

Prototipe Sistem Kendali dan Monitoring Alat Pengering Biji Kopi Arabika Berbasis Internet of Things

ABSTRAK

Kopi merupakan salah satu perkebunan dan produk unggulan Indonesia yang berperan penting dalam perekonomian, terutama sebagai sumber pendapatan petani. Jenis kopi yang banyak di tanam di Aceh Tengah adalah kopi arabika (*Coffea arabica*). Proses pengeringan menjadi tantangan utama karena panen sering terjadi saat musim hujan, yang menyebabkan kesulitan dalam melakukan pengeringan yang sangat bergantung pada cuaca dan lahan. Penelitian ini bertujuan merancang prototipe sistem kendali dan monitoring alat pengering biji kopi arabika berbasis *Internet of Things* untuk menjaga kualitas kopi. Prototipe sistem dirancang menggunakan papan mikrokontroler ESP32 yang terhubung dengan sensor suhu dan kelembapan DHT22, sensor berat load cell, motor DC, kipas AC dan DC, heater, relay, buzzer, LCD I2C, serta motor driver L298N. Data suhu dan berat dikirim ke aplikasi *blynk* untuk pemantauan jarak jauh. Selama pengeringan, ESP32 terhubung ke Wi-Fi dan pengguna dapat mengatur durasi pengeringan. Saat suhu ruang pengering melebihi ambang batas, heater dan kipas AC mati, sementara kipas DC menyala untuk membuang udara panas. Hasil pengujian menunjukkan proses pengeringan berjalan efektif. Pengeringan *fullwash* berat 500 g, kadar air awal 57% menghasilkan berat setelah dikeringkan berat 241 g dengan kadar air 12,4% setelah 15 jam. Pengeringan *semiwash* dengan berat 500 g, kadar air awal 35% menghasilkan berat 375 g dengan kadar air 12,2% setelah 9 jam, hasil tersebut sudah memenuhi standar kadar air biji kopi kering yaitu $\leq 12,5\%$. Selama proses, data suhu dan berat tampil akurat di LCD dan aplikasi *blynk*. Setelahnya, dilakukan pemilahan biji grade 1, *roasting* medium, dan uji rasa (*cupping*) yang menunjukkan hasil serupa dengan kopi berkualitas pada umumnya. Prototipe ini terbukti efektif mengeringkan biji kopi arabika serta menjaga kualitas rasa dan aroma.

Kata kunci : kopi arabika, alat pengering, *Internet of Things*, monitoring.

Prototype of Internet of Things-Based Arabica Coffee Bean Dryer Control and Monitoring System

ABSTRACT

Coffee is one of Indonesia's leading plantation and product crops, playing a vital role in the economy, particularly as a source of income for farmers. One of the coffee varieties widely cultivated in Central Aceh is Arabica coffee (*Coffea arabica*). The drying process is a major challenge because harvesting often occurs during the rainy season, which causes difficulties in drying which is highly dependent on the weather and land. This research aims to design a prototype control and monitoring system for an Arabica coffee bean dryer based on the Internet of Things to maintain coffee quality. The system prototype is designed using an ESP32 microcontroller board connected to a DHT22 temperature and humidity sensor, a load cell weight sensor, a DC motor, an AC and DC fan, a heater, a relay, a buzzer, an I2C LCD, and an L298N motor driver. Temperature and weight data are sent to the blynk app for remote monitoring. During drying, the ESP32 connects to Wi-Fi, allowing users to set the drying time. When the drying chamber temperature exceeds a threshold, the heater and AC fan turn off, while the DC fan turns on to remove hot air. Test results indicate an effective drying process. Fullwash drying weighing 500g, initial moisture content of 57% produces a weight after drying of 241g with a moisture content of 12.4% after 15 hours. Semiwash drying weighing 500g, initial moisture content of 35% produces a weight of 375g with a moisture content of 12.2% after 9 hours, these results have met the standard moisture content of dry coffee beans, namely $\leq 12.5\%$. During the process, temperature and weight data are displayed accurately on the LCD and the blynk application. Afterward, grade 1 beans were sorted, roasted medium, and cupped, yielding similar results to those of standard quality coffees. This prototype proved effective in drying Arabica coffee beans while maintaining flavor and aroma.

Keywords: Arabica coffee, dryer, Internet of Things, monitoring.