

PERANCANGAN SISTEM MONITORING IRADIASI MATAHARI UNTUK MENDUKUNG PENGAMATAN EVAPOTRANSPIRASI

INTISARI

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Perubahan iklim dan cuaca yang tidak menentu menjadi salah satu faktor yang mempengaruhi pertumbuhan tanaman dalam proses kegiatan pertanian sehingga berpengaruh terhadap produktifitas yang dihasilkan. Pemahaman serta pengetahuan mengenai iklim dan cuaca penting bagi para petani untuk kegiatan budidaya pertanian yang mengarah ke pertanian presisi, tetapi masih banyak petani yang belum memahaminya. Pertanian presisi dapat berhasil jika pengamatan kondisi lingkungan dilakukan dengan benar. Evapotranspirasi merupakan komponen kondisi lingkungan yang perlu diperhitungkan dimana intensitas radiasi matahari menjadi faktor dominan yang berperan penting dalam proses fotosintesis. Penerapan pengamatan kondisi lingkungan dapat dilakukan menggunakan sistem *monitoring*. Sistem *monitoring* adalah perangkat yang dirancang untuk memudahkan pengamatan kondisi lingkungan secara *real-time* sekaligus menyimpan data secara otomatis. Saat ini sudah banyak teknologi yang dikembangkan untuk memonitoring iklim dan cuaca, namun ketersediaan alat dan *sparepart* yang terbatas di dalam negeri dan harga relatif mahal. Oleh sebab itu, penelitian ini dilakukan dengan tujuan merancang sistem *monitoring* iradiasi matahari secara *real time* dan mengevaluasi kinerja sistem dengan biaya yang rendah.

Sistem *monitoring* iradiasi matahari dirancang dengan beberapa komponen yaitu: Mikrokontroler Wemos Lolin32 Lite, Sensor GY-49MAX44009, Sensor TSL-2561, Powerbank dan Modem. Pengamatan dilakukan selama 5 hari pada pukul 05.00-18.00 WIB dengan interval waktu setiap 10 menit. Uji validasi menggunakan 4 metode yaitu Koefisien Determinasi, RMSE, MSE, dan MAPE. Hasil validasi selama 5 hari menunjukkan nilai rata-rata R^2 sensor GY-49 sebesar 0.9219 dan sensor TSL-2561 sebesar 0.9351. Dari hasil pengujian dan validasi, dapat disimpulkan bahwa sensor GY-49 dan TSL-2561 memiliki interpretasi yang sangat kuat terhadap sensor PYR Solar Radiation.

Kata kunci: sistem monitoring, intensitas radiasi matahari, evapotranspirasi

DESIGN OF SOLAR IRRADIATION MONITORING SYSTEM TO SUPPORT EVAPOTRANSPIRATION OBSERVATIONS

ABSTRACT

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Climate change and impulsive weather were two of the factors that affect plant growth in the process of agricultural activities. Thus, affects its productivity. Climate and weather understanding and knowledge are important for farmers' agricultural cultivation activities that leads to precision agriculture. But, there are still many farmers who do not understand what it means to farm in precision. Precision farming can be successful if the environmental conditions are observed properly. Evapotranspiration is a component of environmental condition that needs to be taken into account where the intensity of solar radiation is the dominant factor which plays an important role in the photosynthesis process. The application of observing environmental conditions can be done using a monitoring system. The monitoring system is a device designed to facilitate real-time observation of environmental conditions while simultaneously storing data automatically. Currently, many technologies have been developed to monitor climate and weather, but the availability of its tools and spare parts is limited in the country, as well as the prices are relatively expensive. Therefore, this research was conducted with the aim of designing a solar irradiation monitoring system in real time and evaluating system performance at a low cost.

The solar irradiation monitoring system was designed with several components, such as; Wemos Lolin32 Lite Microcontroller, GY-49MAX44009 Sensor, TSL-2561 Sensor, Powerbank, and Modem. Observations were made for 5 days at 05.00-18.00 WIB with time intervals every 10 minutes. The validation test used 4 methods, such as; Coefficient of Determination, RMSE, MSE, and MAPE. The validation results for 5 days showed the average R^2 value of the GY-49 sensor was 0.9219 and the TSL-2561 sensor was 0.9351. From the test and validation results, it can be concluded that the GY-49 and TSL-2561 sensors have a very strong interpretation of the PYR Solar Radiation sensor.

Keywords: monitoring system, solar radiation intensity, evapotranspiration