

ABSTRAK

Danar Disanlis Santosa. 2026. Rancang Bangun Kontrol Air Pada Media Pembibitan Tanaman Dengan Sistem Sprinkler Otomatis Berbasis *Internet of Things*. Skripsi Program Studi Teknik Informatika, FT, Universitas PGRI Madiun. Pembimbing (I) Saifulloh, S.Kom., M.Kom.,(II) Moch Yusuf Asyhari, S.Tr.Kom., M.Kom.

Pembibitan tanaman memerlukan kondisi kelembapan tanah yang stabil, sedangkan penyiraman manual sering tidak konsisten dan tidak efisien. Penelitian ini bertujuan merancang bangun kontrol air pada media pembibitan tanaman dengan sistem *sprinkler* otomatis berbasis *Internet of Things* (IoT) yang mampu memantau dan mengendalikan kelembapan media tanam secara otomatis dan jarak jauh. Metode yang digunakan adalah *Research and Development* (R&D) dengan model pengembangan sistem *V-Model*, yang memasangkan setiap tahap perancangan dengan tahap pengujian melalui proses *verification* dan *validation*. Sistem dibangun menggunakan mikrokontroler NodeMCU ESP32, dua buah *capacitive soil moisture sensor*, modul relay, pompa air, dan *solenoid valve*, yang terhubung dengan aplikasi web *dashboard* berbasis Laravel (*backend*) dan React.js (*frontend*) dengan basis data MySQL. Sistem membaca kelembapan tanah setiap 5 detik, mengirimkan data ke *server*, serta menyalakan atau mematikan pompa dan *sprinkler* secara otomatis berdasarkan nilai ambang batas (*threshold*) yang disesuaikan dengan kebutuhan tiga jenis tanaman uji, yaitu bunga kol, labu kuning, dan melon hibrida. Hasil pengujian *black box* dengan 10 skenario uji menunjukkan seluruh fungsi sistem berjalan valid, sedangkan pengujian pengiriman data menunjukkan *delay* pengiriman berkisar 5–10 detik tanpa kehilangan data. Sistem terbukti dapat menjaga kondisi kelembapan media tanam serta melakukan penyiraman secara otomatis maupun manual sehingga meningkatkan efisiensi perawatan bibit tanaman.

Kata Kunci: Kontrol Air, *Sprinkler* Otomatis, *Internet of Things* (IoT), NodeMCU ESP32, V-Model.

ABSTRACT

Danar Disanlis Santosa. 2026. Design and Implementation of Water Control for Plant Seedling Media Using an IoT-Based Automatic Sprinkler System. Undergraduate Thesis. Informatics Engineering Study Program, Faculty of Engineering, Universitas PGRI Madiun. Supervisors: (I) Saifulloh, S.Kom., M.Kom., (II) Moch Yusuf Asyhari, S.Tr.Kom., M.Kom.

Plant seedling cultivation requires stable soil moisture conditions, whereas manual watering is often inconsistent and inefficient. This study aims to design and Develop a water control system for plant nursery media using an Internet of Things (IoT) based automatic sprinkler system capable of monitoring and controlling growing medium moisture both automatically and remotely. The study employs the Research and Development (R&D) method using the V-Model development framework, which pairs each design phase with a corresponding testing phase through verification and validation processes. The system is constructed using a NodeMCU ESP32 microcontroller, two capacitive soil moisture sensors, a relay module, a water pump, and a solenoid valve; it connects to a web dashboard application built with Laravel (backend) and React.js (frontend) and utilizes a MySQL database. The system reads soil moisture levels every 5 seconds, transmits data to the server, and automatically activates or deactivates the pump and sprinklers based on threshold values tailored to the needs of three test plant varieties: cauliflower, pumpkin, and hybrid melon. Black-box testing across 10 scenarios confirmed the validity of all system functions, while data transmission tests showed a latency of 5–10 seconds with no data loss. The system proved capable of maintaining growing medium moisture levels and performing both automatic and manual watering, thereby enhancing the efficiency of seedling care.

Keywords: Water Control, Automatic Sprinkler, Internet of Things (IoT), NodeMCU ESP32, V-Model.