RINGKASAN

Sorgum (*Sorgum bicolor*) merupakan komoditas serealia strategis yang membutuhkan penanganan pascapanen tepat, khususnya pada proses pengeringan, guna mempertahankan kualitas dan memperpanjang masa simpan. Metode pengeringan konvensional (penjemuran langsung) memiliki keterbatasan berupa ketergantungan pada cuaca, waktu yang lama, serta risiko kontaminasi lingkungan (Mariyam *et al.,* 2021). *Solar Dome Dryer* (SDD) hadir sebagai solusi dengan memanfaatkan efek rumah kaca untuk mempercepat proses penguapan air dari bahan secara lebih terkontrol. Namun, pemantauan susut bobot selama pengeringan masih dilakukan secara manual dan periodik, sehingga kurang efisien dan rentan kesalahan. Penelitian ini bertujuan merancang sistem monitoring susut bobot Sorgum berbasis *Internet of Things* (IoT) yang terintegrasi pada *Solar Dome Dryer*, dengan tujuan membaca perubahan bobot secara *real-time*, mengintegrasikan data ke *platform* monitoring jarak jauh, serta membandingkan performa pengeringan SDD dengan metode konvensional.

Penelitian dilaksanakan di *Rice Milling Unit* (RMU) Sri Rahayu, Kalikidang, Sokaraja, Banyumas. Sistem IoT yang dibangun mengintegrasikan sensor *load cell* 100 kg sebagai pendeteksi bobot, modul HX711 sebagai pengkondisi sinyal ADC 24-bit, mikrokontroler ESP32 sebagai pemroses dan pengirim data nirkabel, LCD 16x2 I2C sebagai tampilan lokal, serta *platform* Thinger.io sebagai *dashboard* berbasis *cloud* yang dapat diakses dari jarak jauh. Pengambilan data dilakukan pada dua perlakuan, yaitu SDD dan konvensional, dengan interval pengamatan 60 menit untuk kadar air. Validasi sistem dilakukan dengan membandingkan pembacaan sensor terhadap timbangan referensi manual, sedangkan perbandingan performa pengeringan dianalisis menggunakan uji ANOVA satu arah.

Hasil penelitian menunjukkan seluruh komponen sistem berhasil terintegrasi dan berfungsi stabil. Validasi menghasilkan nilai *Mean Absolute Error* (MAE) susut bobot sebesar 1,75% dan MAE kadar air sebesar 1,83%, tergolong kecil sehingga sistem dinyatakan akurat dan andal. Rata-rata susut bobot pada metode SDD sebesar 6,125%, sedikit lebih rendah dibanding metode konvensional sebesar 7,74875%, namun perbedaan tersebut tidak signifikan secara statistik ($F = 2{,}217972 < F$ kritis $= 4{,}098172$; $p = 0{,}144666$). Variansi susut bobot pada kelompok konvensional (13,99265) lebih besar dibanding SDD (7,45444), mengindikasikan bahwa kondisi pengeringan konvensional lebih dipengaruhi fluktuasi lingkungan. Pada parameter kadar air, metode SDD mencapai kadar air akhir 12,70% dalam waktu 240 menit, sementara metode konvensional membutuhkan waktu 360 menit untuk mencapai kadar air setara (12,63%). Kesimpulannya, sistem IoT berbasis *load cell* pada SDD terbukti layak dan efisien untuk pemantauan pengeringan Sorgum secara otomatis dan *real-time*, dengan SDD unggul dalam efisiensi waktu pengeringan meskipun hasil susut bobot dan kadar air akhir kedua metode tidak berbeda nyata secara statistik.

Kata Kunci: IoT, *Load cell*, *Solar Dome Dryer*, Sorgum, Susut Bobot

SUMMARY

Sorgum (Sorgum bicolor) is a strategic cereal commodity that requires proper post-harvest handling, particularly in the drying process, to maintain grain quality and extend shelf life. Conventional drying methods (direct sun drying) have notable limitations, including dependence on weather conditions, lengthy drying duration, and risk of environmental contamination (Mariyam et al., 2021). The Solar Dome Dryer (SDD) offers a solution by utilizing the greenhouse effect to accelerate water evaporation from the grain in a more controlled manner. However, monitoring weight loss during the drying process is still carried out manually and periodically, making it inefficient and prone to recording errors. This study aimed to design an IoT-based sorgum weight loss monitoring system integrated into a Solar Dome Dryer, with the specific objectives of reading weight changes in real-time, integrating data into a remote monitoring platform, and comparing the drying performance of the SDD against the conventional method.

The study was conducted at the Rice Milling Unit (RMU) Sri Rahayu, Kalikidang, Sokaraja, Banyumas. The IoT system integrates a 100 kg load cell sensor for weight detection, an HX711 module as a 24-bit ADC signal conditioner, an ESP32 microcontroller as the data processing and wireless transmission unit, a 16x2 I2C LCD for local display, and the Thinger.io platform as a cloud-based dashboard accessible remotely. Data collection was carried out under two treatments — SDD and conventional drying — with moisture content measured at 60-minute intervals. System validation was performed by comparing sensor readings against a manual reference scale, while drying performance comparison was analyzed using a one-way ANOVA test.

The results showed that all system components were successfully integrated and operated reliably. System validation produced a Mean Absolute Error (MAE) of 1.75% for weight loss and 1.83% for moisture content, indicating high accuracy and reliability. The average weight loss for the SDD method was 6.125%, slightly lower than the conventional method at 7.74875%, although the difference was not statistically significant ($F = 2.217972 < F\ critical = 4.098172$; $p = 0.144666$). The variance in weight loss was higher in the conventional group (13.99265) compared to SDD (7.45444), indicating that the conventional drying condition was more influenced by environmental fluctuations. Regarding moisture content, the SDD method reached a final moisture content of 12.70% within 240 minutes, while the conventional method required 360 minutes to reach a comparable moisture content (12.63). In conclusion, the IoT-based load cell monitoring system integrated with the Solar Dome Dryer is accurate, reliable, and suitable for automated real-time monitoring of sorgum drying, with SDD demonstrating superior time efficiency despite both methods showing statistically comparable final weight loss and moisture content.

Keywords: *IoT, Load cell, Solar Dome Dryer, Sorgum, Weight Loss*