

ABSTRAK

**Rancang Bangun Alat Pendeteksi Kadar NPK (Nitrogen, phospor
dan kalium) Pada Bibit Pohon Karet Berbasis
IOT (*Internet of Things*)**

(Nazeerah Al'adawiyah: 2025: XV + 79 + Lampiran)

Tanaman karet membutuhkan unsur hara nitrogen (N), fosfor (P), dan kalium (K) yang cukup untuk mendukung pertumbuhan optimal. Penelitian ini menggunakan metode Rancang Bangun (*Research and Development*) untuk membuat alat pendeteksi kadar NPK pada bibit pohon karet berbasis IoT agar pengusaha kebun dapat memantau kondisi unsur hara secara *near real time*. Sistem ini dilengkapi sensor NPK RS485 MODBUS, mikrokontroler ESP32, modul SIM7600CE-T 4G untuk pengiriman data ke WhatsApp, serta LCD I2C untuk menampilkan hasil pengukuran di lapangan. Metode pengujian yang digunakan adalah *black box testing* untuk memastikan semua fungsi berjalan sesuai rancangan. Hasil pengukuran ditransmisikan secara otomatis dengan selisih waktu rata-rata dua menit. Pengujian menunjukkan alat dapat mendeteksi kadar NPK dengan baik, mengirim notifikasi secara stabil, dan membantu pekerja melakukan pendeteksian unsur hara bibit secara praktis di lapangan.

Kata Kunci: Sensor NPK, IoT, ESP32, Bibit Pohon Karet

ABSTRACT

Design and Construction of an IoT (Internet of Things)-Based NPK (Nitrogen, Phosphorus, and Potassium) Level Detection Tool for Rubber Tree Seedlings

(Nazeerah Al'adawiyah: 2025: XV + 79 + Appendices)

Rubber trees require sufficient nitrogen (N), phosphorus (P), and potassium (K) nutrients to support optimal growth. This research uses the Research and Development (R&D) method to design and develop an IoT-based NPK detection device for rubber tree seedlings, enabling plantation owners to monitor soil nutrient conditions in near real time. The system is equipped with an RS485 MODBUS NPK sensor, an ESP32 microcontroller, a SIM7600CE-T 4G module for sending data to WhatsApp, and an I2C LCD for displaying measurement results directly on-site. The testing method applied is black box testing to ensure that all functions operate as designed. Measurement results are transmitted automatically with an average time interval of two minutes. The test results show that the device can accurately detect NPK levels, send notifications reliably, and help workers perform practical nutrient detection of seedlings in the field.

Keywords: NPK sensor, IoT, ESP32, rubber tree seedlings