ABSTRACT

Indonesia has geographical conditions that are very suitable for coffee cultivation. With its diverse topography, tropical climate, varying altitudes, and fertile soil, these conditions favor coffee growth. Some of the challenges that arise are long droughts due to climate change, land located around mountains and far from settlements, and many conventional farmers who are less effective. This research focuses on developing an Internet of Things (IoT)-based automation system for monitoring and managing watering and soil nutrition in coffee plants in Sukarame Village, Bandung Regency, West Java.

The solutions offered in this research include soil moisture detection to determine watering needs, air temperature and humidity monitoring, and soil pH measurement to ensure optimal nutrition for coffee plants. The system utilizes various sensors and key components, including an ESP32 microcontroller, soil moisture sensor, DHT11 air temperature and humidity sensor, soil pH sensor, as well as a sensor to measure the content of soil macronutrients such as NPK, the RS485 sensor. The energy source for this system is supplied by solar panels, and internet connectivity is facilitated by MiFi Orbit Star. The data collected by these sensors is transmitted in real-time to a server, where the information is accessed and displayed through a web interface, enabling efficient remote monitoring.

The results show that integrated IoT and sensor technology provides an innovative solution that can increase productivity and operational efficiency in coffee plant cultivation. The sensor accuracy rate obtained from the RS485 NPK sensor compared to analog sensors is 99.91% for Nitrogen value, 99.70% for Phosphorus value, and 99.80% for Potassium value. The implementation of this system is expected to not only reduce the need for manual intervention but also support more sustainable and environmentally friendly agricultural practices. The positive impacts of using this system include improved crop quality, efficient use of resources, and more accurate monitoring of farm conditions.

Keywords: Coffee Cultivation, Internet of Things (IoT), ESP32, NPK, *Website*