

PROTOTYPE SISTEM MONITORING TANAMAN HOLTIKULTURA MENGGUNAKAN SENSOR SUHU MELALUI THINGSBOARD BERBASIS IOT

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ABSTRAK

Tanaman holtikultura memerlukan kondisi lingkungan yang terjaga, terutama suhu, kelembapan tanah, dan kandungan unsur hara, agar dapat tumbuh optimal. Pemantauan secara manual terhadap faktor-faktor tersebut sering kali kurang efisien karena memakan waktu, membutuhkan tenaga, dan tidak mampu menyediakan informasi secara langsung. Penelitian ini menghasilkan prototype sistem pemantauan tanaman holtikultura berbasis *Internet of Things* (IoT) yang memanfaatkan platform *ThingsBoard* untuk menampilkan data sensor secara real-time. Sistem dikendalikan oleh mikrokontroler NodeMCU ESP32 yang terhubung dengan sensor DHT22 (suhu dan kelembapan udara), soil moisture sensor (kelembapan tanah), sensor PIR (pendeteksi hama), serta sensor MQ-137 (kadar amonia/ NH_3). Data yang diperoleh dari sensor diolah oleh mikrokontroler dan dikirim ke dashboard *ThingsBoard* melalui koneksi Wi-Fi. Fitur otomatisasi diterapkan, seperti kipas aktif jika suhu $>30^\circ\text{C}$, lampu menyala ketika suhu $<27^\circ\text{C}$, pompa air bekerja saat tanah kering, pompa pestisida menyala ketika terdeteksi hama, dan sprayer pupuk aktif saat kadar NH_3 rendah. Berdasarkan hasil pengujian, sistem mampu memantau kondisi tanaman secara langsung, merespons sesuai parameter yang ditetapkan, serta dapat diakses melalui PC maupun smartphone. Penerapan sistem ini berpotensi meningkatkan efisiensi budidaya hortikultura, mengurangi kerusakan akibat hama, dan membantu petani menjaga kestabilan lingkungan tumbuh sehingga hasil panen lebih optimal.

Kata Kunci: *Internet of Things, ThingsBoard, NodeMCU ESP32, DHT22, Soil Moisture, MQ-137, Holtikultura.*

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ABSTRACT

Horticultural crops require well-maintained environmental conditions, particularly temperature, soil moisture, and nutrient content, to achieve optimal growth. Manual monitoring of these factors is often inefficient, as it is time-consuming, labor-intensive, and unable to provide real-time information. This research developed a prototype of an Internet of Things (IoT)-based monitoring system utilizing the ThingsBoard platform to display sensor data in real time. The system is controlled by a NodeMCU ESP32 microcontroller connected to a DHT22 sensor (air temperature and humidity), a soil moisture sensor (soil humidity), a PIR sensor (pest detection), and an MQ-137 sensor (ammonia/NH₃ concentration). Data collected from the sensors are processed by the microcontroller and transmitted to the ThingsBoard dashboard via a Wi-Fi connection. Automation features are implemented, such as activating a fan when the temperature exceeds 30°C, turning on a lamp when the temperature drops below 27°C, running a water pump when the soil is dry, switching on a pesticide pump when pests are detected, and activating a fertilizer sprayer when the NH₃ level is low. The testing results show that the system is capable of monitoring plant conditions in real time, responding according to predefined parameters, and being accessed via both PC and smartphone. The application of this system has the potential to improve the efficiency of horticultural cultivation, reduce pest-related damage, and assist farmers in maintaining stable growing conditions, thereby optimizing crop yields.

Keywords: *Internet of Things, ThingsBoard, NodeMCU ESP32, DHT22, Soil Moisture, MQ-137, Horticulture.*