DESIGNING AN INTERNET OF THINGS-BASED MONITORING SYSTEM APPLICATION FOR SMART GREENHOUSE TO OPTIMIZE VEGETABLE GROWTH AS A FOOD SUPPLY NEED

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ABSTRACT

Urban agriculture faces challenges such as limited land, pollution, and climate change, all of which impact the productivity and efficiency of crop cultivation. One innovative solution that has emerged is the implementation of an Internet of Things (IoT)-based Smart Greenhouse. This study aims to design and implement an IoT-based monitoring system for a Smart Greenhouse that enables real-time environmental monitoring through a web-based interface. The system utilizes a DHT11 sensor for air temperature and humidity, a YL-69 sensor for soil moisture, and a NodeMCU ESP8266 module for transmitting data to the server. Testing was conducted using the black-box method across seven main scenarios involving seven respondents. The results indicate that all core features—such as login, device addition, and sensor monitoring—functioned as expected, with an average success rate of 94.46%. Although the system does not yet support automated irrigation, the findings demonstrate that the application fulfills essential functionalities and holds potential for further development to enhance the efficiency and productivity of urban agriculture.

Keywords: *Internet of Things, Smart Greenhouse, NodeMCU ESP8266, Sensor, Arduino*