

ABSTRACT

Tilapia fish farming in ponds is one of the freshwater aquaculture sectors with high economic potential in Indonesia. The pond environment plays a crucial role in supporting the growth and health of tilapia; however, its management still faces several challenges. One of the main issues is the suboptimal monitoring of water quality and the continued use of manual and imprecise feeding methods. This can lead to feed wastage, deteriorating water quality, and ultimately a decrease in farming productivity.

To address these issues, this study developed an automated system based on the Internet of Things (IoT), designed to monitor pond water quality and manage the feeding of tilapia in an integrated and timely manner. The system uses an ESP32 microcontroller connected to various sensors, including a temperature sensor (DS18B20), pH sensor (SEN0161), *turbidity* sensor (SEN0189), humidity sensor (DHT11), and a load cell (HX711) for weight measurement. Sensor data is transmitted to a Telegram Bot to facilitate remote monitoring. Additionally, the feeding process is carried out automatically based on a predefined schedule, with feed portions measured using a servo motor.

Testing conducted over seven days showed that the system operated stably, with an average sensor accuracy of over 95% and a feed weight measurement error rate of only 1.08%. The automated feeding mechanism demonstrated an average deviation of 8 grams from the 100-gram target, which is still within the acceptable tolerance range. The average system response time for data transmission to Telegram was under 10 seconds. These results indicate that the developed system can improve the efficiency of tilapia pond management by reducing feed waste and enabling accurate and continuous water quality monitoring.

Keywords: Automatic feeding, IoT, load cell, tilapia, water quality