

ABSTRAK

INKUBATOR TELUR AYAM BERBASIS ESP32 DENGAN SISTEM *MONITORING* SUHU DAN KELEMBAPAN, PEMBALIKAN TELUR OTOMATIS, SERTA *LIVE STREAMING* BERBASIS *INTERNET OF THINGS* PADA YITNO FARM

(Rizki Anugrah 2026: xvi + 126 halaman + Daftar Pustaka + Lampiran)

Penetasan telur ayam secara manual di Yitno Farm masih bergantung pada pemantauan langsung sehingga keterlambatan penanganan suhu dan kelembapan berpotensi menurunkan daya tetas, sementara media pemantauan visual dan sistem peringatan jarak jauh belum tersedia. Penelitian ini bertujuan merancang inkubator telur ayam berbasis ESP32 yang mampu memonitor dan mengendalikan suhu, kelembapan, dan pembalikan telur secara otomatis, dilengkapi *live streaming* dan notifikasi berbasis *Internet of Things* (IoT). Sistem menggunakan dua unit ESP32 DevKit V1 terpisah: ESP32 sensor yang membaca dan mengkalibrasi data DHT22 dengan regresi linear, serta ESP32 utama yang mengendalikan *relay*, *driver* motor BTS7960, motor DC *gear* JGY-370, dan ESP32-CAM. Pengendalian suhu dan kelembapan diterapkan dalam dua fase (inkubasi dan menetas), dengan data dikirim via protokol MQTT ke *dashboard web* Python Flask, disimpan pada *database* MySQL, dan didukung notifikasi Telegram. Hasil pengujian menunjukkan koefisien determinasi (R^2) kalibrasi sebesar 0,9983 (suhu) dan 0,9920 (kelembapan), dengan akurasi sensor 99,68% dan 98,20%. Seluruh sembilan skenario *Black Box Testing* dinyatakan valid, sedangkan pengujian terhadap 15 butir telur menghasilkan fertilitas 86,67%, mortalitas embrio 7,69%, dan daya tetas 92,31%. Sistem yang dikembangkan terbukti mampu meningkatkan efektivitas pemantauan dan pengendalian penetasan telur tanpa mengharuskan peternak berada di lokasi.

Kata kunci : inkubator telur, ESP32, DHT22, *Internet of Things*, MQTT, ESP32-CAM, Flask, penetasan otomatis.

ABSTRACT

CHICKEN EGG INCUBATOR BASED ON ESP32 WITH TEMPERATURE AND HUMIDITY MONITORING SYSTEM, AUTOMATIC EGG TURNING, AND INTERNET OF THINGS-BASED LIVE STREAMING AT YITNO FARM

(Rizki Anugrah 2026: xvi + 126 pages + References + Appendices)

Manual chicken egg hatching at Yitno Farm still relies on direct monitoring, so delayed handling of temperature and humidity can reduce hatchability, while visual monitoring and remote warning systems remain unavailable. This research designs an ESP32-based chicken egg incubator capable of automatically monitoring and controlling temperature, humidity, and egg turning, equipped with live streaming and Internet of Things (IoT)-based notifications. The system uses two separate ESP32 DevKit V1 units: a sensor ESP32 that reads and calibrates DHT22 data using linear regression, and a main ESP32 that controls a relay, a BTS7960 motor driver, a JGY-370 DC gear motor, and an ESP32-CAM. Temperature and humidity control is applied in two phases (incubation and hatching), with data sent via the MQTT protocol to a Python Flask web dashboard, stored in a MySQL database, and supported by Telegram notifications. Test results show a calibration coefficient of determination (R^2) of 0.9983 (temperature) and 0.9920 (humidity), with sensor accuracy of 99.68% and 98.20%. All nine Black Box Testing scenarios were declared valid, while testing on 15 eggs yielded a fertility rate of 86.67%, an embryo mortality rate of 7.69%, and a hatchability rate of 92.31%. The developed system proved able to improve the effectiveness of monitoring and controlling egg hatching without requiring the farmer's presence on site.

Keywords : egg incubator, ESP32, DHT22, Internet of Things, MQTT, ESP32-CAM, Flask, automatic hatching.