

ABSTRACT

Saltwater shrimp farming is a leading sector in Indonesia's fisheries exports; however, its productivity is often hampered by complex challenges in water quality management and operational efficiency. Fluctuations in critical parameters such as pH, dissolved oxygen (DO), temperature, and salinity, as well as high energy costs, remain the main issues faced by farmers. This study proposes and implements an innovative Internet of Things (IoT)-based solution to address these problems. The designed system consists of hardware in the form of a series of sensors (pH, DO, temperature, salinity) connected to an ESP32 microcontroller, and software in the form of a mobile application built using Flutter with Firebase as the backend.

The system not only monitors water quality in real time but also integrates automatic control of actuators such as paddlewheels and automatic feeders. Comprehensive testing was carried out, including sensor accuracy tests, automatic control functionality tests, and a User Acceptance Test (UAT). The test results showed low sensor deviations (below 5%), fast automatic control response times (under 7 seconds), and a user satisfaction rate of 90%. These findings prove that the implemented IoT system can operate accurately, reliably, and is well accepted by users. Therefore, this solution can serve as an effective tool to enhance productivity, energy efficiency, and sustainability in shrimp farming in Indonesia.

Keywords: *Shrimp farming, IoT, water quality, energy efficiency, monitoring system, sustainability*