SISTEM PREDIKSI IRIGASI OTOMATIS MENGGUNAKAN ADAPTIVE NEURO FUZZY INFERENCE SYSTEM (ANFIS) PADA SMART FARMING

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Abstract

Uncertainty related to soil moisture and environmental temperature poses a significant challenge in achieving optimal melon plant growth in tropical regions. Melon plants are highly sensitive to changes in temperature and moisture, with an ideal temperature range of 27-35°C and relative humidity of around 70-80%. Inadequate conditions often lead to uneven water distribution, which risks crop failure and reduced productivity. This study aims to develop an automatic irrigation prediction system based on the Adaptive Neuro-Fuzzy Inference System (ANFIS) that can monitor and regulate environmental conditions, particularly temperature and soil moisture, for melon cultivation. The system collects real-time data from sensors and uses the ANFIS model to predict irrigation needs, which are then executed by an automatic controller. The results demonstrate that the system successfully improves water use efficiency and maintains optimal soil conditions, with a Mean Squared Error (MSE) value of 8.624. With a prediction accuracy rate of 95% and a support value of 200, the system has proven to reduce the risk of crop failure and enhance plant productivity, while contributing to the development of adaptive smart agriculture systems in tropical regions. Additionally, this research offers new insights into optimizing water resource usage and more efficient agricultural environmental management.

Keywords: smart irrigation, ANFIS, water efficiency, soil moisture, environmental temperature, tropical agriculture.