



RV College of Engineering®

(An autonomous institution affiliated to VTU, Belagavi)

Department of Master of Computer Applications

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IV SEMESTER – MCA491P Major Project

IOT Based Smart Irrigation System In Arecanut Farms

Synopsis

Smart Irrigation System for Arecanut Farms will be an IoT-based solution designed to automate and optimize water use in arecanut cultivation. Since these crops will continue to require regular, controlled irrigation, the system will aim to replace current manual methods that are inefficient and often lead to water waste or uneven watering. With the Indian smart irrigation market projected to cross ₹17,000 crore by 2025, there will be increasing demand for affordable, crop-specific solutions. It will use simple rule-based scheduling and threshold-based control, drawing inspiration from models like Soil Moisture Deficit, while avoiding the complexity of traditional approaches that require expert calibration. As part of the precision agriculture domain, the system will help conserve water, reduce labor, and enhance farming consistency. On a social level, it will support small and medium-scale farmers by lowering manual effort, improving crop health, and encouraging sustainable practices. The motivation for this project will be to address the current lack of accessible smart farming tools specifically designed for arecanut.

The project will begin by identifying key irrigation parameters in arecanut farming, such as soil moisture. Calibrated soil moisture sensors will be integrated with ESP32 microcontrollers, which will collect sensor data and communicate with a Raspberry Pi gateway using the MQTT protocol. A water flow sensor will be added to monitor the actual volume of water delivered, ensuring irrigation accuracy and detecting system anomalies. A Wi-Fi Relay Hub will wirelessly control a motorized valve to manage drip irrigation based on real-time inputs. The backend, built with Node.js and PostgreSQL, will process incoming data, while a web interface developed in Next.js will allow users to monitor and control the system. Python scripts will handle analytics and decision-making using rule-based scheduling and threshold-based control, guided by a Water Requirement table that considers month, soil type, and plant age. The system assumes accurate sensor readings and stable connectivity. It is currently limited to single-zone irrigation and is intended for small to medium-sized arecanut farms.

The expected outcome of this project is a smart, real-time irrigation system that reduces manual effort and promotes efficient water usage in arecanut farming. It will provide farmers with timely information on soil and environmental conditions, enabling them to automate irrigation or operate it on a schedule. The anticipated result is a functional prototype capable of responding to real-time soil moisture levels with consistent accuracy. The system is expected to improve irrigation precision and reduce water wastage by an estimated 20–30% compared to traditional manual methods, contributing to higher yield quality and resource efficiency.

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