ABSTRACT

The maggot, derived from the Black Soldier Fly (BSF) larva, is widely studied due to its high nutritional value and biological characteristics. It has great potential as an alternative protein source for livestock feed, such as chicken and catfish. However, environmental factors such as temperature and humidity significantly affect the success of maggot cultivation.

This research aims to design an Internet of Things (IoT)-based system integrated with Machine Learning to monitor and control the environmental conditions of BSF maggot cultivation—specifically temperature, humidity, and waste volume—in real time. The system is connected to a mobile application, enabling remote access and control.

The solution uses a Raspberry Pi 3B+ microcontroller and is programmed in Python. Sensor data is processed to control actuators automatically and sent to Firebase for visualization in the mobile app. The test results show that IoT-based maggot farming yields 160 grams per 100 maggots, compared to only 100 grams using conventional methods. The DHT22 sensor achieved 97.06% accuracy, while the soil moisture sensor reached 95.67%.

Usability testing using the System Usability Scale (SUS) scored an average of 74.5, indicating good usability. In terms of waste decomposition, IoT-assisted maggots processed an average of 3.43 kg of waste over 10 days, compared to 2.054 kg without IoT. Quality of Service (QoS) metrics during data communication showed a throughput of 204,795.86 bps, packet loss of 0.22%, an average delay of 105.03 ms, and jitter of 6,151.71 ms.

Keywords: *Black Soldier Fly, Internet of Things, Machine Learning, Mobile Application*