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Smart Irrigation System

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Abstract: *Water scarcity and inefficient irrigation practices pose major challenges to sustainable agriculture. This study presents the development and evaluation of a laboratory-scale smart irrigation system designed to optimize water usage through real-time soil moisture monitoring and automated control. The system employs a soil moisture sensor integrated with an ESP32 microcontroller integrated, relay module, and water pump to regulate irrigation based on predefined threshold values. Sensor calibration was performed using the standard oven-dry method on multiple soil samples to ensure accurate moisture measurement. The system was tested on red and black soils with different moisture requirements, and suitable threshold limits were established for each soil type. Integration with the Blynk IoT platform enabled real-time monitoring and remote control of the irrigation process. Experimental results demonstrated efficient water management, reduced manual intervention, and reliable system performance. The developed model proves to be a low-cost, scalable, and sustainable solution for smart irrigation, with potential applications in small and large-scale agricultural fields.*

Keywords: Smart irrigation system, Soil moisture sensor, Threshold limits, Water use efficiency, Sustainable agriculture

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