

***Implementation of ANFIS Method on Environmental Control System for  
Optimizing Robusta Coffee Seedling Growth in IoT-Based Greenhouse***

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***ABSTRACT***

*The robusta coffee industry in Indonesia faces challenges in maintaining stable environmental conditions during the seedling phase, where conventional management has been unable to consistently maintain temperature, humidity, and soil pH parameters, resulting in suboptimal seedling growth. This study implements the Adaptive Neuro-Fuzzy Inference System (ANFIS) method in an Internet of Things (IoT)-based greenhouse environmental control system to optimize the growth of robusta coffee seedlings (Coffea canephora) through automatic control of air temperature, air humidity, and soil pH conditions. The ANFIS model was trained using 8.640 data points with three input variables and three Generalized Bell-based membership functions per variable, resulting in 27 fuzzy rules. The DHT21 sensor and soil pH sensor were calibrated using the offset correction method to improve reading accuracy prior to system implementation, although the accuracy of the soil pH sensor after calibration had not yet reached an ideal level. The results indicate that the ANFIS model achieved an RMSE value of 0.0751 with a pump decision accuracy rate of 95%, demonstrating that the model performs well in classifying greenhouse environmental conditions and generating automatic pump activation decisions. The environmental parameters used in this study were validated by an expert in plantation crop cultivation and declared suitable for the physiological needs of robusta coffee seedlings, namely temperature of 20–28°C, humidity of 70–90%, and soil pH of 5.5–6.5.*

**Keywords:** ANFIS, IoT, Greenhouse, Robusta Coffee, Environmental Control System.