

ABSTRACT

TERATANI: OPTIMIZING AGRICULTURAL YIELDS WITH IOT AND MACHINE LEARNING THROUGH REAL-TIME LAND CONDITIONING

Indonesia, as a major agrarian nation, faces challenges in enhancing agricultural productivity to meet rising food demands. This research introduces TERATANI, an innovative system leveraging IoT and Machine Learning (ML) to optimize agricultural yields through real-time land conditioning. Equipped with advanced sensors, the system measures soil pH, moisture, and temperature, analyzed via ML algorithms to provide precise land management recommendations.

Conducted at SMA Pradita Dirgantara, Boyolali, from December 2024 to February 2025, this study encompasses system development, implementation, and evaluation. The ESP32 microcontroller serves as the data processing hub, while the Blynk platform offers an intuitive visual interface. ML algorithms such as Neural Network, Logistic Regression, and Random Forest are applied to enhance data analysis and prediction accuracy, facilitating more efficient agricultural decision-making. TensorFlow Lite-based Neural Network was selected for its high accuracy performance. Field tests demonstrate that TERATANI improves irrigation efficiency and reduces resource usage. The tool is easily constructed with affordable materials and open-source software.

TERATANI operates without the internet, suitable for Indonesia's agriculture conditions with limited internet access. With a System Usability Scale (SUS) score of 79.6, the system is user-friendly. Beyond boosting productivity and food security, the system serves as a modern educational tool. With ongoing training, TERATANI is poised to be a cornerstone of agricultural transformation in Indonesia, providing sustainable and innovative solutions to future challenges.

Keywords: TERATANI, IoT, Machine Learning, Agriculture, Food Security