AUTOMATED HYDROPONICS FARM USING IOT

Karunakaran Bhavaram[1], Vijayanathan Senthooran[2], Saliny Nadarajah[1]*

[1]JAM Entertainment, Colombo, Sri Lanka

[1*], [2]Department of ICT, University of Vavuniya, Vavuniya, Sri Lanka

*Corresponding author: salinada22@gmail.com

Abstract

Automation plays an important role in modern agriculture by reducing human effort and improving resource-use efficiency. This study presents the design and development of an automated hydroponics farming system for monitoring and controlling the water and nutrient requirements of plants. The proposed system integrates microcontrollers, water pumps, and environmental sensors to continuously monitor relevant growing conditions and automatically control the irrigation process. Hydroponics enables crop production without soil and provides opportunities for cultivation in areas with limited arable land, including urban environments. The developed system was experimentally evaluated based on water consumption and plant growth performance. The amount of water used was determined by recording the initial and final water levels of the hydroponic tank over the experimental period. The water consumption of the automated system was compared with that of a conventional/manual system to assess its effectiveness in reducing water wastage and manual intervention. The experimental results demonstrated that the automated system reduced water consumption by 25% compared with the manual system while maintaining satisfactory plant growth. The system also reduced the need for continuous manual monitoring and improved the consistency of irrigation. These findings demonstrate the potential of automated hydroponics as a water-efficient and environmentally sustainable approach to modern agriculture. The collected sensor and water-use data can further support optimization of hydroponic configurations and resource management.

Keywords: Automation, Hydroponics, Smart Agriculture, Automated Irrigation, Microcontrollers, Water Efficiency