discharge unsafe ozone depleting substances. Traditional age of power by warm and thermal energy stations likewise hurt the climate. As a feature of this examination work, we led a contextual investigation in a town called Siruvani close to Coimbatore region in the southern territory of Tamil Nadu, India [3-4]. Agribusiness is the life saver for the majority of the 44 families that live in this town. At present, they use diesel based water pumping framework which isn't just costly yet in addition hurts the climate. The residents' benefit is significantly decreased as they go through a ton of cash in purchasing diesel for running the water

pump framework. The investigation led by us shows that the proposed solar based robotized water pumping framework whenever carried out would be a help to these townspeople as far as cost and benefit. What's more, this can save a great deal of water and is climate cordial. In this paper we would examine the plan and execution of the mechanized solar water pumping framework alongside the contextual investigation conveyed in Servant village [3,6]].

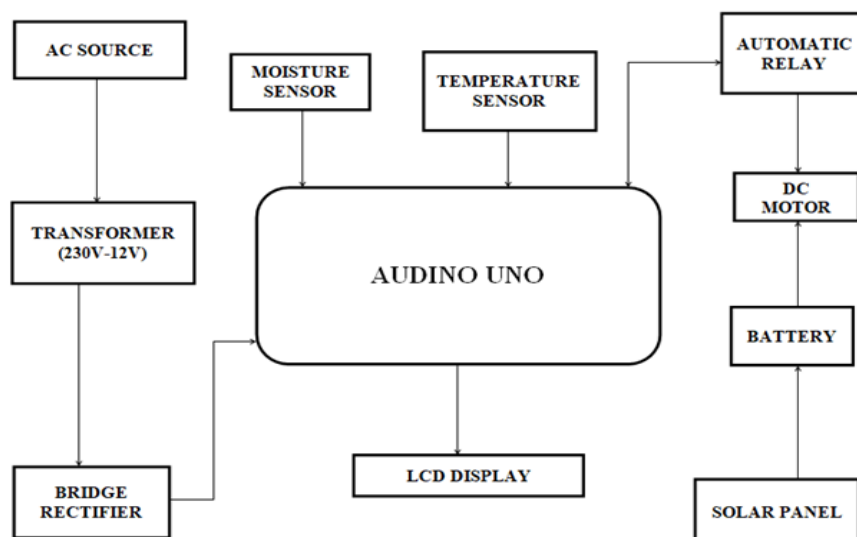
The information gained about ecological variables of the field is sent to the rancher empowering him to control the actuators in the field. Zigbee based low power gadgets are utilized to empower cost saving and the valves and sprinklers are utilized to save the water use for water system. The innovation utilized is basic and simple to carry out and the boundaries recorded aides an extraordinary method to rancher to empower the "Savvy ranches" hypothesis work for him [7]. The miniature regulator is the core of the thought which controls every one of the gadgets and enacts it and runs them in synchronization. So ongoing handling of the data is done and the necessary move is made to build the efficiency of the field. GSM and remote sensors innovation is old innovation, Design of the undertaking is convoluted and Cost is high [10].

- This project, gives outline about most recent inserted advances and applications identified with farming with examination of other study papers and proposed a novel horticulture the board framework.
- Our primary goal of this work is to for Farming where different new technology.

## **2. Design of Solar Irrigation System**

The board is held under the sun for radiation. The photon energy from the sun lights that scene on the top metallic organization causes the electrons in the P-layer and openings in the N-layer to diffuse towards the convergence. In this collaboration the electrons accumulated on the N-side and openings assembled on the P-side charge these different sides oppositely. This fosters an open circuit voltage across the two terminals. The energy change measure proceeds insofar as light is occurrence on the dynamic top surface of the cell. The power created by these cells are gathered and put away in a battery. The power from the battery is shipped off the DC engine. It runs the pump coupled to it. The pull head is associated with the well and release head is coordinated towards the field. The water from the well is pumped out and it is utilized for the homegrown or agrarian reason. A stage down transformer is a sort of transformer that proselytes the high voltage (HV) and low current from the essential side of the transformer to the low voltage (LV) and high current worth on the auxiliary side of the transformer. The converse of this is known as a stage up transformer.

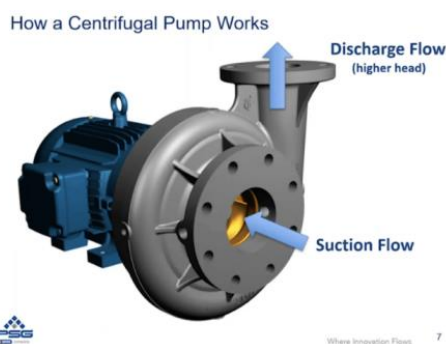
Figure 1. Block Outline of Solar Water System



## Centrifugal Pump

The radiating pump is utilized in our framework to pump the water. The pump that raises water from lower level to more significant level by the utilization of divergent power is known as the diffusive pump. The principle segments of outward pump are impeller, packaging, pull pipe with foot-valve, conveyance pipe, and central player. Impeller is a rotor furnished with a progression of in reverse bended vanes or cutting edges. It is mounted on a shaft, and the shaft is pivoted by a central player. Packaging encompasses the impeller. It is a hermetically sealed and water-tight packaging. The packaging is planned with a step by step expanding region. Henceforth, when water courses through the packaging, the motor energy of water is changed over into pressure energy, before the water leaves the packaging. The upper end attractions pipe is associated with the bay of the pump. The lower end is lowered into attractions well or sump from which water is to be pumped.

Figure 2. Centrifugal Pump



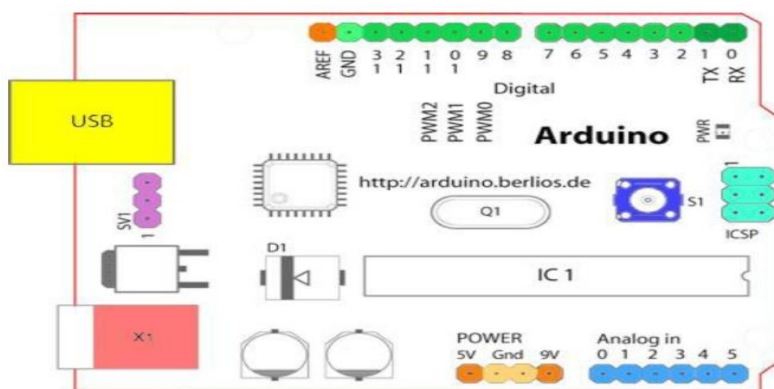
A foot valve is a NRV and a sifter is fixed at the lower end of the attractions pipe. A line whose one end is associated with the power source of the pump and the opposite end convey water at a necessary stature is known as conveyance pipe. Main player pivots the shaft of the impeller. Generally, an electric engine is accommodated this motivation behind driving the pump. In divergent pumps, the

water enters the impeller through the eye of the pump, an entry along the shaft at the focal point of the impeller, and is moved forward the outskirts by the diffusive power. Move of energy from the impeller to the liquid happens that gains in, dynamic and pressing factor energy. Notwithstanding, high speed of the leaving water isn't wanted, as there is energy misfortune because of whirlpool particle the round chamber that encompasses the vanes. Accordingly, the speed in to valuable pressing factor energy this is finished by making the leaving water course through a section of slowly expanding region known as volute or diffuser. This addition in the pressing factor energy expands the conveyance top of the pump. In the event that water supply is kept up at the middle, proceeds with supply of water at high pressing factor is gotten at the outskirts of the impeller. It is an interaction of topping off water in the packaging and attractions line of an outward pump for the evacuation of air prior to beginning it. In the event that the pump is begun with air in the packaging and attractions pipe, there will be just an immaterial pressing factor distinction across the impeller. This won't be adequate to make sufficient vacuum to suck the water into the packaging from the sump. The design of the solar water pump water system framework ought to be resolved based on (1) the pump execution bend, (2) the water system framework execution bend and (3) the pump release and the working pressing factor curve[15].

## Arduino

Arduino interface sheets give the designers, craftsmen, makers, subject matter experts and any individual who tinker with innovation with an insignificant cost, easy to-use innovation to make their inventive, wise articles, valuable endeavors, etc Arduino is an open source contraptions prototyping stage reliant upon flexible, simple to-use gear and software. Arduino is a little microcontroller board with a USB fitting to interface with your PC and various affiliation connections that can be wired up to external equipment,

Figure 3. Arduino Board Layout

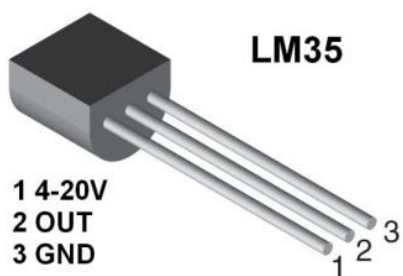


like motors, transfers, light sensors, laser diodes, amplifiers, mouthpieces, etc The Arduino writing computer programs is in like manner open-source. The source code for the Java environment is delivered under the GPL and the C/C++ microcontroller libraries are under the LGPL. It work with a Mac, USB organization, Look charming, cheaper. More powerful than a BASIC stamp, something you could build/fix yourself. Fundamental and easy to use by someone without formal equipment.

## Temperature Sensors

Temperature sensors LM35 are for the most part planned to measure a property which changes considering temperature. The contraptions are then adjusted to conventional temperature scales using a standard (for instance the constraint of water at known squeezing factor). As the temperature of the metal additions, extended unpredictable nuclear development ruins the movement of electrons.

Figure 4. Temperature Sensors

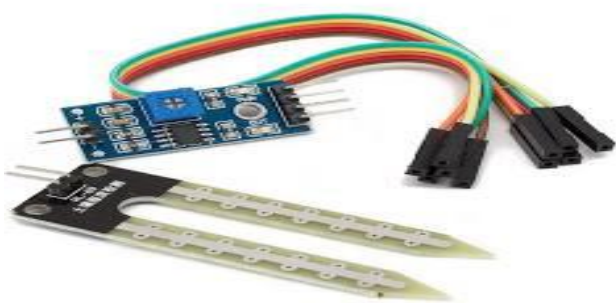


These voltage changes are changed over into computerized readings showing the degree of dampness noticeable all around.

## Soil Moisture Sensors

This gadget used to change over the actual boundaries into an electric sign. The capacity of this sensor is to detect the substance of the dampness in the dirt.

Figure 5. Soil Moisture Sensors



Liquid Crystal Display (LCD) comprises of pole molded little atoms sandwiched between a level piece of glass and a misty substrate. These pole molded particles in the middle of the plates adjust into two distinctive actual positions dependent on the electric charge applied to them. Burns-through less power and produces less warmth. Saves part of room contrasted picture tubes due with LCD's levelness.

## Solar Array

Figure 6. Solar Array

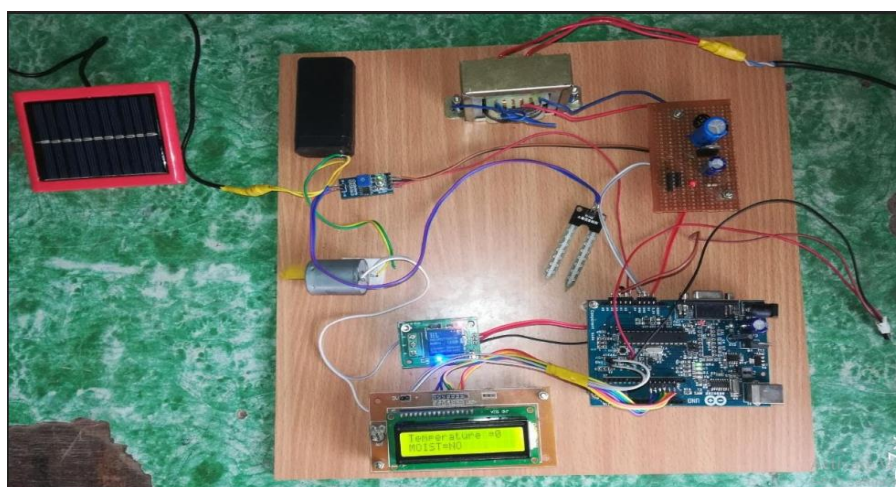


The most helpful strategy for outfitting sun oriented energy is by straightforwardly changing over it into power through Solar PV cell. Sunshine is scene on Solar cells, in this course of action of energy. The PV sway is portrayed as the age of an electromotive power due to the ingestion of ionizing radiation. Energy transformation contraptions, which are used to change light over to power by usage of the PV sway, are called sun oriented cells. Other energy framework has some weight Absence of energy storing and, relatively high capital cost.

### 3. Experimental Setup and Result

The framework gives a web interface to the client with the goal that the client can handle and screen the framework distantly. This venture, gives outline about most recent inserted advances and applications identified with horticulture with examination of other review papers and proposed a novel agribusiness the board framework. Our fundamental goal of this work is to for Farming where different new innovations to yield higher development of the harvests and their water supply. Computerized control highlights with most recent electronic innovation utilizing ATMEL microcontroller which turns the pumping engine ON and OFF on distinguishing the suddenness substance of the dirt. The daylight falling on the solar board comes from the beams of the sun. The motivation behind the gadget is to store the accessible energy from the PV beams in the battery and run the engine. The sensor utilized are temperature sensor and dampness sensor.

Figure 7. Hardware Setup





## Temperature Monitoring

As a result of the running condition, the motor retains the voltage and vibration, thus the motor surface gets heated. So let me say the 3 variations I got into 3 levels.

- a) The output volume shown on the LCD when the motor is not running. The temperature has been measured as 24 degree and It has been in shown figure 8

Figure 8. Temperature Output



- b) According to the program given by the arduinouno the relay, the motor will run only when there is no moisture. The amount of temperature output displayed in LCD while during in its initial stage. The temperature has been measured as 42 degree and It has been in shown figure 9

Figure 9 Temperature Output



- c) After the motor has run for some time the surface temperature rises slightly. Then shows its output in LCD display. The temperature has been measured as 66 degree and It has been in shown figure 10



Figure 10 Temperature Output



### Moisture Sensor

The principle working of this sensor is to Detects the dampness (Humidity) level in the ground and conveys a message to the transfer appropriately.

- a) This dampness sensor identifies nonappearance of the dampness in ground and communicate the sign to the miniature processor after it convey the 'NO' message through the transfer. Here after the engine gets turn ON with the assistance of Relay programmed on off control through introduced software engineer.
- b) This dampness sensor distinguishes nonattendance of the dampness in ground

Also, communicate the sign to the miniature processor after it convey the 'NO' message through the transfer. Here after the engine gets turn ON with the assistance of Relay programmed on off control through introduced programmer. It has been shown in figure 11

Figure 11. Output on Absence of Moisture



- c) Similarly, it detects the presence of moisture in the ground and transmits the signal to the micro processor after it sends the 'YES' signal through Relay. After motor get stop automatically as result of installed coding in relay. It has been shown in figure 12

Figure 12. Output on Presence of Moisture



#### 4. Conclusion

It has been cleared that Nonconventional energy sources debased step by step, so it's obligatory to move regular energy sources like solar, wind, flowing, and so forth. For that reason we utilized solar energy to create power to run the pump and save the time, cash and water utilization, by giving keen control water system framework utilizing amicable solar power. This is a significant investigation in energy and ecological area. The water system control framework was planned, executed, and have accomplished the exploration aims: Sense the dampness of the dirt through the dirt dampness (mugginess) sensors, Display the Temperature and moistness information given by the sensors in LCD screen, Arduino is customized and associated with hand-off to naturally control water system framework, To contact the client by means of humankind advanced cell when the dirt is dry or sodden to consequently kill ON and the water pump to flood the plants land. Water level sensors could be added to flood the land with the appropriate measure of water. Additionally, commotion sensor could be added to shield the homestead field from the animals or even human draw nearer to the ranch by delivering a boisterous sound as a caution or bell. We could add cultivating, sloughing and treating capacities to be executed consequently whether utilizing Arduino or PLC as a regulator. In addition, foster utilizing the GSM Module for controller.

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