ABSTRACT

Agriculture is a primary commodity for Indonesian society and plays a crucial role in fulfilling food needs. However, this sector faces challenges such as land issues and declining fertility, hindering plant growth and reducing harvest yields. Conventional agriculture often struggles with intensive monitoring and care that requires direct presence in the fields.

This final project aims to design a smart gardening system based on the Internet of Things, implemented on the rooftop of the Faculty of Applied Sciences (FIT), Telkom University, covering an area of approximately ± 385 m². This project is part of the Higher Education Superior Research (PUPT) initiative. The system uses an ESP32 microcontroller, RTC, relay, and pump for the plant watering system. The environmental monitoring system utilizes an ESP32 microcontroller with DHT22, MQ135, soil moisture, and soil pH sensors. The data collected from these sensors is sent to Firebase and displayed in real-time on the monitoring website dashboard. Additionally, the system provides a manual watering option through controls available on the monitoring website dashboard..

From the test results, it was found that the percent error accuracy of the sensors is 1.1% for the DHT22 temperature sensor, 2.1% for the MQ135 sensor, 2.3% for the soil moisture sensor, and 9.3% for the soil pH sensor. Additionally, the average data transmission delay was found to be 5 seconds. The plant monitoring test results, conducted every 15 minutes over a period of 2 days, showed that the average temperature of the strawberry plants was around 27 °C, and the temperature would decrease after watering. The average CO_2 level around the strawberry plants was approximately 783 ppm, and the CO_2 level would decrease after watering. The average soil moisture around the strawberry plants was about 45.6%, and the soil moisture level would increase after watering. The average soil pH around the strawberry plants was 7.5, and the soil pH remained neutral after watering. From these results, it is evident that the system operates effectively and helps reduce the time and effort required for plant care, providing significant benefits to farmers and the environment.

Keywords: *smart garden, monitoring, FIT, PUPT, website.*