

DEVELOPMENT OF GREEN TECH AUTOMATED IOT BASED GREENHOUSE AEROPONIC VERTICAL FARMING USING ARDUINO UNO

ABSTRACT

AUTHORS

Remalyn Gaditano
Colin Jay Mallen
Nathaniel James Millare
John Samuel Sangumay
Emmanuel Tupino

RESEARCH ADVISER

Engr. Reynante B. Ponay

AFFILIATION

Bestlink College of the
Philippines

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Engineering

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Aeroponic vertical farming is an advanced agricultural method wherein crops are suspended in the air, and their roots are periodically misted with nutrient-rich solutions. This technique is increasingly popular in urban areas due to its efficient use of space and resources. The development of a Green Tech Automated IoT-Based Greenhouse Aeroponic Vertical Farming system using Arduino Uno promotes sustainable agriculture by enabling controlled, enclosed environments for plant growth. However, successful implementation of this method requires attention to critical parameters such as spraying intervals, mist duration, light exposure, temperature regulation, and humidity control. This study aims to design an automated system that addresses these requirements through precise monitoring and regulation. The researchers used the experimental prototyping method to develop the automated greenhouse system. Arduino Uno and ESP32 microcontrollers served as the core components of the system, programmed using Arduino IDE with the C language. The prototype integrates sensor networks and IoT technologies to automate essential processes in aeroponic vertical farming, including nutrient misting and environmental regulation. The design also incorporates solar power to promote energy sustainability. Functional testing and respondent evaluations were conducted to assess the system's performance across several indicators. The developed prototype operated successfully, with features that regulate environmental parameters such as temperature, humidity, and nutrient delivery through an automated system. The system's solar-powered design, coupled with real-time monitoring capabilities via sensors, contributed to its high performance. Respondents provided favorable evaluations, indicating high levels of satisfaction in terms of the system's efficiency, sustainability, safety, and cost-effectiveness. The use of Arduino Uno and ESP32 microcontrollers proved effective for this application. The study demonstrated that the integration of green technology, IoT, and microcontroller-based automation offers a promising solution for urban agriculture. The developed aeroponic vertical farming system optimizes limited space, conserves water, and minimizes soil-borne diseases. Its sustainable design and automated functionality make it well-suited for addressing food production challenges in urban settings. Future improvements may focus on scalability, enhanced data analytics, and broader integration with smart agricultural platforms.

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