DESIGN AND FABRICATION OF A VERTICAL FARMING EMBEDDED WITH IOT SYSTEM

FINAL PROJECT REPORT

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by

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DESAIN DAN FABRIKASI PERTANIAN VERTIKAL YANG DILENGKAPI DENGAN SISTEM IOT

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Menyatakan bahwa Skripsi yang saya buat merupakan hasil karya sendiri dan didampingi oleh tim dosen pembimbing dan **bukan hasil penjiplakan/*plagiat***. Apabila dikemudian hari ditemukan unsur penjiplakan/*plagiat* dalam Skripsi yang saya buat, maka saya bersedia menerima sanksi akademik dari Politeknik Negeri Sriwijaya.

Demikian pernyataan ini saya buat dalam keadaan sadar dan tidak dipaksakan.

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ABSTRAK

DESAIN DAN FABRIKASI PERTANIAN VERTIKAL YANG DILENGKAPI DENGAN SISTEM IOT

MUHAMMAD ARIF MULYO
xiii + 73 halaman, 3 tabel, 6 lampiran

Penelitian ini menyajikan desain dan fabrikasi pertanian vertikal yang disematkan dengan sistem IoT untuk meningkatkan produktivitas tanaman. Pertanian vertikal memanfaatkan ruang secara vertikal dengan menumpuk lapisan tanaman, memberikan efisiensi ruang yang tinggi, kontrol lingkungan yang wajar, dan potensi pertanian berkelanjutan. Sistem ini menggunakan sensor IoT untuk penerangan, pemantauan pH air, TDS air, dan suhu air, yang terhubung dan diproses melalui mikrokontroler Arduino Uno dan NodeMCU 32, tidak hanya itu terdapat kamera pengawas yang akan terhubung dengan aplikasi smartphone. Pengujian dilakukan dengan menggunakan dua jenis tanaman, yaitu bok choy, dan kangkung, indoor dan outdoor. Perbandingan rata-rata antara tanaman bok choy dan kangkung di dalam ruangan menunjukkan perbedaan suhu air (bok choy: 29,74 °C, kale: 29,14 °C), TDS air (bok choy: 68,39 ppm, kale: 76,67 ppm), pH air (bok choy: 7,46, kale: 7,39), dan intensitas cahaya (bok choy: 556,16 lux, kale: 562,85 lux). Sebagai perbandingan, perbandingan luar ruangan rata-rata menunjukkan perbedaan suhu air (bok choy: 28,85 °C, kale: 28,30 °C), TDS air (bok choy: 94 ppm, kale: 95,61 ppm), pH air (bok choy: 7,14, kale: 7,02), dan intensitas cahaya (bok choy: 2549,27 lux, kale: 5928,73 lux). Sistem pemantauan real-time melalui aplikasi Telegram dan Tapo bekerja dengan baik, memungkinkan pengguna untuk memantau pertanian vertikal melalui smartphone. Penelitian ini berkontribusi pada pengembangan pertanian vertikal yang efisien dan berkelanjutan menggunakan IoT dan memberikan pemahaman tentang perbedaan kondisi lingkungan antara tanaman bok choy dan kangkung.

Kata Kunci: Pertanian Vertikal, Arduino Uno, NodeMCU ESP32, Internet of Things (IoT)

ABSTRACT

DESIGN AND FABRICATION OF A VERTICAL FARMING EMBEDDED WITH IOT SYSTEM

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xiii + 73 pages, 3 tables, 6 appendix

This research presents the design and fabrication of vertical farming embedded with an IoT system to increase crop productivity. Vertical farming utilizes space vertically by stacking layers of crops, providing high space efficiency, reasonable environmental control, and sustainable farming potential. This system uses IoT sensors for lighting, water pH monitoring, water TDS, and water temperature, which are connected and processed through Arduino Uno and NodeMCU 32 microcontrollers, not only that there are surveillance cameras that will be connected to smartphone applications. Testing was carried out using two types of plants, namely bok choy, and kale, indoors and outdoors. The average comparison between bok choy and kale plants indoors showed differences in water temperature (bok choy: 29.74 °C, kale: 29.14 °C), water TDS (bok choy: 68.39 ppm, kale: 76.67 ppm), water pH (bok choy: 7.46, kale: 7.39), and light intensity (bok choy: 556.16 lux, kale: 562.85 lux). In comparison, the average outdoor comparison showed differences in water temperature (bok choy: 28.85 °C, kale: 28.30 °C), water TDS (bok choy: 94 ppm, kale: 95.61 ppm), water pH (bok choy: 7.14, kale: 7.02), and light intensity (bok choy: 2549.27 lux, kale: 5928.73 lux). Real-time monitoring systems via Telegram and Tapo apps work well, allowing users to monitor vertical farming via smartphones. This research contributes to the development of efficient and sustainable vertical farming using IoT and provides an understanding of the differences in environmental conditions between bok choy and kale plants.

Keywords: Vertical Farming, Arduino Uno, NodeMCU ESP32, Internet of Things (IoT)

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The author also hopes this thesis can be used as reference material for the next thesis. The author realizes that there are still many errors in this thesis. Therefore, the author hopes for constructive criticism and suggestions and hopefully the thesis can benefit science development.

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Writer

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