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Development of Automated Monitoring System for Hydroponics Vertical Farming

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Abstract. Proposed is an automated monitoring system for hydroponics vertical farming. This project aims to design and develop an automated system to monitor and maintain the level of nutrition solution for the vertical farming process. The monitoring condition includes Electrical Conductivity (EC), pH value, the liquid level as well as the water temperature of the nutrient solution stored in the rectangular PVC. Instead of using soil as the growing medium, the project used hydroponics method to grow the leafy vegetables, Bok Choy. The data monitored will be sent and processed by Arduino Mega microcontroller and upload to Ubidots Cloud using the ESP8266 NodeMCU. The system also provides control function to maintain the nutrient level and amount of solution flows into each layer of vegetables. It is expected that the implemented system would reduce the water and electrical consumption and allows the growth of the plant to be supervised from time to time without having a person to look after.

1. Introduction

The world's population is expected to increase by another 2 billion people by the year of 2050 and eventually it will lead to a bigger challenge, feeding more people with limited lands [1]. Vertical farming was considered to be one of the latest technologies in agriculture field to reduce the land used issue. It is a practice of growing plants and vegetables on vertically inclined surfaces. This method of planting produces foods in vertically stacked layers instead of farming vegetables or foods on a single level. This type of farming method results in more crops production within the same square footage of growing area [2].

Even so, monitoring process is essential in vertical farming process as it helps to monitor the amount of nutrients provided to the plants. However, the expenses needed for the application of advanced technologies for vertical farming are way too costly which include the buildings or greenhouses for the plants, the lighting system and monitoring system of the vertical farm. Therefore, this research proposed a solution by implementing an automated monitoring system for vertical farming using hydroponics method. Aside from monitoring the nutrient solution, the proposed solution will minimize the use of electricity and water when growing the Bok Choy plants.

This research project aims to develop an automated monitoring system for vertical farming that is able to monitor the condition of nutrient solution and utilizes the least amount of electricity and water to produce vegetables.

