ABSTRACT

The rapid population growth and limited agricultural land in urban areas pose significant challenges to sustainable food production. The cultivation of freshwater redclaw crayfish (Cherax quadricarinatus) and pakcoy (Brassica rapa) through aquaponics offers an innovative solution, but it still faces obstacles in water quality management, feeding efficiency, and manual environmental monitoring. These limitations can hinder productivity and increase the risk of crop failure. This study aims to design and implement an Internet of Things (IoT)-based aquaponics system that integrates real-time water quality monitoring, automated feeding, and natural filtration using pakcoy plants. IoT integration enables precise control over key parameters such as temperature, pH, and water level, ensuring optimal conditions for crayfish and plant growth. The main contribution of this research is the development of an IoT-based monitoring system that enhances aquaponics management efficiency through real-time data, along with an optimized ratio of crayfish to plants to maintain ecosystem balance. Additionally, the automated feeding system helps reduce cannibalism among crayfish, which is a major factor in aquaculture failure. Experimental results indicate that the developed system successfully increased the average crayfish weight by 6.28–6.72 grams and length by 2.26–2.64 cm over eight weeks, while pakcoy plants exhibited a height increase of 2.23–3.24 cm per week, reaching a final average height of 26–27 cm. The IoT monitoring system effectively maintained stable environmental parameters, with high accuracy in pH, temperature, and water level sensors. These findings demonstrate that IoT-based aquaponics is an effective solution for improving the efficiency of integrated crayfish and plant cultivation in a sustainable ecosystem.

Keywords: *Aquaponics, IoT, Redclaw Crayfish, Pakcoy, Automated Feeding System, Sustainable Agriculture.*