

IMPLEMENTATION OF A MAINTENANCE SYSTEM IN AN IOT-BASED SMART HYDROPONIC SYSTEM

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ABSTRACT

A hydroponic system is an efficient cultivation method as it does not require soil as a growing medium. However, the success of this method heavily depends on the stability of environmental conditions. In practice, IoT-based hydroponic systems often encounter various technical issues, such as sensor malfunctions, programming errors, and data display disruptions. This study aims to implement an automated maintenance system to sustain the performance and reliability of the hydroponic system. The maintenance system was designed using preventive, corrective, and evaluative approaches, applied to key components such as pH sensors, TDS sensors, ESP32 microcontrollers, water pumps, and LCD displays. Problem resolution involved system workflow inspections, physical testing, and software corrections. Evaluation results demonstrated that after maintenance and repairs, the system could resume normal and consistent operation. Validation using a Likert-scale questionnaire showed a 98% expert acceptance rate, indicating that the system is feasible for use and further development. Additionally, this system helps users maintain stable plant nutrient levels and improves environmental monitoring efficiency in hydroponic installations.

Keywords: Hydroponics, Maintenance, Sensors, Expert Validation, IoT