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A Review on IoT Based Solar Powered Monitoring System Application in Hydroponic Farming

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A B S T R A C T

This paper presents an innovative method of cultivating plants without use of soil and application of Internet of Things (IoT) technology in hydroponic farming, with using solar power as a renewable energy source. This system can be implemented the crops on large scale to help the farmers for maximum yield with using only water. The system integrates various sensors like temperature, Ph level, LDR and data collection devices to monitor and optimize critical parameters such as temperature, humidity, nutrient concentration, Ph Level and light intensity in hydroponic environments. Real-time data is transmitted to a central control hub, and a mobile application can be developed to provide farmers with remote access to monitor and control their hydroponic farm, enabling them to make informed decisions and receive alerts in case of any deviations from desired conditions. The use of solar power ensures energy efficiency and reduces environmental impact. This approach enhances the efficiency and productivity of hydroponic farming, contributing to sustainable agriculture practices while reducing operational costs. Using this system, we are getting benefited from hydroponic farming is a Real-time monitoring, automation, and data-driven decision-making for improved crop management and resource efficiency. Yield good quality crop in commercial infrastructure

Keywords: *Raspberry PI PICO W, IoT, Solar PV, Battery, Controller.*

1. Introduction

In this project we will utilize the power from solar & benefits of IoT to accomplish Hydroponic farming in a smart way while conserving energy. The objective of this project is to substantiate that the use of solar energy & IoT can bring about the agricultural revolution in India.

An IoT-based solar-powered monitoring system is an innovative application for hydroponic farming. This system integrates Internet of Things (IoT) technology with solar power to enhance the efficiency and sustainability of hydroponic farming. It allows real-time monitoring and control of crucial parameters such as light, temperature, humidity, nutrient levels, and water quality in hydroponic setups. By harnessing solar power, it ensures a sustainable and cost-effective energy source for these systems, reducing the reliance on conventional electricity. This technology empowers farmers with data-driven insights and remote management capabilities, resulting in improved crop yields, resource conservation, and overall precision in hydroponic farming operations. The system is depends on real time access.

2.Hydroponic Farming

The technology was invented in Israel where maximum farm output with minimum use of resources was a concern. In this farming the crops are grown only using water. For successful farming it is important that the water health is maintained alongside its flow. This technology ensures use of 85% less water for farming than the conventional techniques used. Hydroponic farming is a method of growing plants without soil, using a nutrient-rich water solution to deliver essential nutrients directly to the plant's roots. While hydroponics eliminates the need for soil, various inert growing mediums can be used, such as perlite, vermiculite, coconut coir, or even simply water. Plants in hydroponic systems receive their essential nutrients from a carefully balanced nutrient solution. This solution typically contains water, mineral salts, and other nutrients required for plant growth. Hydroponic systems are often more water-efficient than traditional soil-based farming, as they recycle and reuse water. This can be particularly important in water-scarce regions. Hydroponics can be used to grow a wide range of crops, including vegetables, herbs, fruits, and even some flowers. It's popular for growing crops like lettuce, tomatoes, and peppers. Hydroponic systems are less susceptible to certain pests and diseases common in soil-based farming. However, they can still face challenges, and it's important to maintain a clean and controlled environment. In indoor hydroponic setups, artificial lighting, such as LED or high-intensity discharge (HID) lights, is often used to provide the necessary light for photosynthesis. Hydroponic farming can

reduce the need for arable land, minimize soil erosion, and decrease pesticide use. Overall, hydroponic farming offers an innovative and efficient way to grow crops, especially in urban areas or regions with challenging environmental conditions.

3. Proposed Methodology

An IoT-Based Solar-Powered Monitoring System In Hydroponic Farming Could Involve Deploying Sensors To Monitor Key Parameters Like Temperature, Humidity, Ph Level And Water Level. These Sensors Would Collect Data and Transmit It to A Central Hub or Cloud-Based IoT Platform Using Wireless Communication Protocols. The System Could Be Powered by Solar Panels to Ensure Sustainability and Reduce Energy Costs. The Data Collected Can Be analysed In Real-Time To Optimize Plant Growth And Automate Irrigation And Nutrient Dosing processes. additionally, a mobile application can be developed to provide farmers with remote access to monitor and control their hydroponic farm, enabling them to make informed decisions and receive alerts in case of any deviations from desired conditions.

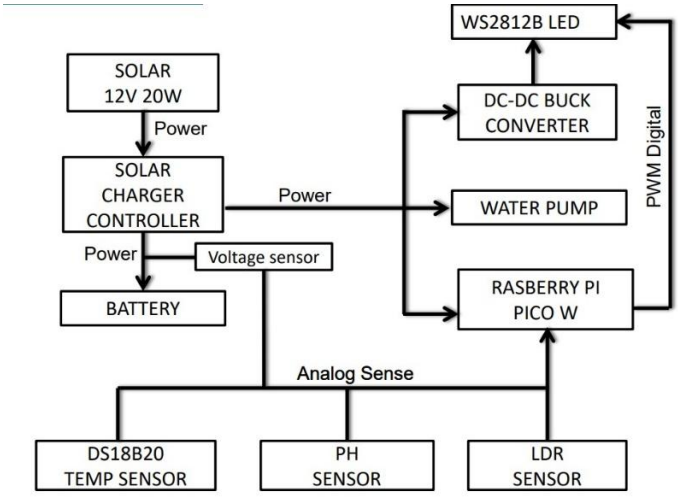

Fig. 1 – Block Diagram of proposed system

3.1 Description

1. Solar We have using solar as a main source or a renewable source of the system. 12v/20w power solar panel will be used to provide a sufficient power to run or charge the battery.

2. Solar charger controller We have used the solar charger controller to modulate the solar power according to the Need of the equipment's.

3. Battery It is used to store the power for the need at dark time. 4. Water pump it is used to transfer the flow of water from the storage tank.

5. Raspberry PI PICO W Raspberry Pi Pico is a microcontroller and brain behind the complete project. It will get inputs from the sensors, generate outputs for control of equipment like LED lights and also connect to the internet via Wi-Fi to send sensor reading on cloud. It will decide when to send notifications to the user using GSM

6. DC-DC Buck converter DC-DC buck converter is used to step down a bigger DC voltage to smaller DC voltage

7. Voltage sensor it is used to control the voltage provided to the sensors

8. DS18B20 TEMP Sensor it is used to detect the temperature of the water

9. PH sensor it is used to detect the PH Level of the water

10. LDR Sensor It is a automatic brightness detector or it is used to change or controlled the intensity of the LED

11. WS2812B LED it is a high intensity coloured LED

Application

Hydroponic farming, the practice of growing plants without soil, offers several applications across various fields. Some notable applications include: Urban agriculture, harsh environment, research and education, commercial agriculture, space exploration, Food security, aquaponics, gardening for home and commercial application.

4. Conclusion

The "IoT Based Solar Powered Monitoring System Application In Hydroponic Farming" have a real time monitoring access for the application of hydroponic farming by using a specific parameters like sensors, solar, microcontroller, etc. Aim of the system is to produced a organic food material with less water and land conservation.

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References

[1] "Vaishali Puranik", "Automation in Agriculture and IoT", - IEEE, 2019.

[2] "Izanoordina Ahmad" "Development of hydroponic System and Data Monitoring Using Internet of Things", - IEEE, 2022.

[3] "Harish Tiwari", "IoT based vertical farming using hydroponics for spectrum management & crop quality control", - IEEE, 2022.

[4] "Dr. D. Saraswathi", "Automation of Hydroponics Green House Farming using IoT", - IEEE, 2020.

[5] "Supachai Puengsungwan", "Internet of Things (IoT) based hydroponic lettuce farming with solar panels", - IEEE, 2019.

[6] "Tharindu Madushan Bandara", "Smart farm and monitoring system for measuring the Environmental condition using wireless sensor network - IOT Technology in farming", - IEEE, 2020.