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SOLAR POWER BASED MODERNIZATION OF AGRICULTURE FOR CROP PROTECTION USING IOT

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Abstract : This paper describes a cooperative system that uses sensors and a wireless sensor network (WSN). This paper has temperature and air or dust sensors that are exposed to natural changes. The sensor measures the value and uses a DC motor to open and close the panel in order to safeguard against cutting. Crop protection is achieved by using water to measure soil moisture.

Depending on the settings at which the controller chooses whether to supply water or not. Farmers may be drawn to modern agriculture since it simulates agriculture and uses microprocessors. As a result, this process has increased farmers interest in integrating remote field monitoring into their agricultural operations. Making direct communication with farmers and simplifying their tasks is the primary objective. Farmers are informed on soil physical activity, weather, temperature, altitude, and humidity via cell phones. In order to help farmers maintain their land, thingspeak website will send notifications with a date and time on their phone. Farmers that employ this technique will feel at ease and free to cultivate their land. In situations where they can't be managed, farmers will be able to keep an eye on their land from a distance. Farmers have remote access to their land. By looking at their phones, they will be able to operate from a distance. The other primary goal is to use solar energy sources that are renewable to provide some income or money to farmers on the same plot of land.

***Key words* : Crop protection, IOT, Microcontrollers, WSN**

I. INTRODUCTION

Agriculture is the backbone of India. Today, India is a producer of wheat, rice, etc. second largest in the world. Education changes according to people's lifestyles. Nowadays technology is making people lazy so agriculture has developed with new tools. Pesticide is indispensable in agriculture. In order for farmers to know about their crops, the remote sea must log in to the website with the unique username and password, to be able to view the content. content sent by Arduino, including date, time and data used. With WiFi integration, they can easily monitor their lands via WiFi. Dry land is a major threat to farmers. Understanding and highlighting the main points of our thesis is not an easy task. Here we regularly post methods to prevent plants from rotting due to heavy rain and exposure to sunlight. This is achieved through a design process using IoT technology. The obvious idea is to protect crops from heavy rain and sun by closing off areas that receive and conserve rainwater. We used IoT, Sensors and soil moisture sensor in this system to carry out this study for hours. Here we only use renewable energy, i.e. solar energy produced by solar panels, as the power source for this project. A growing portion of the population depends on trees for farming or work. Here we see how brutal modern agriculture is because of the ravages of disease. The benefits of technological development in agriculture depend on

India's ability to develop and produce infrastructure such as water, connectivity, flood control and stable power supply. Irrigation is not an important part of the development of our country's economy. Through timely irrigation, judicious use of bio fertilizers and proper field maintenance, Indian agriculture has been modernized. The expansion strategy will be an important tool to reduce the energy costs required for ventilation systems in agriculture. The system uses a combination of wired and wireless technology with the ARM controller to provide continuously updated information about the agricultural environment and metrics needed for agriculture. e-ISSN: 2582-5208 International Research Journal of Modernization.

II. LITERATURE REVIEW

In the more than 50 years since it gained its independence, India has accomplished a great deal in agriculture to increase food production. India's agricultural policy was altered as a result of severe drought in 1965 and 1966. Regardless of the success of the agrarian approach, the groundwater is poor to the point that India n ranchers constructed wells to gather groundwater. New technologies are being used to irrigate large areas. The long-term advantages of horticultural technology advancement rely upon India's foundation upgrades, for example, water availability, flood control, solid power and generation limit. It becomes an important component of the expansion of our nation's economy alongside the rivers. Ideal water system and utilization of bio composts alongside appropriate administration of the fields has prompted the modernization of Indian horticulture. This turns out to be an intriguing concept that will help cut down on the energy costs associated with agricultural fogging. The system controls the agricultural environment and provides the necessary protection for production in today's farm farming by combining wired and wireless technology with an ARM controller.

A wireless sensor network was created by Balaji Banu [1] to monitor agriculture and enhance crop yield and quality. These sensors include water level, humidity, temperature, and others. For multistate monitoring, the designer makes use of analog-to-digital conversion as well as wireless transceiver modules and sensor nodes based on the Zigbee protocol, such as the ATMEGA8535 and I CS8817 BS system. Information is stored using web applications and databases. The energy performance is controlled by the sensor nodes while they are inactive during this test.

A smart farm monitoring experiment using ZigBee technology was carried out by Liu Dan [2], Joseph Haul, Kisangiri Michael [3], Wang Weighing, and Cao Shuntian [3]. Their experiments aim to create a controlled working environment in the greenhouse that can control the environment, cut down on farming and investment, and save energy and electricity. This IoT technology is based on the BS standard and the cc2530 wireless sensor node and controller chip. The Linux operating system and the cortex A8 processor serve as the foundation for the gateway. The design is well-known for its ability to monitor the greenhouse from a distance and also saves money on energy by ostensibly replacing conventional electrical appliances.

III A. HARDWARE DESCRIPTION

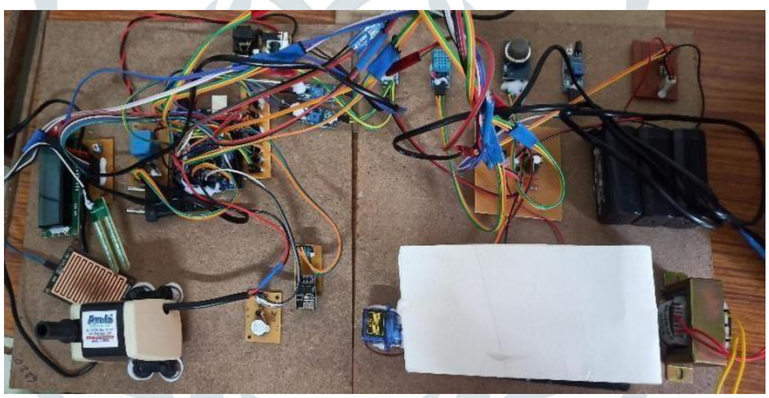


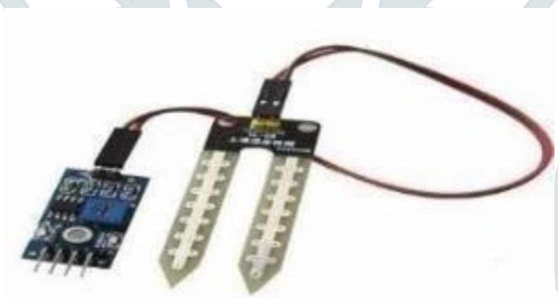
Fig1: Construction of circuit of the proposed system

ArduinoUno: It can interface simple sensors that give ceaseless information, like temperature and dampness sensors. The Arduino Uno also has a number of digital input and output pins that can be used to control motors, pumps, and relays, among other things. The C++-based Arduino programming language can be used to program these pins. The low power utilization of the Arduino Uno makes it ideal for use in a nursery setting, where energy productivity is significant. The simplicity of arrangement and programming likewise settles on it a decent decision for ranchers who might not have broad specialized skill. By and large, the Arduino Uno microcontroller gives an adaptable and effective stage for controlling the different parts in a nursery framework, including sensors, actuators, and different gadgets. The farmer can develop a bespoke system that maximizes yield and quality of their crops by programming the microcontroller to respond to various inputs and conditions.

Fig2: Arduino UNO

Sensors: There are three kinds of sensors that can be used to measure the various environmental conditions that are necessary

The Grove Soil Moisture Sensor can accurately measure the soil's humidity. Utilization of electric conflict between two points could precisely ration the volumetric liquid contained in the earth indirectly. It is useful in agricultural systems because it identifies earth's humidity levels, which means that the ground would need to be moistened when needed and could impede



2) The DHT11 humidity sensor was able to calculate environmental data with up to 2 percent relative humidity accuracy. The sensor was chosen because maximum harvests will result in the highest yield of produce as soon as humidity falls within an ideal range As outdoors conditions basically support those special greenhouses nurseries estimations are critical.

Fig 4: DHT11 humidity sensor

3) The LM35 is a temperature computing gadget having identical result voltage proportionate to temperature. The LM35 provides output voltage in either Celsius or Fahrenheit.

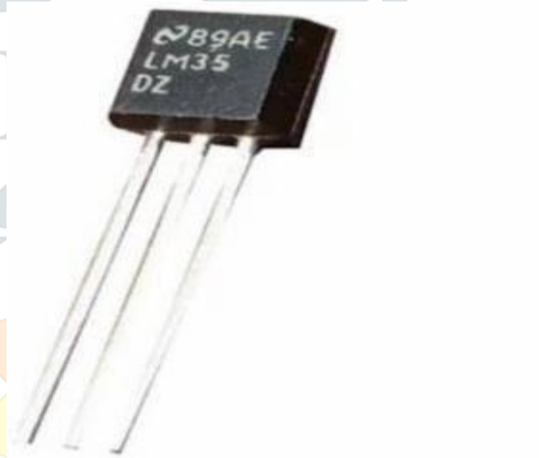


Fig 5: LM35 temperature sensor

4) The object-detecting sensor can be used in the field to detect any object that is touched. It will sound a beep when it detects any object within 3 milliseconds, allowing the farmer to enter the land and safeguard the field.

Fig 6: Object detecting sensor

WIFI: Utilize WSN to collect temperature, humidity, and other information from various sensors. It will be straightforwardly up dated for approved clients.

Fig 7: Wireless sensor network

Solar Panel: During crop protection, solar panels primarily perform opening and closing functions. The boards are situated 2-3 meters off the ground and sit at a point of 30 degrees, giving shades and offering crop insurance from climate.

Fig 8: Solar panels

Battery: The battery is what we use to power the motor. It gives a voltage in the scope of 220v. It supplies power whenever it is required to do so in a field to continuously monitor the farmer.

Fig 9: Battery

B. SOFTWARE DESCRIPTION:

Internet of Things (IOT): Web of things (IoT) is a worldwide framework for the data society, empowering progressed administrations by interconnecting (physical and Virtual) things in view of existing and developing interoperable data and correspondence advancements. With The web of things the correspondence is stretched out by means of web to everything that encompass us. The Internet Of Things encompasses a lot more than just wireless sensor networks, machineto-machine communication, 2G/3G/4G, GSM, GPRS, RFID, WI-FI, GPS, microcontrollers, microprocessors, and other similar technologies. These are considered just like the empowering innovations that make “Web of Things” applications conceivable. Empowering Advances for the Web of Things are thought of as in and can be gathered into three classifications:

1) Innovations that empower “things” to secure logical Data, advances that empower “things” to deal with Relevant data.

2) Advances to further develop security and protection. The first two categories can be understood as the necessary functional building blocks for incorporating “intelligence” into “things,” which are, in fact, the characteristics that set the Internet of Things apart from the conventional Internet. The Internet of Things is not a single technology; rather, it is a combination of various hardware and software technologies. The third category is not a functional requirement but rather a defactor requirement, which would severely limit IoT penetration. The Web of Things gives arrangements in light of the combination of data innovation, which alludes to equipment and programming used to store, recover, and process information and correspondences innovation which incorporates electronic frameworks utilized for correspondence between people or gatherings. In order to meet the requirements of IoT applications for energy efficiency, speed, security, and dependability, a diverse mix of communication technologies must be adapted. In this setting, it’s possible that the diversity will increase to a number of manageable connectivity technologies that meet the needs of IoT applications, are adopted by the market, have already proven to be usable, and are backed by a strong technology alliance. The key enabling technologies for the Internet of Things, such as internet, WIFI, Bluetooth, ZigBee, GSM, and GPRS, are examples of standards in these categories .

IV. METHODOLOGY

The diagram shows the simplified block level configuration of the system.

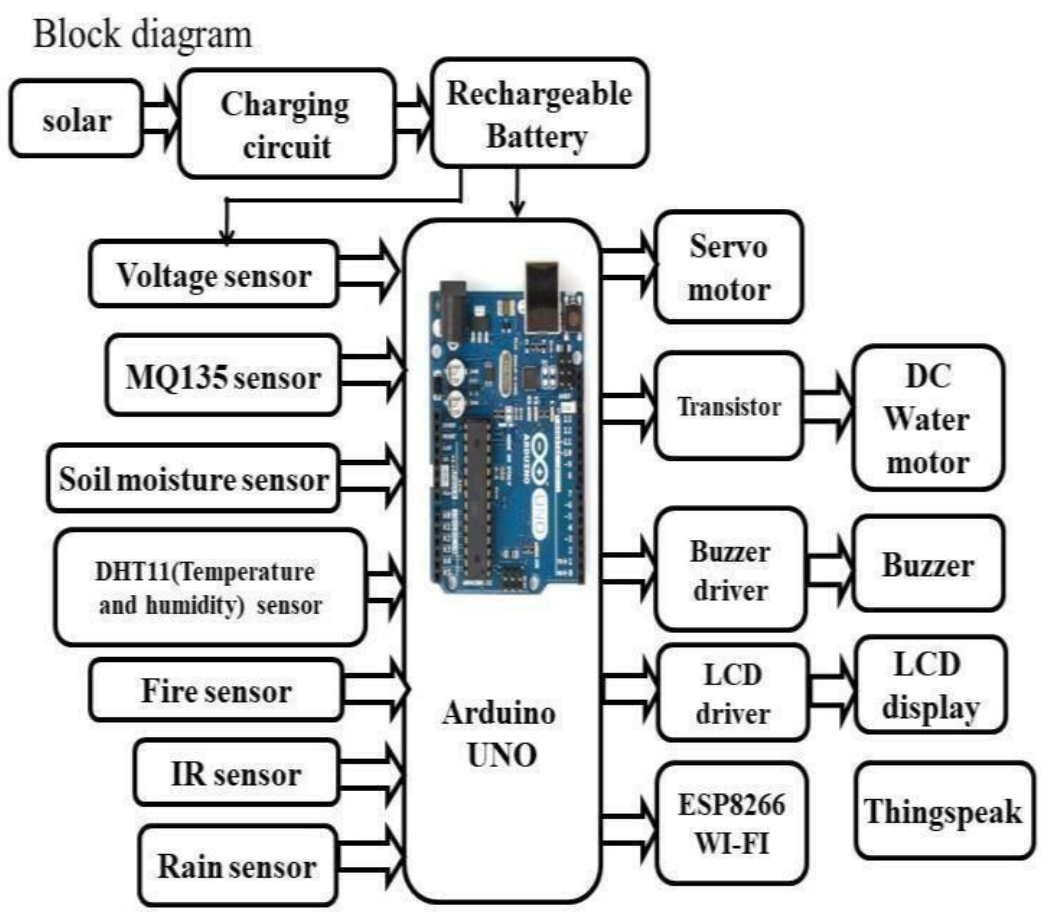


Fig. 10. Block diagram of proposed system

The system's components are depicted in the diagram in this framework the contributions of the framework are Power moving through the input and output ports.

A.WORKING

First, the processor detects the presence of solar energy, which is connected to the motor and driver. After
turning 180 º clockwise and anticlockwise, the solar panel hides inside the battery to come to a stop. The maximum and minimum soil moisture levels are managed via sensors. The pump motor will force water into the field when soil moisture levels are low. The user will receive all of the aforementioned information via IoT technology. The thermometer will gauge the temperature throughout the farm, the rain gauge will identify periods of heavy rain and shut off the panels to save the crops. The relay is attached to the water pump, and the pump begins to pump water when the humidity sensor determines that the soil is dry. The system uses the solar power to work all sensors and controller.

1) The intense sun, intense rain, industrial gas leaks, and fire, is the primary goal.
2) The sensor is positioned to keep an eye on various conditions, such as strong sunlight, rain, etc.
3) The solar panel is used to guard against industrial leaks, rain, and excessive temperatures.
4) The design of the system takes into account the area where the panels are installed while determining the opening and shutting system for the crops.
5) any causes.

This is a more thorough flowchart for the system's automatic control and monitoring mode:

1) Get started
2) Read data from sensors or other sources, such as weather, obstacle detection, temperature, and moisture content.
3) Analyze inputs to decide what steps to take in accordance with preset thresholds and set points.
4) Produce control signals to modify output devices, such as heaters, fans, and water pumps.
5) Issue commands to actuators or additional output device.
6) Keep an eye on system reaction.
7) Adapt control signals in response to sensor feedback as necessary.
8) When a parameter approaches a certain value, alert the microcontroller.
9) After receiving the signal, the microcontroller enters manual mode, allowing the user to operate the device.
10) The user has setpoint adjustments.

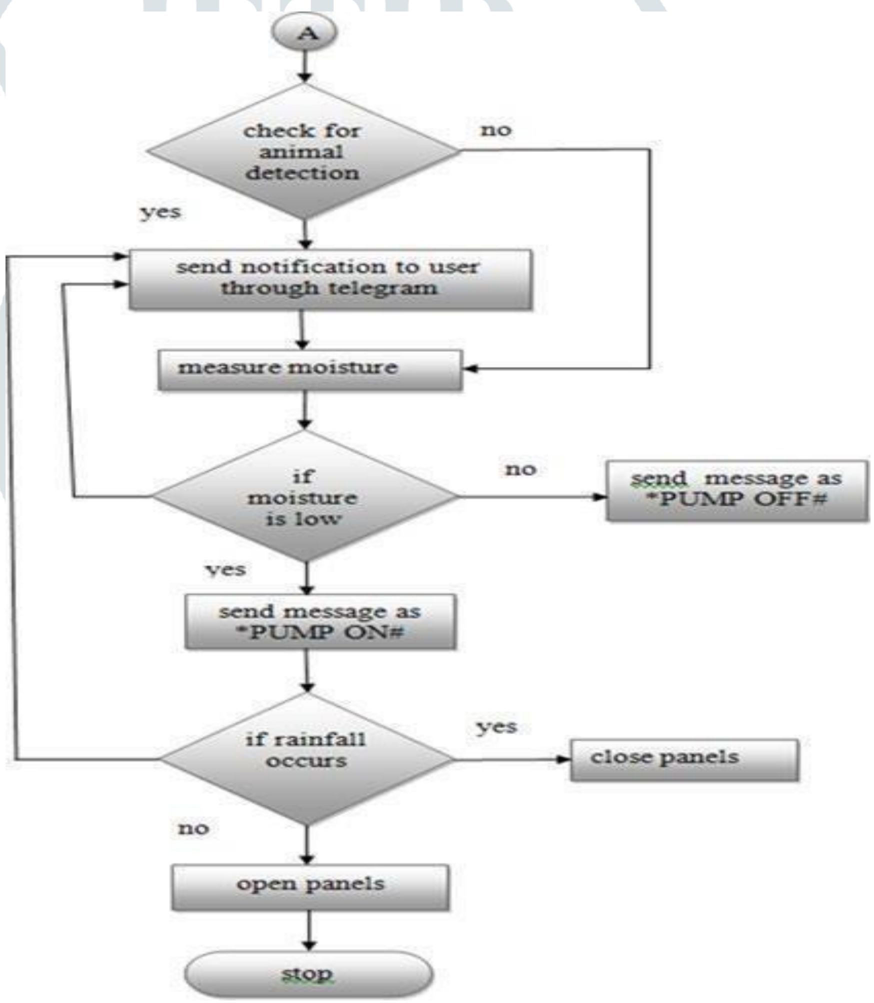


Fig 12: Flow chart represents a basic manual mode of control.

V.RESULT AND DISCUSSION:

Making sure that the greenhouse has a way to gather rainwater is necessary. In short, the primary control variables to take into account when cultivating serrano pepper in the area of interest are:

1. Temperature: Set the greenhouse's temperature within it around 24 and 27 degrees Celsius. A thermostat-based heating and cooling system will be used for this method.
2. Soil: Use drain-friendly, sand loam soil which is full of organic matter. Adding compost or other organic materials to the soil will assist achieve this.
3. Moisture: Preserve soil moisture values acceptable to the crop. The moisture level is 100 in this instance. When the relative humidity rises above 100, the irrigation system needs to be turned off automatically.
4. Preventive rain: Utilize a rain sensor to determine when precipitation is anticipated. When a substantial downpour Occurs, the greenhouse roof ought to automatically close to safeguard the crops and stop irrigation. Gathering and using rainwater for other purposes requires installing a rainwater harvesting system. By changing these variables, the farmer can maximise Serrano Pepper growth and yield even during the wet season.

V. CONCLUSION:

In conclusion, the solar-powered modernization of agriculture and crop protection using IoT (Internet of Things) technology has significant potential to improve the efficiency, productivity, and sustainability of farming practices. With the use of solar energy, farmers can reduce their dependence on traditional fossil fuels and can save on energy costs while reducing their carbon footprint. Additionally, IOT devices such as sensors and drones can help farmers monitor crop health, soil moisture levels, and weather conditions in real-time, allowing for precision farming and targeted application of resources. The integration of solar energy and iot technology in agriculture can help address many of the challenges faced by farmers today, including climate change, water scarcity, and food security. It can also lead to more profitable and sustainable farming practices while improving the quality and quantity of crop yields. However, there are still challenges to be addressed, such as the high cost of implementing IoT systems and the need for adequate training and support for farmers to use them effectively. Additionally, there may be concerns around data privacy and security, which must be addressed to ensure the safe and ethical use of IoT technology in agriculture. Overall, the solar-powered modernization of agriculture and crop protection using IoT technology holds significant promise for the future of farming, and continued research and investment in this area is crucial to its success.

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