

ABSTRACT

Waste is the residual output from human usage products that are no longer used and can originate from various human activities in daily life. Organic waste can consist of fruit peels, vegetable scraps, and food leftovers. In Indonesia, most household organic waste is simply discarded and piled up, leading to excessive waste accumulation, which reduces soil carrying capacity and disrupts community comfort and environmental health.

One solution to overcome this problem is through composting. In the modern era, to facilitate the organic waste recycling process more efficiently, it is necessary to design a monitoring system for composting devices based on the Internet of Things (IoT). Dry and liquid composting stations are brought together in a single container to save space and make it easy to move the composting tool. The system is supported by the NodeMCU ESP32 microcontroller and several other supporting sensors as well as a website that allows users to monitor the composting process through a device connected to an internet connection. The target of using the tool is households and industries that produce a lot of organic waste.

After testing demonstrated for over 24 days showed that each sensor is reliable for monitoring the composting process. The testing also proved that the DHT22 sensor had an average error accumulation of $\pm 1^{\circ}\text{C}$, the soil moisture sensor with an average error accumulation of $\pm 1\%$, the MQ-4 sensor with an average test result of 75.8%, the soil pH sensor with an average error accumulation of ± 7 , and the water level sensor with an average error accumulation of ± 2 cm. The NodeMCU ESP32 was also able to transmit data in real-time with adequate performance, and the DC motor effectively controlled the compost mixing process. The majority of users provided positive feedback on the monitoring website, with 99.33% stating that the website is easy to use, user-friendly, and easy to remember. The design of this tool can help address waste management issues and support the recycling of organic waste into compost within 24 days to produce dry compost and 19 days for liquid compost.

Keywords: Composting, Internet of Things, Recycling, Organic, Waste