Project Reference Number: 46S_BE_3975

Project Name: Smart Aeroponics

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Keywords:

Introduction

Agricultural activities are an important sector which determines any country's living standards and growth rate. With the advent of technology, it is important to match that pace and contribute towards smart agriculture. Agriculture is in a phase of major change around the world and dealing with serious problems. In future, it would be difficult task to provide a fresh and clean food supply for the fast-growing population using traditional agriculture. Under such circumstances, soil-less cultivation is the alternative technology to adapt effectively. The soil-less system associated with the Hydroponic and Aeroponics system. In the aeroponics system, plant roots are hanging in the artificially provided plastic holder and foam material replacement of the soil under controlled conditions. The roots are allowed to dangle freely and openly in the air. However, the nutrient rich-water is delivered with atomization nozzles. The nozzles create a fine spray mist of different droplet size intermittently or continuously. This project gives one of the best plants growing method for food security and sustainable development. The system has shown some promising returns in various countries like Northern America, Latin America and the Caribbean and is recommended as the most efficient, useful, significant, economical and convenient plant growing system then soil and other soil-less methods**.**

Objectives

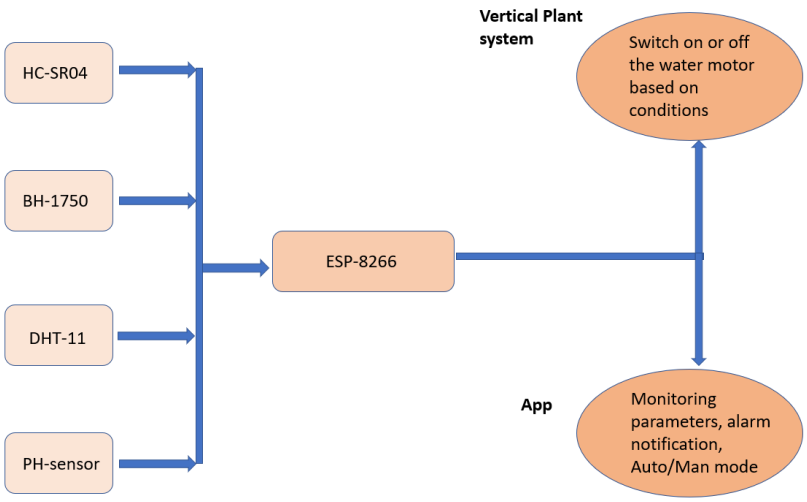
- The main objective here is to design and implement a vertical system of plants which use minimal amount of soil and grows mostly with the help of coco pit and water filled with nutrients.
- High pressure nozzles are fixed to ensure the mist environment.
- Once the set-up is done, the next step is to automate the monitoring and watering process. This automation is done with a microcontroller and a couple of sensors. The parameters will be monitored in an app made for the same. The watering process can be put into manual mode or automated mode in this app.

Methodology

To brief the project, a vertical aeroponic system has been designed and set up and certain alterations were made to the designed system to achieve the mist environment. The foldable pipe was replaced with a PVC pipe to which sprinkles were attached to achieve the mist.

To automate this, a control system has been designed and implemented using sensors to obtain the parameters necessary for plant growth, such as light, humidity, and temperature, and an ultrasonic sensor fixed on the top of the tank to detect the water level. ESP8266 Wifi module with self contained SOC and integrated TCP/IP protocol is used. The sensors used are HC-SR04 to measure the amount of water in the container. If there is no enough water, an alarm is set-up, DHT-11 is to measure the temperature and humidity around the vertical system, BH-1750 light sensor to measure luminosity and a PH sensor to measure and maintain proper Ph of the nutrient water that is to be pumped to the plants.

All these parameters can be monitored and alarms are notified in the app built for the same. The whole system can be switched to manual mode or automatic mode as per the requirement using the app.



Results and Conclusion

This project explains about one of the best methods of growing plants which is useful compared to other cultivation systems in many aspects. Here, an aeroponics system has been designed and implemented. Not only implementation in agricultural aspect, the system has been automated by designing and implementing a control system and analyse the environmental parameters required for plant growth. The extracted data has been deployed in a IoT platform through a channel made for the specific project where all the data has been displayed and analysed. This method could be employed easily in various countries for vegetable production either indoor or outdoor where natural resources are available efficiently.

Innovation in the project

The major innovation in this project is that the whole system is automated and there is no need of manual assistance all the time. The parameters and needs of the plants can be monitored via a simple mobile phone. It also gives alarm and warning in case of any need.

Future Scope

This project could be extended by designing ML and DL algorithm to monitor plant growth and to identify any disease developed on the leaves.

Raw data is collected from the plants and by image processing and machine learning techniques, the data can be trained and farm bot can be designed to analyse the same using the trained data and so can identify the plants with diseases and the ones with good growth.

In order to provide better control, researchers have created systems that rely on machine learning – systems that can learn from examples – in order to learn what control actions are needed and execute them in order to provide ideal control to an aeroponic setup. A machine learning system will be able to anticipate things like the lag between turning an AC unit on and the temperature decreasing, so it will be able to be both more efficient and more accurate in the way it controls your environment. A deep learning neural network can be used to perform a control role. To take this to industrial level, PLC (Programmable Logic Computer) would be used where all the sensors could be wireless and gives data just through a network which could be easily analysed and reduces the complication of circuit.