

# IOT BASED HYDROPONIC SYSTEM USING LIGHT INTENSITY FOR LETTUCE GROWTH

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## **Keywords:**

Hydroponics, IOT, Light Intensity, Lettuce, Deep Water Culture, Wi-Fi Module

## **Introduction**

The environmental conditions are moving towards much harsher conditions where it has become difficult to have proper soil to grow crops and this has led to lack of food and increase in crop demand. Lack of proper cultivation lands has made it difficult to meet these demands and this can be solved by the use of hydroponics system which is a soil less system, where nutrients are used to cultivate crops. Hydroponics farming uses less water and is a better alternative when compared with traditional farming. Use of hydroponic farming can significantly improve the output of crop when compared to use of conventional methods. Hydroponics is considered as the future of the farming due to changes happening around the world.

In the past few decades, NASA has involved itself extensively in hydroponic research for the development of a Martian environment using LED lighting to grow in a different colour spectrum with much less heat .It is believed that hydroponics will create advances within space travel as a bio-regenerative life support system in the future during drastic conditions. Intensive research work has been going on with regards to the advancement of hydroponic system with the aim of achieving better yield and to overcome challenges posed by soil or traditional farming.

## **Objective**

Following are the objectives:

- (a) To explore best approach to overcome drawbacks of soil farming.
- (b) To design and implement Deep Water Culture system integrated with IoT to monitor and control various parameters to provide best environment for plant growth.
- (c) To save time and also for easier management.
- (d) To have control over climatic conditions.

## Methodology

The design consideration in this work can be summarized as follows:

- (a) Basic design flow of Deep-water culture based hydroponic system is shown in the figure. It consists of Node MCU Board, Light Intensity sensor, Pressure sensor, Humidity sensor, Temperature sensor, Deep water culture system, Air Pump, WI-FI with IoT module, smart phone and power supply.
- (b) In this project Deep water culture (DWC) based hydroponic system has been implemented and air pump is used to aeration.
- (c) Light intensity sensor is used to know the intensity of light which reaches the plant. In this project we use light intensity as key parameter to growth of the plant.
- (d) Light intensity sensor sends the signal to Node MCU board. Light intensity level will be calculated in Node MCU Board and we can tune the intensity through application and vary the light intensity level to achieve good growth.
- (e) Pressure sensor, humidity sensor and temperature sensor are used to calculate farming area parameters and these data are given to Node MCU board to calculate and update parameters.
- (f) WI-FI Module and IOT networks are used to monitoring parameters at user's smart phone.

### Deep Water Culture

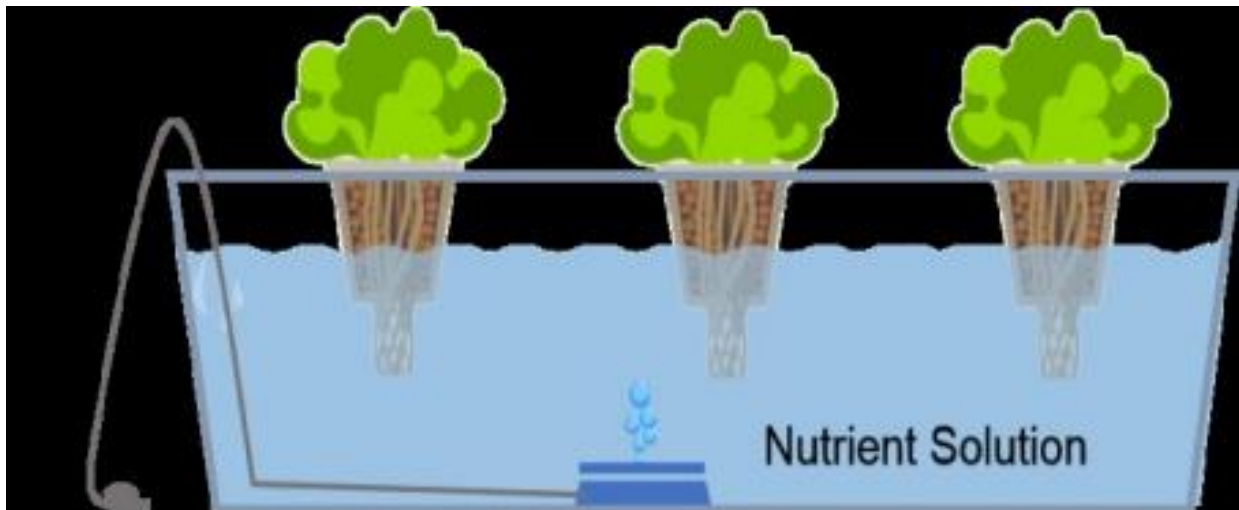
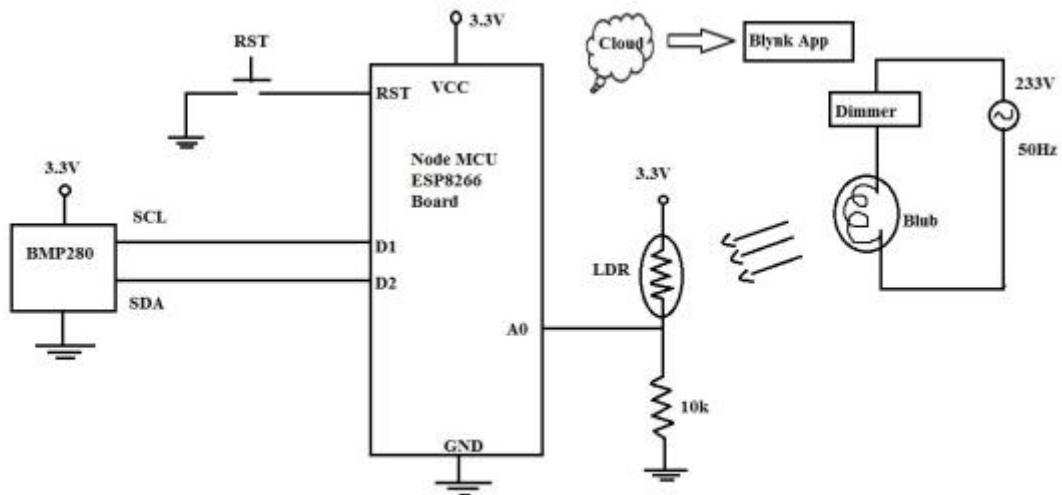


Fig. Deep Water Culture System

Deep Water Culture (DWC) is the type of hydroponic system that you can build and maintain at home. In this system, the plants grow with their roots submerged directly in nutrient-rich water. It is a method for growing plants without a substrate media. The roots of the plants are encased in a net pot that is suspended from a lid with roots dangling in a liquid nutrient solution. The deep water culture nutrients are high in oxygen.

## Circuit diagram



## Results and Conclusion

The conclusion drawn from this project is that it is not optimal as there was a limited resource. Implementation of IoT based hydroponic system with variation of light intensity has produced moderate growth. Plant shows signs of decreased growth rate with lower light intensity.

## Scope of Future Work

Different approaches to efficiently control light intensity needs to be investigated for better growth of lettuce. Growth rate of lettuce with higher light intensity can be explored. Further, organic cultivation can be implemented to produce organic crops.