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RENEWABLE ENERGY BASED INTRGRATION INTO CLOUD AND IOT BASED SMART AGRICULTURE

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Abstract: The development of a smart farm system using renewable energy is suggested in this paper. The goal of the article is to use IOT and smart agriculture using emerging technology. The key to increasing the production of productive crops is tokeep an eye on the environment. The creation of a system thatcan track temperature, humidity, and moisture is a feature of this article. A water pumping system can automatically turn on and off based on the soil's moisture content. We employ a solar fencing system to keep animals away from the crops.
The crop can be protected from insects with a led pest trap. Both solar fencing and led pest traps have automatically turn on at night time. By giving proper amount of water to the plant with the help of automatic drip irrigation system, we might improve productivity.

Keyword: **Solar power – pumping water with BLDC motor – solar fencing system – solar led pest trap – data transferred to cloud – controlled in android**

I. INTRODUCTION

The foundation and primary force behind life on earth is water.

Water is used by humans for agriculture, sanitation, and industrial purposes. The annual water withdrawal has increased in recent decades. yearly volume varies between 11 and 15 billion cubic metres, of which 69% is used for agriculture.

Sadly, the majority of this water is lost due to ineffective irrigation control systems. The greatest user of freshwater in Morocco is agriculture, as it is in the majority of dry and sub-Saharan nations, especially since the Green Plan programme. This initiative intends to promote agriculture as a productive industry capable of boosting the economy, combating poverty, and effectively and sustainably preserving a large population in rural areas.

To ensure there was enough basic food for local consumption and programmes to promote exports, the government offered several facilities and assistance to farmers and investors in irrigated agriculture within the framework of this programme.

Additionally, investors in irrigated agricultural projects began sounding the alarms about the impending severe groundwater depletion [3] and the absence of a real-time, cost-effective data collection system for irrigation systems in farming fields that would allow them to take advantage of cutting-edge technologies.

For sustainable, efficient, and smart agriculture to take place in sub-Saharan settings, a cost-effective and long-lasting data collecting system is required. The system should utilise cutting-edge information and communication technologies (ICT) that can withstand the aridity of an agricultural setting as well as renewable energy sources. The data capture system can be very important in boosting agricultural output and raising crop quality when combined with suitable control, management, and data analytics.

Most notably, unlike the conventional techniques of irrigated agriculture, which heavily depend on fossil fuels, especially gas, as a source of energy and frequently utilise subsurface water reservoirs. Modern management systems are used by smart agriculture (SA) to rationalise water use and switch to renewable energy sources.

II. BLOCK DIAGRAM

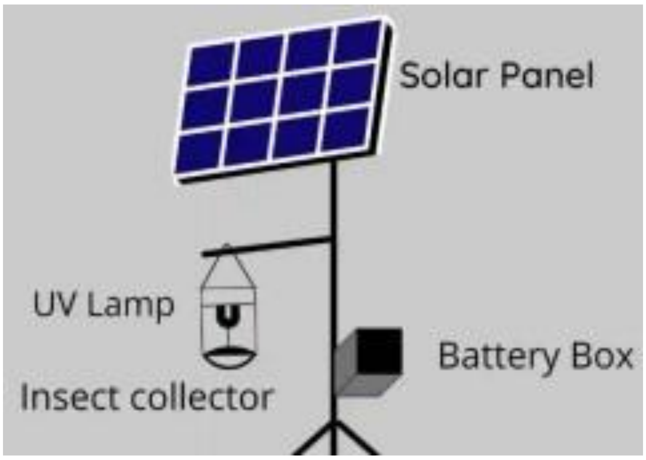

Fig 1.1 Model block diagram of pest trap

Fig 1.2Model block diagram of irrigation

The above block diagram shows the output and inputs of the microcontroller in the drone system. The RC controller of the drone is helps control the speed of the propellers and also act as a flight controller. Sensors inside acrylic box sends the whether the medicine or surgical items or medicals products inside the box or not and it sends the data to the mobile through the microcontroller and then the location coordinates and the fixed wave points sent by interfaces with the rc controller. After the microcontroller starts motors for spinning the propellers and gps module helps to move the motors according the locations coordinates sent by the app.

III. COMPONENTS SCOPE

1. Cloud-Based Big Data Analytics Platforms

The open-source flow-based programming tool Node-RED is used in this study to enable the wiring of hardware components, application programming interfaces (APIs), and web services. To create the application, we used the JavaScript-based library that came with Node.js. We constructed the various required functional IoT components for the application and wired pre programmed nodes represented by relevant iconography.

2. Smart Irrigation Management

The irrigation practises currently in use are rather sophisticated and rely on watering at specified intervals, which doesn't require a lot of human involvement. However, it also requires a lot of guesswork and can be extremely wasteful in terms of water and energy use. Some areas of the field are either under- or over irrigated despite the use of contemporary irrigation equipment. In addition, even though farmers would turn off irrigation systems when it was predicted that it would rain, occasionally they forget to check the forecast and modify their plans accordingly. Utilizing precision farming techniques and Internet of Things (IoT) enabled sensors that track temperature, humidity, and soil moisture levels over the entire field, the smart irrigation management system can take all of this into account. This data is used to control a system that automatically modifies irrigation schedules.

3. Iot Applications In Smart Agriculture

Smart TVs and linked cars are just two examples of how IoT and connected products have impacted every aspect of our everyday lives. These new technologies have made all of our activities much more convenient and comfortable. The potential of connected things is huge, according to all research. For instance, a report by Fortune Business Insight projects that the size of the worldwide IoT industry would reach $1,854.76 billion by 2028. It is anticipated to grow at a compound annual growth rate (CAGR) of 25.4% between 2021 and 2028 [21]. IoT has a wide range of applications that span various industries. The next section introduces the most alluring IoT applications in agriculture.

4. BATTERY

An electrochemical gadget (made out of at least one electrochemical cells) that can be accused of an electric flow and released depending on the situation may be alluded to as a battery. Lithium polymer (LiPo) batteries are among the most generally perceived battery types used for drones since they offer the potential gain of high energy thickness equivalent to their size and weight, with a higher voltage for every cell with a capacity of 2200mAh.

5. BRUSHLESS DC MOTORS

Our BLDC motors for water pumps offer greater energy efficiency, smoother high speed operation with lower noise, and less power consumption as compared to an induction motor since they are constructed with high performance Neodymium magnets.

In this kind of motor design, the typical rotor winding has been replaced by correctly coupled permanent magnets, and the mechanical commutator has been replaced by an electronic speed control system. Because of the total value, these motors are becoming more and more popular, and more OEMs are specifying them in their designs.

6. Solar Fencing System

Solar fence is a potent electrically-powered intruder detection device that may be mounted on a physical fence, the top of a wall, or utilised as a free-standing security system. A very effective deterrent and perimeter defence system is created when an attacker tries to climb or cut the physical fence or wire and receives a safe, brief, acute, and extremely unpleasant shock.

7. NODE MCU

NodeMCU is an ESP8266-based open-source platform that connects things and enables data transfer using the Wi Fi protocol. NodeMCU is an ESP8266-based open-source platform that connects things and enables data transfer using the Wi-Fi protocol. Additionally, it may address many of the project's demands on its own by supplying some of the most crucial microcontroller functionalities. The reason for using NodeMCU is to establishment of connection between drone and mobile phone with GPS.

8. Solar Energy

A system employing photovoltaic technology and another using solar capture heating systems are two approaches to transform solar energy into electrical energy [12]. Semiconductors in the photovoltaic system turn sunlight directly into electricity. Additionally, using heat exchangers and thermodynamic processes, electrical energy can be transformed into mechanical energy throughout the heating process. Both of these approaches are non-centralized. The photovoltaic approach results in greater investment. However, thermal methods are now used for power supply because of developments in the field of solar energy in recent years.

9. MOBILE APPLICATION

Blynk is an IoT stage for iOS or Android cells that is utilized to control Arduino, Raspberry Pi and NodeMCU through the Web. It have control over gear from a decent ways, it can show sensor information, it can store information and do different other interesting things.

IV. WORKING METHODOLOGY

In our project, Numerous studies on smart agriculture have been conducted. From a big data perspective, authors in covered the state of the art in SA systems. Their efforts were directed at bringing big data processing to SA. Additionally, the authors provided a thorough history of the various agricultural systems. It demonstrated how SA might use a variety of data sources to fully utilise information and communication technology (ICT).

Smart relays (Sonoff with embedded ESP8266 Wi-Fi Card are the wireless actuator nodes that we used to operate the water pumps. These are WiFi-based wireless smart switches that can work with a variety of appliances. They function with an AC voltage range of 90–250 volts and a wireless frequency of 2.4 GHz. We chose to use this smart switch since it is affordable, dependable, and has an integrated Wi-Fi module. Moreover, as the Wi-Fi connection might not be available, ensuring contact with the BDAP. We improved the data collecting and control unit by substituting a normal relay 5V coupled to an Arduino Nano microcontroller outfitted with a GSM/GPRS module or a Zigbee module for Sonoff's smart relay module. Fig. 12 depicts the wireless actuator nodes that act on the water pumps to switch them On/Off as well as the wireless sensors used to monitor the water level in the basin and the energy consumption of the water pump.

V. RESULT AND DISCUSSION

Since the soil moisture fluctuates between those extreme levels, the plant is either over- or under-irrigated, and the ideal value (60%) is not sustained for an extended period of time. o The yield's quality and quantity would suffer since the soil moisture level hits 0% for at least five hours every day. · Excessive water and energy use: 2400L were consumed in five days, which is 480L/day for a 25m2 area. The final

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average is eventually used to compare our technology against traditional irrigation in the same area.

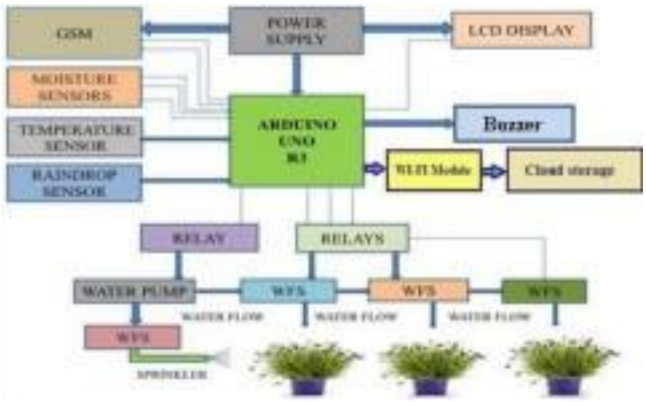

Fig 1.3 Smart agriculture controller and monitoring.

VI. CONCLUSION

The key drives of this paper's development, presentation, and deployment of a smart agriculture system were cost effectiveness, water use optimization, and the integration of renewable energy sources.

The SA system in use makes use of modern ICT. We used Internet of Things (IoT) devices (sensors and actuators) for data collecting and control. For data processing, data visualisation, and data storage, we also leveraged cloud computing. In addition, using real-time processed data, we

method maximises crop yield by conserving water and energy and by giving the plants the right circumstances. **VII.**

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