ABSTRACT

Household organic waste accounts for more than 60% of the total waste generation in Indonesia [1]. Improper management can produce greenhouse gases such as methane (CH_4) and ammonia (NH_3), which negatively impact the environment. This research aims to develop a Household Smart Composter based on the Internet of Things (IoT) to monitor temperature, air humidity, compost moisture, and gas levels in real time using DHT22, Soil Moisture, and MQ-135 sensors connected to an ESP32 microcontroller and the Blynk platform.

The method includes hardware and software design, sensor calibration, and system testing using three organic waste scenarios. The first test (250 g of banana peel, orange peel, and rice leftovers) reached a maximum temperature of 52°C, maximum air humidity of 94%, ammonia and methane gas concentrations ranging from 479–801 ppm, and a maximum compost moisture reading of 2274 ADC, The final compost weight was 77 g after 24 hours of processing. The second test (204 g of banana peel and papaya leaves) recorded a maximum temperature of 50°C, air humidity of 100%, gas levels up to 1003 ppm, maximum compost moisture of 2498 ADC, resulting in 59 g of compost. The third test (157 g of longan peel, orange peel, papaya leaves, and avocado) using the cook mode for 2 hours reached a peak temperature of 72°C, maximum gas concentration of 1268 ppm, air humidity of 100%, and produced 29 g of black, brittle compost.

Based on these results, the system can accurately monitor composting conditions and automatically provide compost status, achieving an organic waste mass reduction efficiency of 70–81%. This system has potential for household-scale application to reduce organic waste and support sustainable waste management.

Keywords: *IoT Composter, multifunctional sensors, real-time decomposition, automatic control, organic waste.*