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IIoT-Based Smart Irrigation System for Efficient Coconut Tree Farming Using AskSensor and Blynk Platforms

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ABSTRACT

The rises of technological innovations, smart farming practices have been increasingly applied to agriculture, including coconut cultivation. The integration of modern technologies such as automated irrigation systems has significantly enhanced crop management and yield. Coconut trees, being perennial and high-water-demand crops, often suffer from issues like improper watering—either due to soil dryness that limits root absorption or overwatering that can suffocate roots and promote fungal growth. Traditional irrigation methods are often inefficient, leading to reduced productivity and plant health. This study aims to design and implement a smart irrigation system for coconut farming based on the Industrial Internet of Things (IIoT). The proposed system is structured into three phases: first, testing the functionality of soil moisture sensors specifically adapted for coconut plantations; second, monitoring real-time soil conditions using the AskSensor IoT platform; and third, automating irrigation control through the Blynk app interface. The results demonstrate that the proposed system effectively maintains optimal soil moisture levels, reduces water wastage, and improves the overall health and yield of coconut trees compared to conventional irrigation methods.

Keywords: *Coconut Farming, Smart Irrigation, IIoT, Soil Moisture Sensor, Blynk App, AskSensor, Automated Irrigation System, Precision Agriculture*

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I. INTRODUCTION

Agriculture is the backbone of many developing economies, and coconut cultivation plays a vital role in tropical regions, contributing to food security, rural employment and economic stability. However, traditional irrigation practices in coconut farming often lead to overwatering

or under watering, resulting in low yield and inefficient water usage especially in the face of increasing climate variability. To address these challenges, the integration of technology into agriculture commonly referred to as smart farming is rapidly gaining momentum. One of the key enablers of smart farming is the Industrial Internet of Things (IIoT), which allows for real-time data collection, remote monitoring, and intelligent automation of farm operations.

An IIoT-based smart irrigation system designed specifically for coconut tree farming. By using sensor networks, cloud-based data platforms like AskSensor, and remote control interfaces like Blynk, the system enables farmers to monitor soil moisture, temperature, and humidity in real-time. Based on this data, irrigation is automatically triggered or manually controlled through a mobile app, ensuring that coconut trees receive the right amount of water at the right time. The solution not only optimizes water usage and improves plant health but also reduces labor and operational costs. Additionally, the cloud-based nature of the system ensures that data is accessible from anywhere, empowering farmers with insights and control at their fingertips. This smart irrigation system is a step toward sustainable agriculture, helping coconut farmers adapt to modern challenges through affordable and scalable technological innovation.

II. LITERATURE SURVEY

In recent years, smart agriculture has emerged as a powerful tool to enhance productivity and sustainability through the adoption of Industrial Internet of Things (IIoT) technologies. Smart irrigation, particularly for water-intensive crops like coconut trees, has become essential to address challenges such as water scarcity, climate variability, and labor shortages.

Patil and Kale (2016) developed an IoT-based smart irrigation system using soil moisture sensors, which significantly reduced water consumption and improved plant growth. R. G. Deshmukh et al. (2018) proposed an automatic irrigation system that measured real-time soil moisture and temperature using Arduino, leading to reduced human intervention.

S. Sharma et al. (2019) utilized Blynk to remotely control water pumps in an agriculture setup via smartphones. This real-time mobile interface enables users to monitor parameters like temperature, humidity, and soil moisture instantly. To store cloud data using AskSensor, analytics, and alerts. This app is user-friendly mobile interface for real-time control and monitoring. Coconut trees require well-drained soil and consistent moisture levels, especially in tropical and coastal climates.

R. K. Kodali et al. (2016) introduced a GSM-based smart irrigation system using NodeMCU and sensors. S. Agrawal and P. Sharma (2020) used ESP32 boards with IoT dashboards for controlling irrigation pumps based on DHT11 and moisture sensors. These systems have laid the groundwork for combining cloud services (AskSensor) and mobile interfaces (Blynk) to develop hybrid smart irrigation platforms that are low-cost, scalable, and efficient.

The reviewed literature highlights the significant potential of integrating IIoT, sensor technology, and cloud/mobile platforms in modernizing coconut farming practices. However, most studies focus either on generic crops or basic control systems. There exists a gap in crop-specific systems**,** particularly for coconut trees**,** that combine AskSensor's analytical capabilities with Blynk's real-time interface for customized, real-time smart irrigation**.**

III. METHODOLOGY AND IMPLEMENTATION

The methodology involves designing a real-time, intelligent irrigation system using IIoT (Industrial Internet of Things) technologies to monitor and automate water delivery based on environmental and soil conditions. Coconut Tree Water Needs to analyze the optimal soil moisture levels and temperature required for healthy coconut tree growth. Site Survey is used to identify the geographical and environmental conditions of the coconut farm.

A flowchart approach for an autonomous irrigation system is shown in Figure 1. It shows how the whole proposed system works, including the system (hardware and software) and the people who will use it (plant owners). System Design is used to develop a system integrating sensors**,** controllers, and cloud platforms**.** Choose communication protocols (e.g., Wi-Fi, MQTT) for transmitting data from sensors to the cloud. Soil Moisture Sensor is used to monitors the moisture content of the soil; Temperature & Humidity Sensor (DHT11/DHT22) is used to records ambient

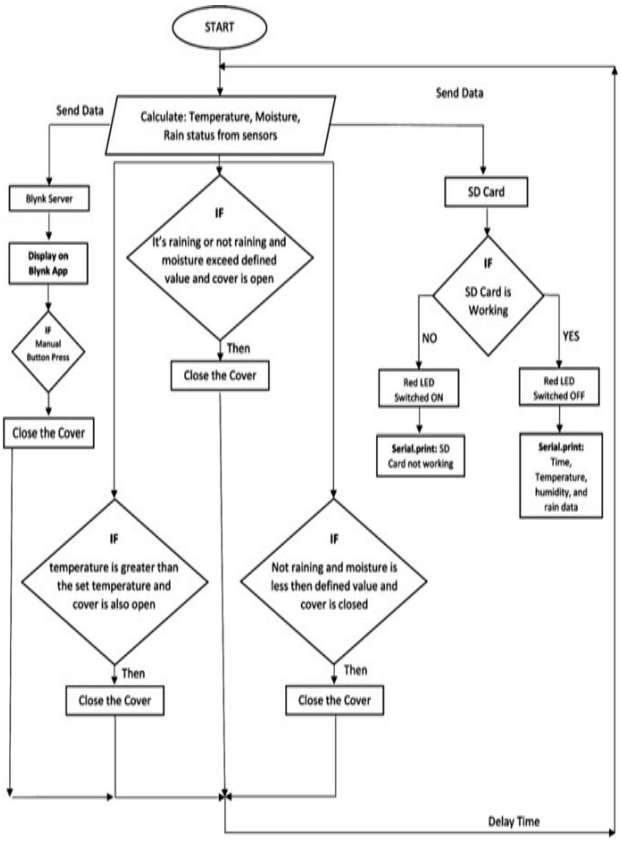

Figure 1: Operation Flow chart of the System

temperature and humidity. Water Level Sensor (optional) used to monitors available water in tanks or reservoirs.

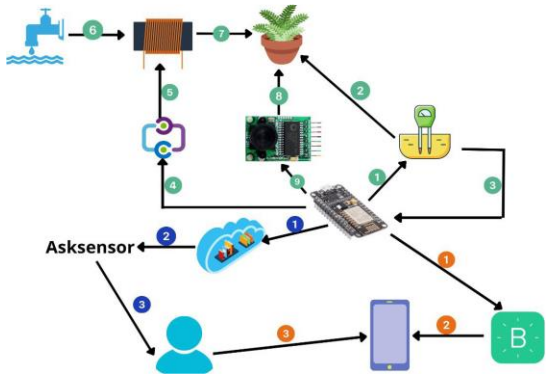

Figure 2. Block Diagram of IoT based Smart Agriculture

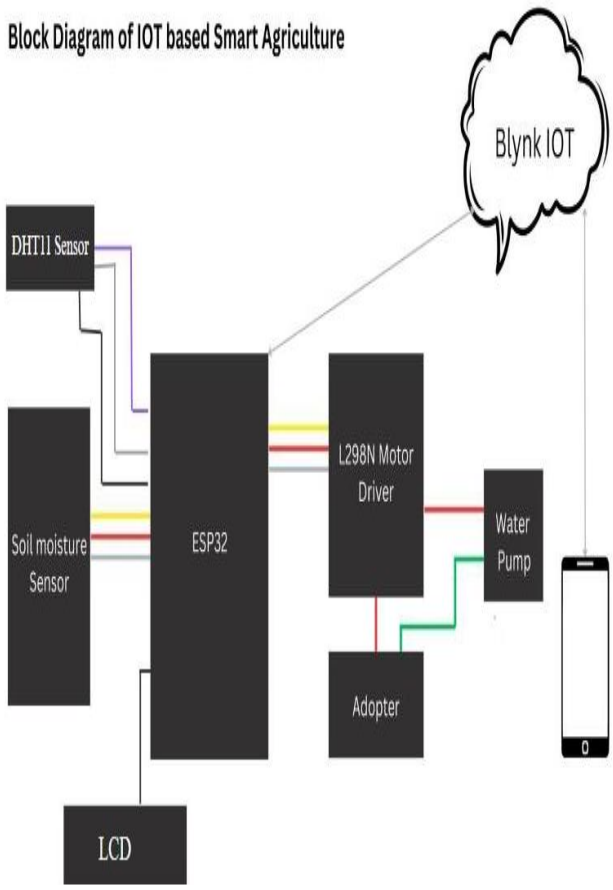

Figure 3: A Demo of the Proposed Irrigation System

Microcontroller Setup Used to NodeMCU ESP8266 sensor (or) ESP32 for sensor data acquisition and internet connectivity. It is programmed using Arduino IDE**.** Cloud Connectivity AskSensor Platform is used for real-time data logging and visualization. Blynk Application is used for user interface (UI), control, and notifications on smartphones.

IV. RESULT AND DESCUSSIONS

The developed IIoT-based smart irrigation system was successfully tested in a simulated coconut farming environment. Real-Time Monitoring is used to monitor the soil moisture, temperature, and humidity data were continuously monitored using sensors. Data was transmitted to the AskSensor platform**,** allowing real-time and historical visualization. Automated Irrigation Control monitor when soil moisture fell below the threshold (e.g., 30%), the system automatically activated the water pump.

Once the required moisture level was reached, the system shut off the pump, ensuring precise water usage. Mobile App Integration via Blynk users could monitor environmental conditions, view sensor data, and control the irrigation system remotely. Alerts were triggered when the soil moisture dropped to critical levels, enabling timely interventions. Water Conservation compared to traditional irrigation, the system showed a significant reduction in water usage, preventing over-irrigation and water waste. Data Logging and Visualization AskSensor platform provided visual graphs of sensor readings, helping users understand irrigation patterns and improve decision-making. The system demonstrated efficient, intelligent irrigation tailored to the needs of coconut

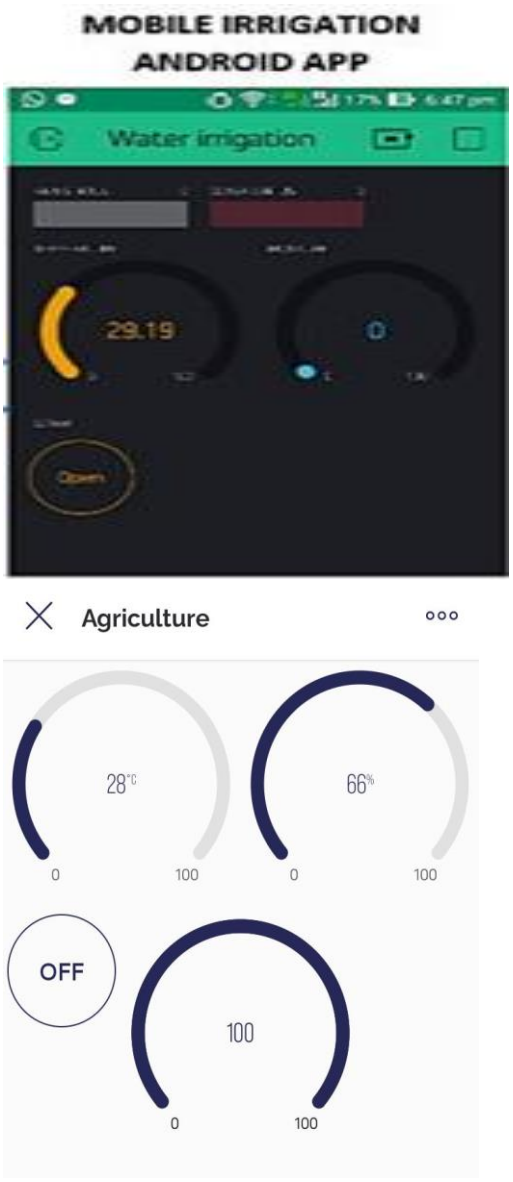

Figure 4: Blynk output

farming effectiveness of the system accurately identified when irrigation was needed, avoiding both water stress and overwatering, which are harmful to coconut tree roots. The integration with Blynk allowed farmers to remotely monitor and control irrigation without technical expertise

easy to use. This system can easily be scaled to cover larger farms by adding more sensors and pump units. Occasional internet connectivity issues could affect real-time updates. Sensor calibration was required to maintain accuracy in different soil conditions. Environmental factors like rainfall weren't detected (could be improved with additional rain sensors). This system reduced water consumption by 30–50%. Minimized manual labor and human error. Supported sustainable farming practices and increased coconut yield.

V. CONCLUSION

The results clearly show that integrating IIoT with platforms like AskSensor and Blynk provides an effective and smart solution for coconut tree irrigation. The system ensures timely and efficient watering, conserves water, and empowers farmers with real-time control and insights making it a valuable advancement for precision agriculture. The use of sensors, microcontrollers, and cloud platforms facilitated accurate data collection and efficient water management, significantly reducing water wastage and manual labor. The system's ability to automate irrigation decisions, alert users, and provide historical data analysis supports improved crop health, higher productivity, and sustainable farming practices.

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