ABSTRACT

Melons are a horticultural commodity with high economic value and promising market opportunities. According to data from the Surabaya City Statistics Agency (BPS), melon production has increased significantly from 70 quintals in 2021 to 230 quintals in 2023. However, the unpredictable climate in Surabaya, such as fluctuations in temperature, humidity, and sunlight duration, has the potential to hinder optimal melon growth. Therefore, a system capable of adaptively and sustainably controlling the growing environment is needed, particularly during the seedling stage.

This research aims to design an Internet of Things (IoT)-based decision support system using an ESP32 microcontroller and Mamdani fuzzy logic. The system is built using a DS18B20 temperature sensor and a resistive soil moisture sensor as the main inputs, along with actuators such as fans, water pumps, and grow lights controlled by relay modules. The system is designed to automatically monitor and control temperature, soil moisture, and lighting, taking into account time variables and environmental conditions.

Testing was conducted over 30 days with data recording intervals of every 15 minutes. The results showed that the system had an accuracy rate of 97.33%, with a reading error of 2.67%, mostly caused by interference with the sensor connection. The applied fuzzy logic also functioned well in regulating the actuators based on the degree of temperature and humidity membership. Thus, this system demonstrated quite reliable performance in automatically monitoring and regulating the melon seedling environment.

Keywords: *Internet of Things, ESP32, Fuzzy Logic, Agricultural Automation, Environmental Monitoring.*