ABSTRAK

SISTEM AUTOMASI PENYIRAMAN TANAMAN BAWANG MERAH BERBASIS *FUZZY LOGIC* DAN IOT

(2025 : xiv + 60 *Halaman* + 35 *Gambar* + 9 *Tabel* + *Lampiran* + *Daftar Pustaka*)

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Bawang merah (*Allium cepa*) merupakan komoditas penting di Indonesia yang memerlukan kondisi lingkungan optimal, terutama suhu dan kelembapan tanah. Penyiraman manual sering kali kurang efisien karena bergantung pada pengamatan langsung dan tidak memperhitungkan perubahan kondisi secara bertahap. Penelitian ini merancang sistem automasi penyiraman berbasis *Fuzzy Logic* Mamdani dan Internet of Things (IoT) untuk meningkatkan efisiensi irigasi. Sistem memanfaatkan mikrokontroler ESP32, sensor suhu DHT22, dan sensor kelembapan tanah sebagai input, serta pompa air sebagai aktuator. Data suhu dan kelembapan diubah menjadi variabel linguistik seperti "kering", "sedang", dan "lembab" melalui fuzzifikasi, kemudian diproses dengan aturan *IF–THEN* untuk menghasilkan output PWM yang mengatur intensitas penyiraman. Pemantauan dan pengendalian dilakukan secara lokal melalui LCD dan jarak jauh melalui aplikasi Blynk. Hasil pengujian menunjukkan sistem mampu merespons kondisi lingkungan secara proporsional, dengan tingkat kesesuaian hasil perhitungan manual dan sistem mencapai 96,04%. Implementasi ini memberikan kemudahan monitoring dan kontrol jarak jauh serta berpotensi menghemat penggunaan air dibandingkan metode penyiraman konvensional.

Kata kunci: Bawang Merah, Penyiraman Otomatis, Fuzzy Logic Mamdani, IoT, ESP32, Blynk

ABSTRACT

AUTOMATIC IRRIGATION SYSTEM FOR SHALLOT PLANTS BASED ON FUZZY LOGIC AND IOT

(2025 : xiv + 60 Pages + 35 Pictures + 9 Table + Attachment + List Of References)

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Shallots (Allium cepa) are an important commodity in Indonesia that require optimal environmental conditions, particularly temperature and soil moisture. Manual irrigation is often inefficient as it relies on direct observation and does not account for gradual changes in conditions. This research designs an automatic irrigation system based on Mamdani Fuzzy Logic and the Internet of Things (IoT) to improve irrigation efficiency. The system utilizes an ESP32 microcontroller, DHT22 temperature sensor, and soil moisture sensor as inputs, with a water pump as the actuator. Temperature and moisture data are converted into linguistic variables such as "dry," "medium," and "wet" through fuzzification, then processed with IF–THEN rules to produce a PWM output that regulates irrigation intensity. Monitoring and control are performed locally via an LCD and remotely via the Blynk application. Testing results show that the system can respond proportionally to environmental changes, with an accuracy rate between manual calculation and system output reaching 96.04%. This implementation provides ease of monitoring and remote control, as well as potential water savings compared to conventional irrigation methods.

Keyword: *Shallots, Automatic Irrigation, Mamdani Fuzzy Logic, IoT, ESP32, Blynk*