

ABSTRAK

**SISTEM IDENTIFIKASI KEBUTUHAN UNSUR HARA PADA
TANAMAN BERBASIS INTERNET OF THINGS**

(Rafly Jhonathan, 2026 : 57)

Penelitian ini bertujuan untuk merancang dan membangun sistem identifikasi kebutuhan unsur hara pada tanaman berbasis Internet of Things (IoT) yang dapat membantu memantau kondisi unsur hara tanah secara real-time. Sistem yang dirancang menggunakan sensor NPK berbasis Modbus RS485 untuk mengukur kandungan Nitrogen (N), Phosphor (P), dan Kalium (K), serta ESP32 sebagai mikrokontroler untuk mengolah data hasil pembacaan sensor. Hasil pengolahan data ditampilkan melalui LCD 20x4 dan dilengkapi buzzer sebagai indikator peringatan. Selain itu, sistem menggunakan koneksi internet untuk mengirimkan hasil monitoring dan analisis kepada pengguna melalui aplikasi WhatsApp sehingga kondisi unsur hara dapat dipantau dari jarak jauh. Sistem menentukan unsur hara yang paling membutuhkan penambahan berdasarkan perbandingan nilai hasil pembacaan dengan nilai ambang batas yang telah ditentukan, kemudian memberikan rekomendasi jenis pupuk yang sesuai. Pengujian dilakukan menggunakan beberapa sampel tanah dengan kondisi kandungan unsur hara yang berbeda. Hasil pengujian menunjukkan bahwa sensor NPK berhasil membaca kandungan unsur hara dan mengirimkan data kepada ESP32 untuk dianalisis. LCD mampu menampilkan hasil pengukuran secara real-time, buzzer berfungsi sebagai indikator, dan hasil analisis berhasil dikirimkan melalui WhatsApp. Seluruh komponen sistem dapat bekerja dan terintegrasi dengan baik sehingga sistem mampu melakukan identifikasi kebutuhan unsur hara serta memberikan rekomendasi pemupukan secara otomatis.

Kata Kunci : Internet Of Things, Unsur Hara, Sensor NPK, ESP32, Tanaman, Monitoring.

ABSTRACT
IMPLEMENTATION OF AN IOT SYSTEM FOR WATER CONSUMPTION
MEASUREMENT IN DETERMINING WATER BILL DISTRIBUTION IN
BOARDING HOUSES

(Rafly Jhonathan, 2026 : 57)

This study aims to design and develop an Internet of Things (IoT)-based nutrient requirement identification system for plants that can monitor soil nutrient conditions in real time. The proposed system uses an NPK sensor based on Modbus RS485 to measure the levels of Nitrogen (N), Phosphorus (P), and Potassium (K), while an ESP32 microcontroller is used to process the sensor data. The processed measurement results are displayed on a 20x4 LCD and supported by a buzzer as a warning indicator. In addition, the system utilizes an internet connection to send monitoring and analysis results to users through WhatsApp, allowing soil nutrient conditions to be monitored remotely. The system determines the nutrient that requires the most supplementation by comparing the measured values with predetermined threshold values and subsequently provides appropriate fertilizer recommendations. Testing was conducted using several soil samples with different nutrient conditions. The results showed that the NPK sensor successfully measured the soil nutrient levels and transmitted the data to the ESP32 for analysis. The LCD was able to display the measurement results in real time, the buzzer functioned as a warning indicator, and the analysis results were successfully delivered through WhatsApp. All system components operated and integrated properly, enabling the system to identify nutrient requirements and provide fertilizer recommendations automatically.

Keywords: Internet of Things, Nutrient Requirements, NPK Sensor, ESP32, Plants, Monitoring.

