

ABSTRAK

Aldhi Defriyanto. 2026. Analisis Kinerja Sistem Penjadwalan Pompa Pada Penyiraman Media Tanam Berbasis Iot Menggunakan Moisture Sensor Dan Mikrokontroller Esp32. Skripsi. Program Studi Teknik Elektro, Fakultas Teknik, Universitas PGRI Madiun. Pembimbing (I) Irna Tri Yuniahastuti, S.Pd., M.Pd., (II) Ina Sunaryatiningsih S.T., S.Pd., M.T.

Penyiraman media tanam secara manual sering menyebabkan ketidaktepatan waktu dan penggunaan air yang kurang efisien. Penelitian ini bertujuan untuk merancang dan membangun sistem otomasi penyiraman media tanam berbasis *Internet of Things* (IoT) menggunakan mikrokontroler ESP32, menganalisis kinerja sistem, serta menentukan durasi nyala pompa yang efektif dan efisien berdasarkan penjadwalan penyiraman. Metode penelitian yang digunakan adalah *Research and Development* (R&D) dengan tahapan perancangan sistem, implementasi, serta pengujian fungsional, kalibrasi sensor kelembaban tanah menggunakan *soil moisture meter*, dan pengujian efektivitas durasi nyala pompa selama 1 menit, 2 menit, dan 3 menit. Hasil penelitian menunjukkan bahwa seluruh komponen sistem berfungsi dengan baik, meliputi sensor kelembaban tanah, RTC, relay, pompa air, *Google Apps Script*, *Google Spreadsheet*, dan komunikasi data melalui jaringan internet. Hasil kalibrasi menunjukkan pembacaan sensor sesuai dengan *soil moisture meter*. Berdasarkan pengujian, durasi nyala pompa selama 3 menit menghasilkan kelembaban media tanam yang paling stabil dibandingkan durasi 1 menit dan 2 menit, dengan penggunaan air sebesar 7,5 liter setiap siklus penyiraman. Dengan demikian, sistem yang dikembangkan mampu melakukan penyiraman otomatis sesuai penjadwalan, memantau kelembaban media tanam secara daring, serta memberikan durasi penyiraman yang efektif dan efisien.

Kata Kunci: *Internet of Things*, ESP32, otomasi penyiraman, sensor kelembaban tanah, media tanam.

ABSTRACT

Aldhi Defriyanto. 2026. *Design and Performance Analysis of an Internet of Things (IoT)-Based Automated Irrigation System for Planting Media Using Soil Moisture Sensors and an ESP32 Microcontroller*. Undergraduate Thesis. Study Program of Electrical Engineering, Faculty of Engineering, Universitas PGRI Madiun.. Advisors: (I) Irna Tri Yuniastuti, S.Pd., M.Pd., (II) Ina Sunaryatiningsih S.T., S.Pd., M.T.

Manual irrigation of planting media often results in improper watering schedules and inefficient water use. This study aims to design and develop an Internet of Things (IoT)-based automated irrigation system using the ESP32 microcontroller, analyze the system performance, and determine the most effective and efficient pump operating duration based on scheduled irrigation. This study employed the Research and Development (R&D) method, which included system design, implementation, functional testing, soil moisture sensor calibration using a soil moisture meter, and evaluation of pump operating durations of 1, 2, and 3 minutes. The results showed that all system components, including the soil moisture sensors, RTC module, relay, water pump, Google Apps Script, Google Spreadsheet, and internet communication, functioned properly. The calibration results indicated that the sensor readings were consistent with the soil moisture meter. Based on the experimental results, a pump operating duration of 3 minutes produced the most stable soil moisture compared to the 1-minute and 2-minute durations, with a water consumption of 7.5 liters per irrigation cycle. In conclusion, the developed system is capable of performing scheduled automatic irrigation, monitoring soil moisture remotely, and providing an effective and efficient irrigation duration.

Keywords: *Internet of Things, ESP32, automated irrigation, soil moisture sensor, planting media.*