ABSTRAK

Indonesia sebagai negara agraris masih banyak mengandalkan metode pertanian tradisional, salah satunya penyiraman tanaman secara manual yang kurang efektif dan rentan terhadap perubahan cuaca. Hal ini berdampak pada hasil panen yang tidak optimal. Penelitian ini bertujuan merancang dan mengimplementasikan sistem pengawasan dan pengendalian kondisi tanah berbasis Internet of Things (IoT) untuk penanaman daun bawang dan mawar dalam metode polikultur. Sistem ini diharapkan mampu membantu petani mengatur suhu udara, kelembaban tanah, pH tanah, dan intensitas cahaya secara otomatis, sehingga meningkatkan produktivitas pertanian dan efisiensi penggunaan lahan.

Perancangan sistem dilakukan melalui tahapan studi literatur, perancangan perangkat keras dan perangkat lunak, serta pengujian dan analisis sistem. Perangkat keras terdiri dari mikrokontroler ESP32 yang terhubung dengan sensor suhu *DS18B20*, *capacitive soil moisture sensor*, sensor pH tanah, sensor LDR, serta dikendalikan oleh *relay*, motor servo, pompa DC, dan kipas DC. Data sensor diproses oleh ESP32 dan dikirim ke platform IoT Antares.

Hasil implementasi menunjukkan bahwa sistem berhasil melakukan pengawasan dan pengendalian kondisi tanah untuk penanaman dua tanaman sesuai dengan perpotongan parameter pertumbuhan optimal daun bawang dan mawar. Pengujian menunjukkan setiap sensor dan aktuator bekerja sesuai fungsinya, serta data yang dikirim dapat dipantau secara *real-time* melalui Antares. Sistem ini memberikan solusi efektif dalam mengoptimalkan pertumbuhan tanaman dengan pengawasan dan pengendalian berbasis IoT, serta menjadi inovasi yang dapat dikembangkan lebih lanjut di sektor pertanian modern. Rata – rata *error* sensor *DS18B20* sebesar 1.38%, *error capacitive soil moisture sensor* sebesar 4.93%, *error* sensor pH tanah sebesar 6.39% dan *error untuk* sensor LDR sebesar 6.1%.

Kata kunci : kondisi tanah, suhu, keasaman, Antares, pertanian cerdas.

ABSTRACT

As an agricultural country, Indonesia still relies heavily on traditional farming methods, one of which is manual watering of crops, which is ineffective and vulnerable to weather changes. This results in suboptimal crop yields. This study aims to design and implement an Internet of Things (IoT)-based soil condition monitoring and control system for onion and rose cultivation using polyculture methods. The system is expected to help farmers automatically regulate air temperature, soil moisture, soil pH, and light intensity, thereby enhancing agricultural productivity and land use efficiency.

The system design was carried out through stages of literature review, hardware and software design, as well as system testing and analysis. The hardware consists of an ESP32 microcontroller connected to a DS18B20 temperature sensor, soil moisture sensor, soil pH sensor, LDR sensor, and controlled by a relay, servo motor, DC pump, and DC fan. Sensor data is processed by the ESP32 and sent to the Antares IoT platform.

The implementation results show that the system successfully monitors and controls soil conditions for the cultivation of two plants according to the optimal growth parameters for onion leaves and roses. Testing showed that each sensor and actuator functioned as intended, and the data transmitted could be monitored in real-time via Antares. This system provides an effective solution for optimizing plant growth through IoT-based monitoring and control, and represents an innovation that can be further developed in the modern agricultural sector. The average error rate for the DS18B20 sensor is 1.38%, the capacitive soil moisture sensor error rate is 4.93%, the soil pH sensor error rate is 6.39%, and the LDR sensor error rate is 6.1%.

Keywords : soil condition, temperature, adicity, Antares, smart farming.