

**DESIGN AND DEVELOPMENT OF AN INTERNET OF THINGS-BASED
MONITORING SYSTEM FOR A LEMPUYANG CHILI DRYING OVEN
USING ESP32, MQTT, AND MIT APP INVENTOR**

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ABSTRACT

Lempuyang chili (Zingiber zerumbet) is a leading Indonesian spice commodity with high economic value and significant health benefits. Traditional sun-drying methods are considered inefficient, particularly during the rainy season, which negatively affects the quality of the harvested product. This study aims to design an Internet of Things (IoT)-based temperature monitoring system for a lempuyang chili drying oven, capable of monitoring oven conditions in real time via a smartphone device. The developed system uses an ESP32 microcontroller as the main controller, a MAX6675 thermocouple module as the temperature sensor, and an L298N driver to control the stove blower and air blower. Monitoring data is transmitted to the MIT App Inventor application via the MQTT protocol using the HiveMQ Cloud broker with TLS encryption. The parameters monitored include actual temperature, setpoint value, stove blower PWM, air blower PWM, and the oven's operational status. The test results show that MQTT communication between the ESP32 and the MIT App Inventor application ran well and stably. The data logging feature to Google Sheets successfully stored all data with a 100% success rate. All features of the MIT App Inventor application—including automatic MQTT connection, oven parameter display, real-time temperature graph visualization, and spreadsheet monitoring—functioned as expected.

Keywords: *lempuyang chili; Internet of Things (IoT); ESP32; MQTT; oven temperature monitoring*