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Digitalized Agricultural Resources Information System and Iot- Based Smart Farming

Aju Saigal

ajusaigal06@gmail.com

Crown University International Chartered,
Argentina, South America

Dr. Basheru Aremu

info@crownintl.education

Crown University International
Chartered Inc. USA

Dr. S Arumuga Perumal

riyasa@crownintl.education

Crown University International Chartered,
Argentina, South America

ABSTRACT

To grow more plants over a larger area, we need to use slower wattage lights. Over powering the grow area, simply results in excess heat wasted electricity and inner tip burn of plants. Lettuce is one of the most popular and faster growing crops hydroponically. The changes in Temperature, humidity will affect the growth of the plant. Hence plant monitoring is a necessary part of hydroponic system. The difficulty of knowing the environment information and nutrient requirements of the plant sometimes makes issues. The awareness of the above information is an important thing for hydroponic system. Several types of sensors are required for the monitoring the growth of hydroponic system such as Temperature Sensor, Light Sensitivity Sensor, Humidity Sensor etc. A microcontroller is needed for processing the output of the sensors data. A processor called Arduino, which can accommodate data from different sensors at the same time. The farmers will get right information of growth of the plants by using different sensors analyzed data such a way they will get more yield. The analyzed report will help the farmers to monitoring the growth of the plants and to improve the quality of the crops.

Keywords: IoT, Sensor

1. INTRODUCTION

Fertilizers are using for growing leafy plants and needs higher nitrogen number for growing plants like lettuce. Without water, fertilizers, the plants may not grow well and reproduce. Similarly, the temperature is too high, the plants may start dying.

The objective of this study is to determine the growth monitoring of hydroponic lettuce production and more suitable monitoring automated solution of lettuce production in India. For this, we are using the nutrient film technique of growing hydroponic lettuce, have NPK solution, artificial lighting controls, PH sensors, Temperature sensors, TDS sensor and water circulation pumps. Changes in the TDS, PH etc are easily identified by using these sensors. The scope of the research are as follows, the data

is obtained from different sensors and processed it. The result of analyzed data is used for monitoring the growth of the plants.

To maintain the growing condition of the Lettuce, we need to check the EC, PH, Temperature etc. Lettuce should be grown via germinating from seed and requires sufficient indirect light. If we have less space, we have selected NFT technique. It can be harvested fully from the head; hence we can save lots of time.

EC/PPM- 0.8-1.2,

560-840(1EC=700PPM)

PH- 5.5 -6.5

Light hours – 14- 18

Preferred hydroponic system –

DWC & NFT

Planting- Germinate from seed

Temperature– Range: 45-75 degree Fahrenheit

Harvest – Preferred to be harvested fully from the head. It takes about 5-8 weeks for harvest depending on the variety of Lettuce.

Proposed system is an automated plants growing monitoring system.

Hydroponics kit is used for growing lettuce. The kit is available in the market, which include Air pump, net pots, Clay balls, NFT Channel or pipe, End caps and nutrients. Hence, we purchased it for monitoring the growth of lettuce. It is easy to install and use it indoor. The NFT channel/pipe is openable and it allows you to check the water level.

We can harvest lettuce every 30 days, which means 12 harvest /year. The average yield of hydroponic lettuce is determined via

different PH level.

Growing lettuce with different PH level PH 4.5

Head	130 gm
Roots	16gm

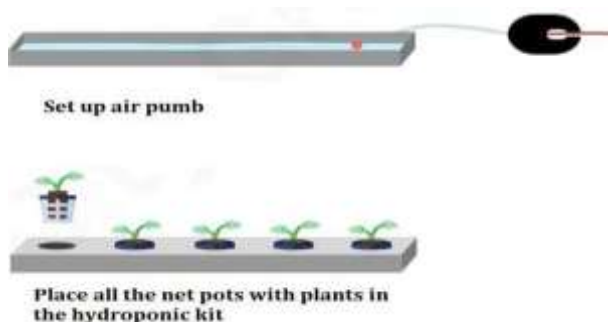
PH 7.0
PH 8.5

Head	150 gm
Roots	26gm

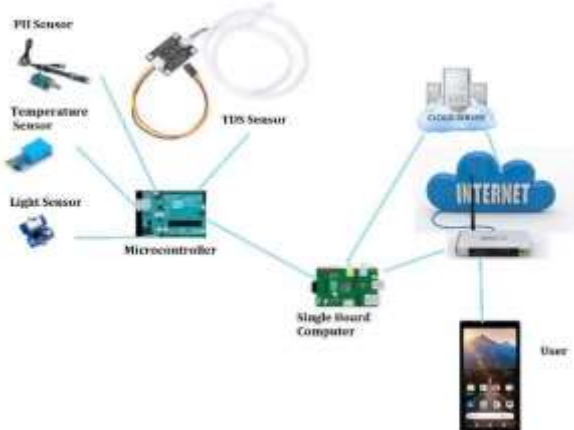
Energy usage is also considering in the hydroponic lettuce production. Hence we calculated the energy usage by using the following formulae

$$E = \frac{h \times c}{\lambda} \times \frac{6.022 \times 10^{23}}{mol}$$

E: Energy per mole of photons (J/mol) h: Planck's



2. HARDWARE DESIGN



3. SOFTWARE DESIGN

Data is transferred from different sensors and send to the Single Board Computer, after that it is transferred into the Cloud Server using HTTP protocol and block chain technology. In addition, the analyzed data will be sent to the concerned user's mobile phone as per their requirements. The software application is supported by Android and iPhone. The user can set the alert type as sms and he can view the detailed analyzedreport also.

constant (6.626×10^{-34} J·s): Speed of light (2.998×10^8 m/s) Wavelength of light (m)



System Design: Hydroponic system requirements are air pump, net pots, cocopeat, clay balls, plant and hydroponic nutrients. Sensors are used to monitor any changes occur in the plant, whether Temperature, EC, TDS etc.

Head	165gm
Roots	22gm



4. RESULTS AND ANALYSIS

All the result of sensor parameters will get via mobile phone. The farmers can monitor the growth of the plant and avoid the nutrient deficiency of the plant and control the environmental parameters also. Hence nutrients are provide to the plants via less water.

5. CONCLUSION

The conclusion that can be obtained from the result of the growth monitoring system by using different sensors. The alert system will provide early information to the farmers with the condition of growth of the plants with nutrient deficiency when critical situation occur.

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