

ABSTRACT

Spraying pesticides that do not take into account wind conditions can cause waste of chemicals, pollute the environment, and endanger the health of farmers. To overcome these problems, this research designs an Internet of Things (IoT)-based wind speed and direction monitoring system using ESP32 and LoRa communication, supported by a local display (16x2 LCD) and LED indicators. This system is designed to work independently in areas without electricity and internet by using solar panels and batteries, and sending data to the dashboard via the MQTT protocol. This system aims to provide realtime wind conditions, and can provide monitoring of wind speed and direction remotely by using a dashboard in order to provide immediate warnings for wind conditions that do not support pesticide spraying. The test results show the system is able to operate stably up to a distance of 200 meters with RSSI values between -86 dBm to -88 dBm. The average wind speed recorded was 0.84 m/s in the morning, 1.15 m/s in the afternoon, and 0.51 m/s in the afternoon. Based on these results, the most ideal time for pesticide spraying is in the morning and evening because the wind speed is relatively low and stable. The wind direction varies from 0° to 360°, with the dominant wind direction to the southeast in the afternoon. The indicator LED lights up when the wind speed exceeds 3 m/s to indicate unsafe conditions for spraying. All data is displayed on the LCD and sent to the dashboard for remote analysis. The system is proven to be effective in providing real-time wind condition information and can improve the efficiency and safety of pesticide spraying on agricultural land in areas without internet connection.

Keywords: IoT, LoRa, Wind speed, Wind direction, MQTT.