

ABSTRACT

This research aims to develop an Internet of Things (IoT)-based water quality monitoring system using the ESP32 microcontroller to measure essential parameters in Spirulina cultivation media. The system integrates DS18B20 temperature sensor, pH sensor, BH1750 light intensity sensor, and a Total Dissolved Solids (TDS) sensor from DFRobot. The installation was carried out in an aquarium as a prototype of a Spirulina pond, with data displayed in real-time through the Blynk application and automatically recorded into Google Spreadsheet. The research method consisted of hardware design, software integration, sensor validation with standard instruments, and system testing under daytime and nighttime conditions. Validation results indicated that the sensors achieved good accuracy with an average error margin below 5% compared to standard tools. Field testing showed that during the daytime, water temperature increased from 24.63 °C to 27.69 °C along with light intensity, pH decreased from 10.24 to 9.74, while TDS dropped from 1739 ppm to 1622 ppm. At night, temperature remained stable (24.62–27.00 °C), light intensity stayed low (16–17 lux), pH slightly decreased from 10.33 to 9.71, and TDS fluctuated within 1150–1237 ppm. Overall, the system was able to operate continuously, provide real-time information on water quality parameters, and shows potential for application at a larger scale for Spirulina pond monitoring.

Keywords: *Water quality monitoring, ESP32, IoT, Spirulina, sensors*