

ABSTRACT

Traditional tempeh production in Indonesia still faces major challenges due to unstable temperature and humidity during the fermentation process. This instability can lead to inconsistent product quality, increased risk of production failure, and economic losses for producers, especially small-scale businesses that rely on manual methods. The main issue addressed in this research is the lack of an automated system that can maintain the incubator's temperature and humidity within the ideal range to ensure consistent tempeh fermentation.

This research offers a solution through the design of a temperature and humidity monitoring and control system for the incubator, utilizing Internet of Things (IoT) technology. The system employs a DHT22 sensor connected to an ESP32 microcontroller to measure temperature and humidity in real time. The data is sent to the Blynk Platform, enabling remote monitoring of fermentation conditions. Additionally, the system automatically controls a heater and fan to maintain the temperature and humidity at the desired levels.

Testing showed that the system successfully kept the incubator temperature within 30–37°C and humidity between 60–70% for 24 hours of fermentation. The system reduced temperature fluctuations to $\pm 0.5^{\circ}\text{C}$ and humidity variations to $\pm 2\%$, improving the consistency of tempeh quality compared to conventional methods. In conclusion, this system effectively supports stable, efficient, and user-friendly tempeh production for small-scale producers.

Keywords: ESP32, Humidity Fermentation, Humidity, Incubator, Internet of Things, Platform Blynk, Temperature