

ABSTRACT

Urbanization pressure in peri-urban areas such as Semarang City has triggered extensive agricultural land conversion, posing a threat to food security. Although aquaponics has emerged as an adaptive solution and has been widely developed with automation technologies, its implementation and development in the Semarang area remain limited. This study aims to address this limitation by developing an Internet of Things (IoT)-based aquaponics monitoring and control platform with multi-tenant functionality using the Laravel framework and Tailwind CSS. The software development process was managed adaptively through the Agile Scrum methodology, which was divided into three sprint cycles to facilitate team collaboration. The platform integrates an ESP32 microcontroller, various environmental quality sensors, and actuators, while utilizing third-party services such as HiveMQ (MQTT Broker) and Fonnite for user notification services. Through the implementation of the Scrum methodology, the system development was completed on schedule and in accordance with the planned objectives. Furthermore, the results of black-box testing demonstrated that the monitoring website operated as intended and fulfilled its functional requirements.

Keywords: Aquaponics, IoT, Scrum, Laravel, Black Box Testing.