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Intelligent Irrigation System for Farms

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ABSTRACT: Agricultural is kind of field in India most people work in. It has well credit in Indian economy. Since last few decades population of India has increased to great extent and hence food and water requirements too. Besides necessity, huge amount of water wastage in the land also takes place, due to improper methods of irrigation. The designed intelligent irrigation system help users to monitor the relative soil moisture at different locations throughout the field to more precisely scheduled irrigation system. Recently solar energy is getting replaced with electrical energy in wide range. Cost effective solar energy can be the answer for all our energy needs. Intelligent irrigation system has made use of same and hence it is best approach to overcome existing problems from energy saving standpoint. Proposed system consists of water pump which is running on solar power and an automatic water flow control with the help of moisture sensors and water level sensor. This system fixes problem of critical energy requirements since it save electricity by reducing the usage of grid power and also save water by reducing water losses. It provides a reliable solution to enhance water usage very effectively using renewable energy sources in the agriculture field. It removes labour need for flooding irrigation. Using this system, we can save energy, manpower and most importantly water to improve the crop production and ultimately profit.

KEYWORDS: Moisture sensor, Water level sensor, Microcontroller, Intelligent irrigation, Solar power, GSM module.

I.INTRODUCTION

Solar power is considered among the largest eco-rich energy source throughout the world. Solar energy cannot be considered an only alternative to the today's high requirement of energy but it serves as an eco-friendly and renewable source of energy. Photovoltaic generation is an optimized approach for exploiting the solar power. Now a day's solar panels are greatly used for powering street lights, providing power to water heaters and to serve domestic demands. Cost of solar panels has been constantly decreasing because of that its utilization in diverse sectors such as home use, irrigation etc has been increased. Irrigation system is one among the versatile applications of solar technology for farming. The proposed system can be a appropriate option for all farmers in the current energy requirements scenario in India. Energy produced using solar system is an eco friendly way of energy production, which offer free and abundant amount of energy once initial investments are made for solar system. In this paper an intelligent irrigation system is proposed which use solar energy for driving water pump to drain water from well or bore well into a tank. So, the automatic regulation for outlet valve of tank is done using moisture sensor and ARM controller which is employed for controlling the rate of water flow from the tank to the irrigation field.

Solar energy is widely available energy source in all over world. Solar energy is not only good by the view of the economy but also solar power is environment friendly form of the energy. Now days this energy is used in street lights and in other domestic loads. Nowadays due to advance technology's the cost of solar panel decreases, which will help to use solar energy in various sectors. In India there is major problem of energy, therefore solar energy is best solution for Indian farmers. The continuously extraction of water from earth is results in decrease water level from earth so that lot of land comes slowly in the un-irrigated area, another reason is unplanned irrigation. Now-a-day's population increases rapidly so demands of food also increases which doesn't get balance between demand and supply of food. So, maintenance of produced food needs to be increased in that order. Present work offers a simpler and economical solution to these entire problems. Modernizing the irrigation services, through existing resources to meet the need of rapidly growing demand of crop production, it is a challenge to researchers. Increasing population stressed pressure mostly on available natural resources to meet the need. Stress on water resources is not far away from this challenge but it is into the core of all. All over 70% of usable water is used for agricultural production and remaining 30% for the domestic purpose. To meet that need of food demand there is need to enhance the crop production either by increasing

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cultivated land or improve agricultural techniques. Irrigation is playing important role in agricultural production as well as water resource management.

Drip irrigation is one of the most popular water-conservation technique. Drip irrigation technology has receiving the unprecedented attention in the recent past. That technique is based on soil moisture content of the crop root zone, so that the crop can be growing healthy in any given environmental condition. In dry or semi-dry regions, root water uptake produce stresses the stoma to regulate its movement, however, the roots take in soil moisture to meet the crop water requirements from the soil and make serious harm to the crop's remain less than the critical limits. The existing alternative irrigation systems are still dependent on human alertness with manual operation to achieve the selected areas of irrigation with slow response and are time consuming. The existing irrigation devices need the external determination of soil moisture content of crop's root zone for different region of cultivation, and hence the serious mismanagement of accuracy of control and timing as a result less agricultural production. In this proposed system, an intelligent drip irrigation system design is proposed which can optimize the crop water requirements along with the automation in the water-conservation field, saving manual labours as well as using the solar power to function in the global energy crisis scenario.

In the world of advanced technologies, life of human being should be simpler. As of now, farmers are facing numerous problems to keep their crops green in summer season. The prime reason for this deficiency of water is the unavailability of proper knowledge regarding the usage of power. The availability of power is only one of the concerning parameter, while they have to wait until the water requirements are fulfilled. So this process leads them to an unnecessary wastage of resources. So the required solution is provided by an intelligent irrigation system. Street lights, water heaters and domestic demands now days are extensively run on solar energy. Solar energy promotes its usage in various areas because of continuous decrease in cost. For present state of energy requirement intelligent irrigation system should be an acceptable substitute for the farmers. We are using moisture sensor in this system which consists of water pump along with automatic water flow control. This system provides a possible way out to enhance water usage effectively in the concerned area.

II. LITERATURE SURVEY

Much research has carried out in design of irrigation system. The water used for crop irrigation is over 60% of the total water, and the agricultural water consumption increases year by year. Many novel methods have developed to pump water. People uses various power resources, like human energy, hydro power, animal power, wind, solar, fuel, etc. The total utilization in agricultural sector stands out at 131.96 billion KWh [2]. So, intelligent irrigation system is the opportunity for farmers and answer for the present energy requirement [2].

Concept of intelligent irrigation: The old irrigation methods are sprinklers and flood type system. In these two methods, the consumption of water is in large amount. In the case of slopes present in the field large amount of water moves downwards. Thus, the remaining part of field remains unirrigated. Large amount of water goes waste in these two methods. Such problem could be overcome by this work which uses different sensors with microcontroller, hence 50% water saving is achieved. Use of solar panel make this green way of energy saving [6].Now-a-days there are different water issues like supply, cost, delivery infrastructure, etc. As population grows the limited water resources spread thin to keep up with demand. The cost of water and power usually increases annually. In many cities and villages, old water system designed decade ago to service much smaller population are inflexible and difficult to maintain [8].

Majority of the power generation is carried out through conventional resources of energy in India. Mineral oil and coal-based power plants heavily contribute to release greenhouse gases. Installation of new power plant is predictably dependent on import of highly volatile fossil fuels like petrol, diesel etc. Thus, it is essential to tackle energy crisis through judicious utilization of richly available renewable energy resources, such as solar energy, biomass energy, wind energy, geothermal energy and Ocean energy [4].Electrical energy wastage could be a main reason for having huge difference between necessity and consumed power. The main reason can be the power supplied for farming needs in during the nighttime. Farmers turn on motor pumps and leave it "on" for the entire night. Farmers do not worry to turn off the motor pumps when the land is watered with sufficient. This is a prime cause of consumption of electrical

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energy from the grid [4].Photovoltaic cells are the transducers that assimilate the light and translate it into electric energy. The connections are done in an array of cells and set between sheets of glass which is then supported inside a metal frame. These frames are called as modularized solar panels. PV cells comprises of thin silicon wafers; a semi-conducting material. When sunlight is incident on these materials, the incident energy removes electrons from their atomic configuration, which facilitates the electrons a conductive path to flow through the material to produce electric power [1].

III. METHODOLOGY

In Existing system developed for efficient use of water and water management. Many systems are available in market but they provide automatic irrigation part and some system provides the solar pumping and automatic irrigation part for drip irrigation only. But proposed irrigation system consist of solar pumping and automatic irrigation for different type like drip irrigation, sprinkler irrigation and direct water flow. In this system we utilize the solar power from solar panels to automatically drive water from well directly into a storage tank depending. According to the requirement the water will be supplied to the field. A solenoid valve is self-controllable by smart algorithm in which it regulates the water flow into the field according to moisture requirement of the field. In this we are also using water level sensor to detect the water level in the storage tank. With the help of moisture sensor we detect the amount of moisture exist in the soil. According to the requirement of moisture content for the crop the water flow is regulated. So we can conserve the water by avoiding over flooding of crops.

Block Diagram:

In the fig 1, it shows the block diagram of proposed system. It includes different blocks like Microcontroller, Soil Moisture Sensor, Water Level Sensor, etc. All the blocks are explain in the next part.

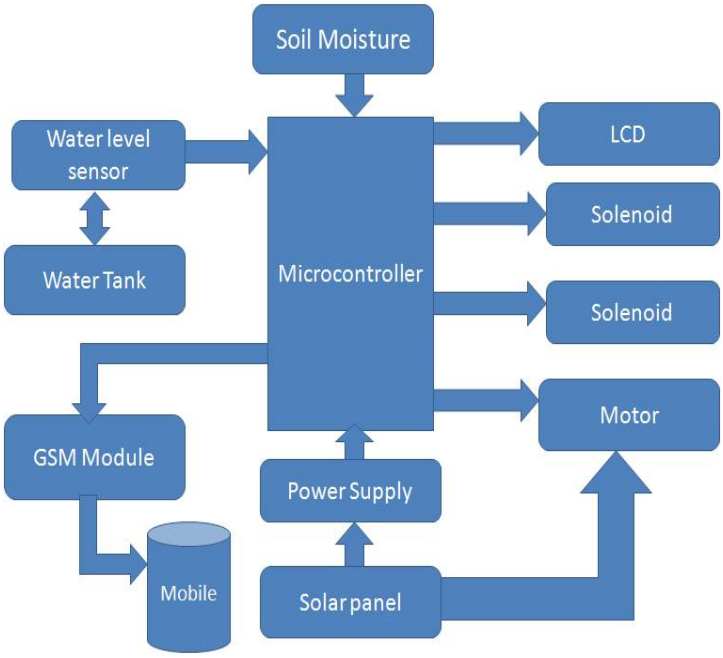

Fig. 1: Praposed block diagram

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Soil Moisture Sensor: Soil moisture sensors determine the volumetric water content in the soil. Vegetation and crops are always depending on the moisture available at root level in the soil. It monitors moisture contents in the soil. It is having connecting probes, which is laid down in the soil. This is used to sense the moisture content in the soil and send the signal to the controller. If the level of moisture in the soil reaches below the pre-set value, then the water is supplied to the field. So these sensors do not have moving parts, they are specific, do not need calibration, work under many environmental situations and are consistent between sensors reading. They are not expensive and easy to use.

Water level sensor: Water level sensor detects level of water in the storage container. If water level is above high level set point then water will be supplied to the field and if it decreases below low level set point then it will give the command to the controller and water will be provided from well or bore to the storage tank.

Solar panel: It pumps electrical energy into a battery to store it but it has no control over received electricity and battery storage. The charge controller placed in between the solar panels. Then the battery regulates the current and the voltage mainly halts charging activity temporally when it is necessary. Solar tracker is the device used to arrange a particular solar panel of photovoltaic module with the sun, so that the tracker can upgrade the systems output power by keeping the sun in focus for the whole day. Thus increase in efficiency of the equipment over the fixed position system.

Solenoid: It is having the tightly wound coil into a packed helix. In physics, the term refers particularly to a long thin loop of wire, often wrapped around the metallic core which produces a uniform magnetic-field in a volume of when the electric current is passed through it. Whenever it generates the controlled magnetic field we use a solenoid which is a type of electromagnet.

Microcontroller: We are using ARM7 microcontroller in this project. The LPC2138 microcontroller is base on a 16/32-bit ARM7TDMI-S CPU with real-time emulation, that combine the microcontroller with 32 kB, 64 kB, 128 kB, 256 kB and 512 kB of embedded high-speed flash memory. Unique accelerator architecture enables 32-bit code execution at maximum clock rate and a 128-bit wide memory interface.

LCD Display: The standard liquid display used in this work. It is 16×2 display i.e. 16 characters per 2 lines. LCD displays the motors ON/OFF state and displays the quantity of moisture sensor.

GSM Module: The GSM modem is having RS232 interface, which allow you to connect PC, microcontroller to MAX232. It consist internal TCP/IP stack to enable you to connect with internet via GPRS. It is more suitable for Voice, SMS and DATA transfer applications as well. By using GSM modem, you can send SMS, Audio calls, Read SMS; attend the incoming calls and internet act through a simple AT commands.

Motor: In this, we take the values from field sensor like soil moisture and water level. If the input values are abnormal then motor starts. When the moisture is normal during this case, its pre-set value and field sensors values are equal so motor will automatically turn off. In case, if any one of the field sensor remain abnormal then the pre-set value will not match with the field sensors values so motor will remain ON.

Flow charts:

In the fig 2, it shows the implemented flowchart for the proposed systems. This explains the start and end of the system with two conditions of soil moisture and water level sensor.

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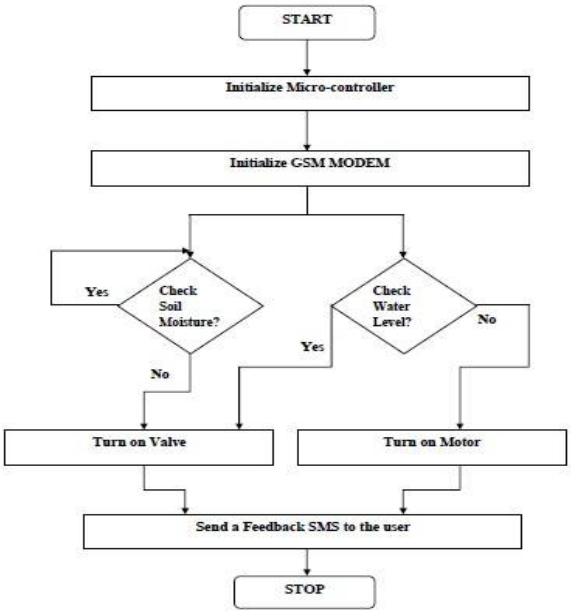

Fig. 2: Flow Chart 1

In the fig 3, it shows the implemented flowchart for the proposed systems. This gives the details about soil moisture sensor working.

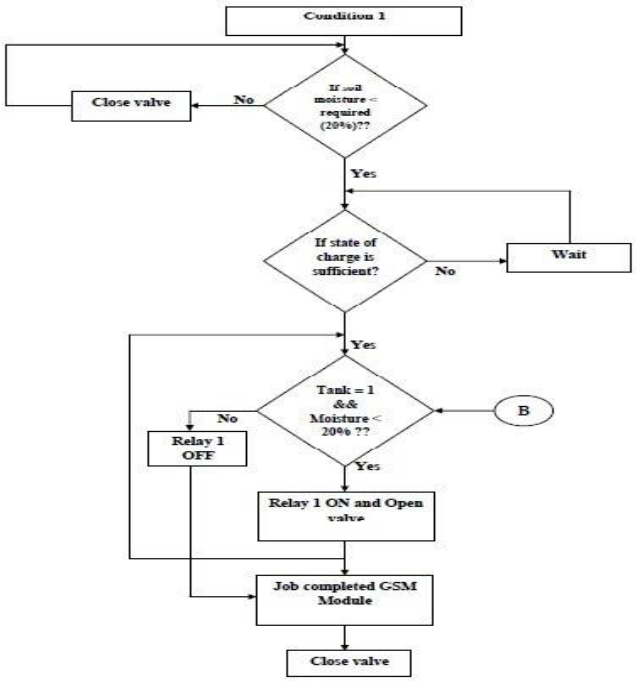

Fig. 3: Flow chart 2

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In the fig 4, it shows the implemented flowchart for the proposed systems. This gives the details about water level sensor working.

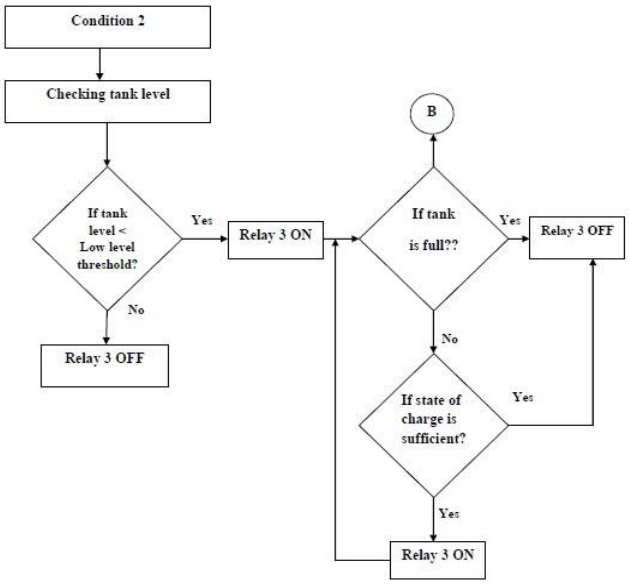

Fig. 4: Flow Chart 3

Advantages of the system:

1) It is a solution for energy crisis.
2) Reduce water wastage.
3) Easy to implement and environment friendly.
4) Used for drip irrigation, Sprinkler irrigation and direct water flow.
5) Less man power required.
6) Less energy conservation.
7) No manual operation is required hence cost of maintenance is reduced significantly.

IV. RESULT AND DISCUSSION

In the fig 5, it shows the systems working hardware. This system was tested in the field. Proposed system in this project will be able to optimize the usage of water and reduce manpower.

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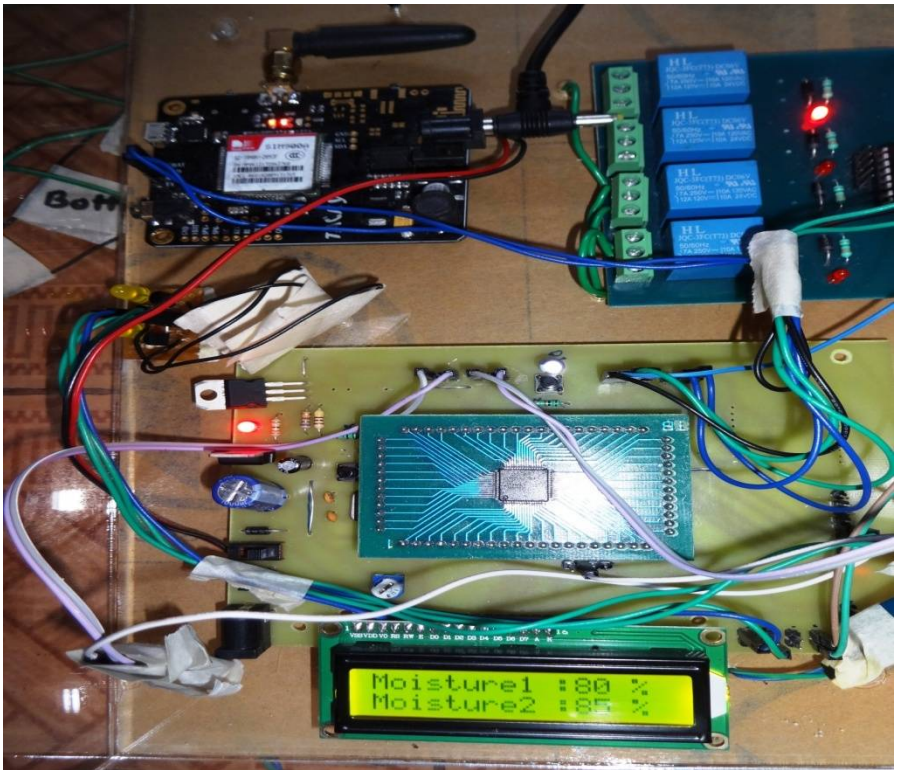
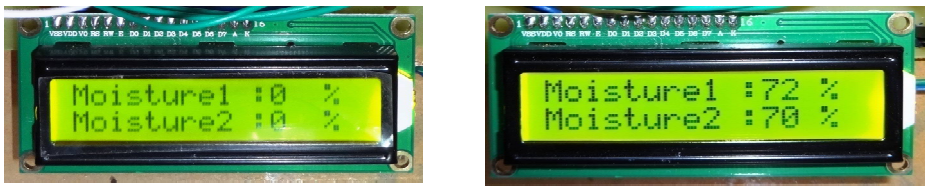
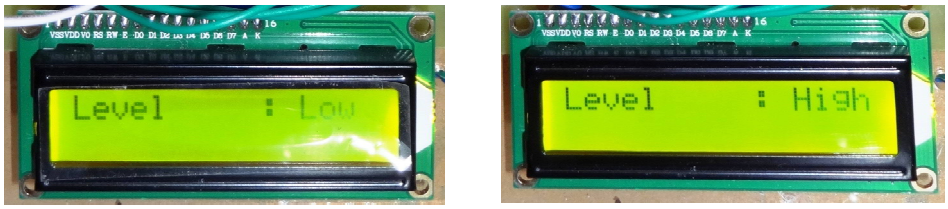


Fig. 5 Working Hardware



Moisture Sensor Output on LCD



Water Level Sensor Output on LCD

Fig. 6 Sensors Output on LCD Display

In the fig 6, it shows the output of soil moisture sensors in first two display pictures and output of water level sensor in second two display pictures.

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V.CONCLUSION

Intelligent irrigation system increases the usage of water by reducing wastage and reducing the personal human involvement in the field. The excess power produced with the help of solar system can be given to the grid with small modification in this system circuit, which will be a source of income for the farmers. That encourages Indian agriculture. This system is environment friendly solution and easy to implement to irrigate the fields.This proposed method will be found successful when implemented in field as they pump all over the whole day. This system require nominal attention maintenance and as they are automated. This system also determines the possibility and applications by using solar panels to provide power for pumping demands of sprinkler irrigation. To be implemented this system we required high capital investment but the overall profit is high. This system is economical for long time.

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