ABSTRAK

SISTEM *MONITORING* PERINGATAN DINI PERUBAHAN LINGKUNGAN PERTANIAN BERBASIS IOT MELALUI *WEBSITE*

(2025: xvi + 88 halaman + 27 gambar + 14 tabel + 13 lampiran)

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Sistem monitoring peringatan dini perubahan lingkungan pertanian berbasis Internet of Things (IoT) dirancang untuk mengotomatisasi proses pemantauan lingkungan. Sistem ini diakses melalui website dan berfungsi untuk mengamati, mengukur, serta mencatat parameter lingkungan. Parameter yang dimonitor meliputi suhu, kelembapan udara, kualitas udara (CO dan CO_2), kelembaban tanah, curah hujan, intensitas cahaya, dan kecepatan angin. Data dari sensor DHT22, MQ-7, MQ-135, soil moisture, LDR, raindrop module, dan anemometer diakuisisi oleh mikrokontroler ESP32, diproses, dan ditampilkan secara real-time melalui antarmuka website yang responsif. Sistem ini bertujuan memberikan informasi akurat dan tepat waktu kepada petani guna mendukung pengambilan keputusan dalam pengelolaan tanaman, pengendalian hama, dan mitigasi dampak iklim. Pengujian sensor dilakukan dengan membandingkan hasil pembacaan terhadap alat terkalibrasi, serta menghitung akurasi dan standar deviasi tiap parameter. Kinerja website diuji menggunakan PageSpeed dan GTMetrix untuk memastikan kecepatan akses dan keandalan penyajian data. Hasil yang diharapkan adalah sistem peringatan dini yang bekerja secara efektif dalam memantau kondisi lingkungan pertanian, guna mendukung peningkatan produktivitas dan ketahanan sektor pertanian.

Kata Kunci: IoT, monitoring lingkungan, pertanian, Peringatan dini, ESP32, website

ABSTRACT

IOT-BASED EARLY WARNING MONITORING SYSTEM FOR AGRICULTURAL ENVIRONMENTAL CHANGES VIA WEBSITE

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The Internet of Things (IoT)-based early warning monitoring system for agricultural environmental changes is designed to automate the process of environmental monitoring. Accessible through a website, the system functions to observe, measure, and record key environmental parameters. These parameters include temperature, air humidity, air quality (CO and CO_2), soil moisture, rainfall, light intensity, and wind speed. Data from sensors such as the DHT22, MQ-7, MQ-135, soil moisture sensor, LDR, raindrop module, and anemometer are acquired by an ESP32 microcontroller, processed, and displayed in real-time through a responsive website interface. The system aims to provide farmers with accurate and timely information, supporting informed decision-making in crop management, pest control, and climate impact mitigation. Sensor performance is tested by comparing sensor readings with calibrated instruments and calculating the accuracy and standard deviation for each parameter. Website performance is evaluated using PageSpeed and GTMetrix to ensure fast access and reliable data presentation. The expected outcome is an early warning system that operates effectively to monitor agricultural environmental conditions, supporting increased productivity and resilience in the agricultural sector.

Keywords: IoT, environmental monitoring, agriculture, early warning, ESP32, website