

ABSTRACT

Urban agriculture faces various challenges, particularly the limited availability of land and time for manual plant maintenance. One innovative solution to address these issues is the implementation of a smart farming system based on the Internet of Things (IoT), which enables *real-time* monitoring and automated control of environmental conditions for plant growth. This research aims to develop and implement a vegetable maintenance system on the *rooftop* of the Faculty of Electrical Engineering (FTE) at Telkom University by integrating IoT technology with a *mobile* application. The system utilizes temperature sensors (DS18B20), analog pH sensors, and TDS sensors to monitor key parameters in hydroponic cultivation. An ESP32 microcontroller is used to transmit sensor data to Firebase Realtime Database, which is then accessed by an Android-based *mobile* application for *real-time* monitoring, automated notifications, and manual control of pumps and water valves.

The implementation results demonstrate that the system successfully performs its main functions. Sensor data is transmitted in *real-time* to Firebase and displayed in the *mobile* application with a response time of 1 to 5 seconds. The system also sends automatic notifications when environmental parameters exceed optimal thresholds (temperature 25–27°C, pH 6.0–7.0, and TDS 560–840 ppm). The *mobile* application's interface is designed to be user-friendly, achieving a user satisfaction rate of 95% based on survey results. Thus, this project proves that the integration of IoT and *mobile* applications can significantly improve the efficiency, effectiveness, and sustainability of urban farming, particularly in small-scale environments such as *rooftop*.

Keywords: Firebase, Hydroponics, IoT, *Mobile* Application, Plant Maintenance, Smart Farming, Plant Maintenance