

ABSTRACT

Rapid growth in the agricultural sector and increasing food needs require effective development methods to manage plant growth, one of which is agriculture with hydroponic technology which uses nutrient solutions as a planting medium that replaces soil. Lettuce plants are one of the common commodities in this system. However, there is still poor quality of lettuce plants due to lack of supervision in the growth process. Plant growth is greatly influenced by various factors such as nutrient levels in the air, light intensity, air temperature, air pH, room temperature. To increase the efficiency of hydroponic farming on lettuce plants requires effective management of its growth to ensure optimal harvest results. Leaf area on lettuce plants is an important indicator in activating plant growth and maturity to increase good production results.

In this final project, a system was created to detect growth in hydroponic lettuce plants based on leaf area which will be measured using OpenCV image processing technology and analyzing the parameters that most influence leaf area growth using the random forest algorithm. These parameters include TDS value, air temperature, room temperature, plant area temperature, air pH and light intensity. The data obtained was then analyzed using important features from the random forest modeling that had been drilled. This system was created as a good control system to improve agricultural management.

The results of testing this system show that the Random Forest model has an R^2 value of 0.986 and an MAE of 5.7% in the first model, and an R^2 of 0.965 and an MAE of 8.7% in the second mode, indicating high results. TDS was found to be the parameter that had the most influence on lettuce plant growth compared to air pH, whose value was unstable due to changes in temperature. Tests also showed plants on the first shelf received more nutrients and grew faster than the second shelf.

Keywords: Hydroponics, Machine Learning, Random Forest, Digital Image