RINGKASAN

Rancang Bangun Sistem *Smart Hybrid Energy Technology* untuk Penyediaan *Growth Light* UV Budidaya Tanaman Kedelai berbasis IoT

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Produktivitas kedelai dipengaruhi oleh karakteristik tanaman dan lamanya penyinaran. Di daerah tropis seperti Indonesia, pertumbuhan kurang optimal karena variasi suhu dan lamanya penyinaran yang terbatas. Penelitian menunjukkan, panjang penyinaran ideal bagi kedelai subtropis adalah 14-16 jam. Untuk meningkatkan lamanya penyinaran, digunakan teknologi *smart hybrid energy* dengan panel surya dan tenaga angin untuk kontrol lampu UV otomatis. Proyek ini bertujuan menambah lama penyinaran untuk tanaman kedelai dengan memanfaatkan energi alternatif yang ramah lingkungan.

Dalam penelitian ini menggunakan beberapa penyelesaian metode penelitian seperti, perancangan mekanikal, perancangan elektrikal, dan perancangan *software*. Penelitian dilakukan dengan diawali dengan penentuan metode penelitian yang akan dilakukan, tinjauan pustaka, perancangan mekanikal, perancangan elektrikal, perancangan *software*, pengujian dan evaluasi sistem, pengambilan data, tahap analisis serta diakhiri dengan pembuatan laporan akhir.

Penelitian ini merancang sistem *smart hybrid energy* dengan fokus pada komponen fisik, elektronik, dan perangkat lunak, serta melakukan pengujian komprehensif. Perancangan fisik melibatkan pembuatan baling-baling turbin angin dan dudukan panel surya untuk optimalisasi pengumpulan energi terbarukan. Perancangan elektronik terpusat pada *panel box* sebagai pusat kontrol, sementara perangkat lunak mengintegrasikan sensor dan aksi otomatisasi melalui jaringan WiFi dan Telegram *Bot*. Pengujian komponen meliputi panel surya, turbin angin, serta sensor LDR, UV, dan PZEM-004t, menunjukkan efisiensi dan konsistensi kinerja yang sesuai. Pengujian sistem keseluruhan menegaskan kemampuan sistem untuk beradaptasi dengan kondisi lingkungan dan memenuhi kebutuhan energi secara efisien.

Kata kunci : *smart hybrid energy, monitoring,* Wifi, UV

SUMMARY

Design and Develop a Smart Hybrid Energy Technology System for Provisioning Growth Light UV in Soybean Plant Cultivation based on IoT

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The productivity of soybeans is influenced by plant characteristics and the length of planting. In tropical areas such as Indonesia, growth is less optimal due to limited temperature variations and the length of dew. Research has shown that the ideal life span for subtropical soybeans is 14-16 hours. To increase the life span, smart hybrid energy technology with solar panels and wind power is used to control automatic UV lights. The project aims to increase the length of decommissioning for soybean crops by leveraging environmentally friendly alternative energy.

This research uses several completion methods such as mechanical design, electrical planning, and software planning. The research is carried out by starting with the determination of methods of research to be done, library examination, mechanic design, electric design, software design, testing and evaluation of systems, data collection, phase of analysis, and ended with the preparation of the final report.

The research designs smart hybrid energy systems with a focus on physical, electronic, and software components, as well as conducting comprehensive testing. Physical design involves the manufacture of wind turbine wheels and solar panels to optimize the collection of renewable energy. Electronic design focuses on the box panel as the control center, while the software integrates sensors and automation actions through WiFi and Telegram Bot networks. Component testing includes solar panels, wind turbines, as well as LDR, UV, and PZEM-004t sensors, showing appropriate efficiency and consistent performance. The test of the entire system confirms the ability of the system to adapt to environmental conditions and meet energy requirements efficiently.

Keywords : smart hybrid energy, monitoring, Wifi, UV