ABSTRAK

Harianto, Riki Dwi. (2026). Rancang Bangun *Soil Moisture and Irrigation Controller* pada kebun Durian di Wilayah Segulung Kabupaten Madiun Menggunakan ESP32. Skripsi. Program Studi Teknik Informatika, Fakultas Teknik, Universitas PGRI Madiun. Pembimbing : (I) Moch Yusuf Asyhari, S.Tr.Kom., M.Kom. (II) Pratiwi Susanti, S.Kom., M.MT.

Penelitian ini bertujuan untuk merancang dan membangun sistem *Soil Moisture and Irrigation Controller* berbasis *Internet of Things* (IoT) yang mampu memantau tingkat kelembapan tanah serta mengendalikan proses penyiraman tanaman durian secara otomatis maupun manual. Penelitian menggunakan metode pengembangan V-Model yang terdiri atas tahapan *requirement analysis*, *system design*, *implementation*, *unit testing*, *integration testing*, *system testing*, dan *acceptance testing*. Sistem dibangun menggunakan mikrokontroler ESP32, dua sensor *soil moisture* kapasitif, modul relay, *solenoid valve*, serta aplikasi berbasis web yang dikembangkan menggunakan Laravel sebagai *backend* dan React JS sebagai *frontend*. Pengujian dilakukan terhadap fungsi pembacaan sensor, pengiriman data secara *real-time*, pengendalian penyiraman otomatis maupun manual, serta pengujian fungsional menggunakan metode *Black Box Testing*. Hasil penelitian menunjukkan bahwa sistem mampu membaca kondisi kelembapan tanah dengan baik, mengirimkan data ke *dashboard* secara berkala, serta mengendalikan penyiraman sesuai kondisi tanah dan perintah pengguna. Seluruh fitur sistem dapat berjalan sesuai kebutuhan fungsional, baik pada proses monitoring maupun pengendalian irigasi. Penerapan sistem ini membantu petani memantau kondisi kelembapan tanah secara *real-time*, mengurangi ketergantungan terhadap penyiraman manual, serta meningkatkan efisiensi penggunaan air dalam proses budidaya tanaman durian. Dengan demikian, sistem yang dikembangkan berhasil memenuhi tujuan penelitian dan dapat menjadi solusi pendukung penerapan teknologi IoT pada bidang pertanian, khususnya sistem irigasi cerdas berbasis ESP32.

Kata Kunci : Internet of Things (IoT), ESP32, *Soil Moisture*, Irigasi Otomatis, Laravel, React JS.

ABSTRACT

Harianto, Riki Dwi. (2026). *Design and Development of a Soil Moisture and Irrigation Controller for* Durian *Plantations in* Segulung, Madiun *Regency Using* ESP32. *Thesis. Informatics Engineering Study Program, Faculty of Engineering,* Universitas PGRI Madiun. *Advisors* : (I) Moch Yusuf Asyhari, S.Tr.Kom., M.Kom. (II) Pratiwi Susanti, S.Kom., M.MT.

This study aims to design and develop an Internet of Things (IoT)-based *Soil Moisture and Irrigation Controller* capable of monitoring soil moisture levels and controlling the irrigation process for durian plants automatically and manually. The research employed the V-Model development methodology, which consists of the stages of *requirement analysis*, *system design*, *implementation*, *unit testing*, *integration testing*, *system testing*, and *acceptance testing*. The system was developed using an ESP32 microcontroller, two capacitive soil moisture sensors, a relay module, a solenoid valve, and a web-based application developed with Laravel as the backend framework and React JS as the frontend framework. System testing was conducted on sensor data acquisition, *real-time* data transmission, automatic and manual irrigation control, and functional testing using the *Black Box Testing* method. The results indicate that the developed system successfully monitors soil moisture conditions, transmits data to the web *dashboard* in real time, and controls irrigation according to soil moisture conditions and user commands. All system features operated according to the specified functional requirements for both monitoring and irrigation control. The implementation of the system assists farmers in monitoring soil moisture in real time, reduces dependence on manual irrigation, and improves water-use efficiency in durian cultivation. Therefore, the proposed system successfully achieved the research objectives and can serve as an IoT-based smart irrigation solution for modern agricultural applications using ESP32.

Keywords: Internet of Things (IoT), ESP32, Soil Moisture, Automatic Irrigation, Laravel, React JS.