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Auto Irrigation using Sun Tracking and Crop Monitoring- A Review

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ABSTRACT:

In daily operations related to farming or gardening, watering is the most important cultural practice. Especially in rice cultivation huge amount of water is used. In conventional method continuous standing water is kept above paddy field during whole growing period of rice crop, though it is not necessary to keep continuous standing water in the field. The alternate Wetting and Drying (AWD) irrigation systems are a modern technology which saves water as well as increases crop yield. This AWD is being practiced manually in Bangladesh. This proposed model aims to make the AWD irrigation system into automated AWD irrigation system. However huge amount of electric power and fuel are being consumed by irrigation system in the country. The other aims of the proposed model are use of renewable energy instead of electric and fuel energy to save and secure future resources. To fulfil the country's feed, enhance the economy and develop availability of water automation in AWD is an essential requirement. Smart irrigation system occupies an exact amount of water at the correct location. It saves time and decreases hard work. It also makes a country self-sufficient in the food section. The traditional watering system is long time consumed where automation in AWD mitigate the time duration. It can also sense the weather behaviour. During the rainy season it checks the possibility of rain and acts like that with help of the multi-level sensors. So, it can improve production efficiency as well. For this reason, an automatic irrigation control system has been designed with sensors, solar panels, fast charger, and battery. The sensors detect the dynamic water above and below ground surface. All this set up is controlled by Arduino microcontroller. Online Wi-fi ESP8266 module is used to control automated online monitoring to get feedback from sensors. A fast charger is used as back up part in AWD method. This whole circuit is more efficient and works automatically and manually.

Keywords: Solar Panel, Irrigation System, Moisture Sensor, Arduino, etc.

Introduction:

Agriculture is vital to many economies. With the rising need for food and resources, it is essential to improve farming practices. Irrigation is a key part of crop production. If it is not managed well, it can waste water, lower crop yields, and increase costs. Recently, combining technology with agriculture, often called smart farming, has provided useful solutions. This project, "Auto Irrigation Using Sun Tracking and Crop Monitoring," introduces a new approach to precision farming. It merges automated irrigation systems with solar tracking and real-time crop monitoring. The sun-tracking system ensures solar panels follow the sun's position throughout the day. This maximizes energy generation for powering sensors and irrigation parts. At the same time, sensors track important environmental factors like soil moisture, temperature, humidity, and sunlight intensity.

One of the major targets of Sustainable Development Goal (SDG) is food security and modern agricultural can play a vital role. Bangladesh is an agriculturally based country. It is the fourth-largest rice producer all over the world (World Atlas, 2021). Agriculture covers 71% land area of Bangladesh (Trading Economics, 2021). Rice is the staple food of about 163 million country's people. It provides nearly 48% of rural employment, about two-third of total calorie supply and about one-half of the total protein (Trading Economics, 2021). Since the agricultural land decreasing day by day on the other hand population is increasing. Therefore, food production has to be increased either vertically or horizontally for feeding future generation. But there is no alternative of adaption modern technology to increase the productivity of the land.

The prototype-based study is designed to automate irrigation practices. The soil and moisture sensors are utilizing to switch the motor pump. This system is the optimum solution with low energy consumption with economical for small and large-scale irrigation applications. This reduces water depletion with sustainable practices. This system uses an Arduino microcontroller with a 12V DC power supply to ensure low power consumption. This integrated system controls the motor using moisture sensors. It reduces labor costs with fewer human efforts for both small and huge irrigation systems. [20]. In 2022, the Pakistan Government approved the Quaid-e-Azam Solar Park rated 1000 MW. A feasibility analysis was carried out using RET, Screen software to reduce energy shortage. The energy shortfall of Pakistan reached up to 6000 MW [21]. Indonesia's economy major part depends on agricultural activities. For irrigation Indonesia uses fossil fuels that produce huge emissions the implementation of a sustainable solar-powered irrigation system solves this problem. In this study, automatic solar power is integrated with the sun-tracking system.

Body: The proposed system aims at providing an automatic irrigation system by monitoring the field, crop and weather conditions. The system is powered up by a solar tracker which in turn reduces the cost of electrical power consumption. The system also provides real time updates to the farmer, using which he can manually control the system over web whenever needed.

The Sun powered tracking Auto irrigation system has following advantages:

- Saving water
- Saving Time
- Saving man power

Sr. No	Name Of Authors	Description
1	Nitesh A. Pachpor, Ashutosh Shinde, Dipali Kale, Rupal Chatur & Priti P. Lad (2019)	Describes An Arduino-Based System Using Ldr Sensors For Sun-Tracking Solar Panels And Soil Moisture Sensing To Control Irrigation Pumps
2	M. Saranya Nair & Karan Bhatia (2017)	Developed At Vellore Institute Of Technology (Chennai) Integrating Servo-Motor Solar Tracking, Moisture Sensing, And Web-Based Monitoring
3	U. Arjun, L. Gayathri, B. K. Gowri, V. P. Malavika, Ajish Ashok & C. Sojy Rajan (2022)	A Conference Chapter Describing A Dual-Axis Tracker Using Ldrs, Arduino Nano, Dht-11 Sensors, And Pump Control For Smart Irrigation
4	Abhishek Nagane, Sumit Muke, Chandulal Guguloth & Shreepad Yadav (2021)	Focused On Solar-Powered Irrigation With Soil Moisture Sensor Feedback And Sun-Tracking Mechanisms
5	C. V. Suresh Babu, Bala S. Ganesh, T. K. Kishoor, Alex Khang	Examines An Automated Irrigation System Powered By Solar Tracking Photovoltaics, Where Generated Energy Directly Drives Pumps And Sprinklers For Irrigation

- Optimal water supply to plant/crop.
- Automatic Operation.
- High Efficiency.

Literature Survey:

Proposed Methodology:

Where making the irrigation system an intelligent one. In this system the water force will be an automated done using switch button that means the pump will force the water only when the land needs it. And the water pump will be controlled by a cellular phone from any remote position. To achieve this task, we're making use of a Humidity detector and a node MCU Module or device. The humidity detector will be placed in the field, and it'll be connected to the microcontroller. The humidity detector will be continuously transferring the quantum of humidity to the microcontroller, where it'll be compared with a predefined value. Now whenever the humidity position becomes lower than the predefined position, the microcontroller will spark the node MCU Module, which will shoot a communication to the stoner, stating that the humidity position of the land has dropped. Now upon entering the communication the stoner can spark or switch on the water pump by just transferring a SMS. After entering the SMS, the Node MCU module will shoot the data to the microcontroller and the microcontroller will shoot a command to spark the water pump. After the motor gets started and starts supplying water to the field, contemporaneously the humidity detector will be transferring the humidity. position to the microcontroller. Since the field is getting water force now the humidity position of the field will start adding, this increase in the humidity will again be compared with a predefined humidity position by the microcontroller. Once if it reaches the maximum position again the microcontroller will spark the Wi-Fi module which will again shoot a communication to the stoner about the increase in the humidity position. Now if the stoner wants, he/ she can switch off the water pump by transferring a SMS and they can manage to irrigate asked plot by transferring an SMS. This is how the system will come an automated system also we're drawing maximum power through the sun Now moving to another part of the design, the energy generated through the solar panel. will be transferred to a DC battery. The battery will store the energy for farther operations.

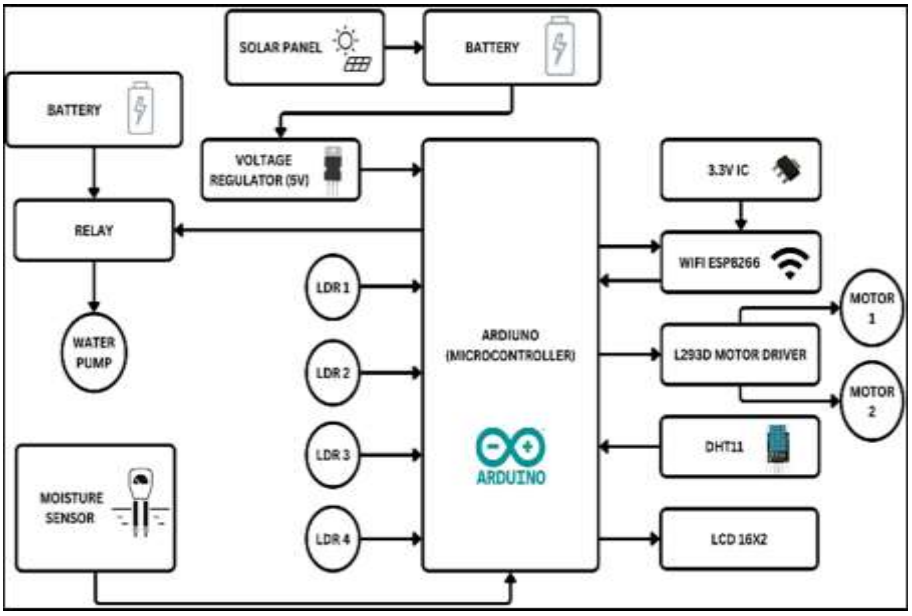

Fig: Block diagram of IOT Base Smart Agriculture System with Dual Axis Solar Tracker

Conclusion:

The proposed sun tracker assisted automatic irrigation system for agricultural fields is successfully constructed and tested in real time. Additional simulator scripts are created to check the system response for a specific soil moisture value. It is observed that the water wastage is reduced considerably. The farmer can remotely monitor the field and crop conditions, thereby planning for an efficient future watering schedule. By relying on weather forecast information, the ground water level also can be maintained. The energy consumption is also handled effectively using our solar tracker. This system will be of prominent use in drought areas or the areas with water scarcity. The system can be improved further by adding pH sensors. By monitoring the pH values, fertilizer usage can also be reduced. The energy efficiency of the system can be further improved by putting the system in sleep mode during the night.

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