

ABSTRAK

SISTEM MONITORING PARAMETER KUALITAS AIR HIDROPONIK DFT SECARA REAL-TIME BERBASIS INTERNET OF THINGS (IoT) PADA TANAMAN KANGKUNG

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Budidaya tanaman kangkung (*Ipomoea aquatica*) pada sistem hidroponik masih banyak dilakukan dengan pengecekan kualitas air secara manual sehingga kurang efisien bagi pengguna dengan keterbatasan waktu. Penelitian ini bertujuan merancang sistem monitoring parameter kualitas air berbasis sensor *Total Dissolved Solids* (TDS), sensor *turbidity*, dan sensor ultrasonik HC-SR04 pada hidroponik metode *Deep Flow Technique* (DFT) berbasis *Internet of Things* (IoT). Sistem menggunakan mikrokontroler ESP32-WROOM-32 sebagai pusat pengolahan data yang membaca nilai kadar nutrisi (ppm), tingkat kekeruhan (NTU), dan ketinggian air (cm) secara terus-menerus. Data hasil pembacaan sensor ditampilkan secara real-time melalui LCD 20x4 I2C serta dikirimkan ke aplikasi Blynk melalui jaringan WiFi. Pengujian dilakukan dengan membandingkan hasil pembacaan sensor terhadap alat ukur referensi berupa TDS Meter dan mistar. Hasil pengujian menunjukkan sensor TDS memiliki rata-rata error sebesar 1,61%, sensor turbidity mampu membedakan kondisi air jernih, keruh, dan kotor dengan baik, serta sensor HC-SR04 memiliki rata-rata error di bawah 6% dalam mengukur ketinggian air. Perbandingan data antara tampilan LCD dan aplikasi Blynk menunjukkan tingkat kesesuaian tinggi dengan error kurang dari 0,2%. Sistem yang dirancang mampu menjalankan fungsi monitoring kualitas air hidroponik secara akurat, stabil, dan

real-time sehingga mendukung pengelolaan tanaman kangkung hidroponik dari jarak jauh.

Kata Kunci: *Hidroponik DFT, Internet of Things, ESP32, Sensor TDS, Sensor Turbidity, HC-SR04, Blynk*

ABSTRACT

REAL-TIME WATER QUALITY PARAMETER MONITORING SYSTEM FOR DFT HYDROPONICS BASED ON INTERNET OF THINGS (IoT) FOR WATER SPINACH PLANTS

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Water spinach (*Ipomoea aquatica*) cultivation in hydroponic systems is still largely monitored manually for water quality, making it inefficient for users with limited time. This study aims to design a water quality parameter monitoring system based on a Total Dissolved Solids (TDS) sensor, a turbidity sensor, and an HC-SR04 ultrasonic sensor for Deep Flow Technique (DFT) hydroponics based on the Internet of Things (IoT). The system uses an ESP32-WROOM-32 microcontroller as the central data processor, continuously reading nutrient concentration (ppm), turbidity level (NTU), and water level (cm). Sensor reading data is displayed in real time via a 20x4 I2C LCD and transmitted to the Blynk application through a WiFi network. Testing was conducted by comparing sensor readings against reference instruments, namely a TDS Meter and a ruler. The results show that the TDS sensor achieved an average error of 1.61%, the turbidity sensor successfully distinguished between clear, turbid, and dirty water conditions, and the HC-SR04 sensor showed an average error below 6% in measuring water level. Comparison of data between the LCD display and the Blynk application showed high consistency, with an error of less than 0.2%. The designed system is able to perform hydroponic water quality monitoring functions accurately, stably, and in real time, thereby supporting the remote management of hydroponic water spinach cultivation.

Keywords: *DFT Hydroponics, Internet of Things, ESP32, TDS Sensor, Turbidity Sensor, HC-SR04, Blynk.*