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Hydroponics System based on Iot

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Abstract-Traditional soil harvesting takes a long time to decompose, which makes it disease-prone and costly. Hydroponics is the practise of growing plants without soil, which is particularly useful in areas with limited space and an unsuitable climate. The hydroponics system is a new and popular method of growing plants without soil using an inert medium. It has a higher nutrient value and allows for nutrient control through nutrient solution. Hydroponics allows farmers to save water while improving crop quality by avoiding pesticides and other factors that affect soil and land quality. The primary focus of this paper is on the cost-effective implementation of hydroponics for Indian farmers, which also produces higher yields than traditional methods.

Keywords: Hydroponics, Internet of Things, soilless, growth, nutrients, crops, Blynk

1. INTRODUCTION

Hydroponic farming is a popular idea in today's agriculture. It is basic and easy to use, and it aids in the conservation of water and land. Hoeing, hauling, pesticides, environment, and other problems have all been encountered in traditional farming. Some soil-based crop diseases are present in soil-based horticulture farming. It also necessitates extensive land use[1].All of these issues are addressed in hydroponics-based farming, which produces higher-quality and healthier crops than traditional farming. With less water, less space, and no illnesses, pests, or weeds, hydroponics framing grows crops faster, better, and healthier. It is required to execute and implement this system, which is similar to conventional agriculture in most respects, such as maintaining proper nutrient levels, using proper irrigation methods, and taking care of the plant. As India's population grows at a rapid rate, it has an impact on food demand and land use [2].

A conventional agricultural farming system necessitates a larger field and proper plant care. Farmers are forced to devote more time and resources to managing their farms [5].

Farmers spend approximately half a day on water supply, and there are other activities that require physical effort from the farmers, such as hoeing, hauling, inspecting for diseases, and many others. IoT technology would assist in reducing the need for land, saving water, and time, as well as reducing human effort.

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1.1 Types of Hydroponics

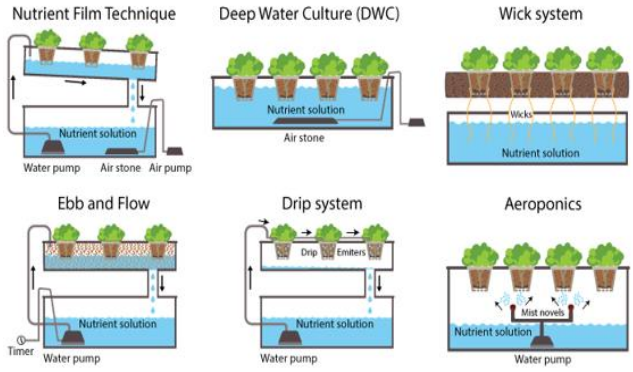

Fig.1.1Types of Hydroponics.

Hydroponics Comes in a Variety of Forms:
a) Nutrient Film Technique: This is a larger-scale technique. The use of sloped channels allows excess nutrients to flow back into the nutrient solution reservoir.

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b) Drip system: The nutrient solution is stored in a reservoir tank and delivered to the plants through tubes and pumps, with the flow of the solution being controlled or regulated.

c) Deep water culture: In this method, the barrier is bypassed, and plants are put directly into nutrient solution, with oxygen supplied by an air stone or diffuser.

d) Wick system: This is the most basic hydroponic system that anyone would use. Aerators, pumps, and electricity are not used in this system.

e) Ebb and Flow (flood and drain): In an Ebb and Flow system, the plants are carefully planted and the grow bed is flooded with nutrient-rich solution until it reaches a few inches below the top layer of grow medium.

f) Aeroponics: Instead of using recirculation, sprinklers are used in this system, and the plants are suspended in the air with a couple of mist nozzles positioned below them

1.2 Statement of the Problem

Diseases, pests, algae growth, leaks, clogs, inconvenient use, grower mistakes, and issues with the environment system are all common problems in hydroponics. Growers should be aware that their plants need precise quantities of nutrients, water, and light.

2. REVIEW OF THE LITERATURE

Because of its suitability and habitat safety, hydroponics or soilless cultivation has become popular in many countries. In areas where soil and water problems exist, such as soil-borne pests and illnesses, soil and water rains, chemical residues in soil and water, water restrictions, and so on, this method can be considered the best alternative to traditional farming. Plants are cultivated hydroponically by providing nutrients in water. Nutrient solution ingredients, electrical conductivity, pH, and oxygen concentration all have a direct impact on crop yield and quality when grown hydroponically. Hydroponics system with labour-intensive processing and monitoring yields lower yields and productivity. The mixing of nutrients in the solution is an important factor that has a direct impact on the plant's growth. Nourishing and controlling the mixer of nutrients is a tedious process that can result in human errors that reduce yield. Our proposed system is an automated hydroponics system that will allow farmers in India to implement hydroponics systems at a lower cost and with higher yields than traditional farming methods.

3. OBJECTIVE OF THE STUDY

The main goals of this project is to create an automatedhydroponic system that anyone can have the potential to create a hydroponic garden in their home backyard without being physically present. The hydroponic system can be used in the places where the electricity is scarcely available and it can be able to power all the electric components using solar energy. The hydroponic system requires low cost for maintenances and gives better yields or crops rather than the traditional soil-based farming. Hydroponics will be long lasting and weatherproof. The sensors are interfaced with microcontroller and the user action is required when the user gets notification from text message or via mail.

3.1 Scope of the Study

The Scope of the project is:

- For beginners, the fundamentals of IoTwill help us understand this and makes us to explore.
- Hydroponics system on mobile app to monitor and improve crop yield will provide real time access.
- It will help us to understand the critical role in agriculture sector by using hydroponic method to get better yields of crops.
- The utilizationofIoTdeviceswill help in hydroponic farming and how agricultural productivity is changed.

3.2. limitation of the study

The Limitation of the project is:

- Putting together a hydroponic system is little expensive.
- Constant monitoring is required for hydroponic system.
- Hydroponic systems are vulnerable to power failure.

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- Technical expertise is needed for growing hydroponic farming.
- Production is limited compared to field method conditions.

4.METHODOLOGY

In the block diagram below (fig. 4.1), we can see that sensors such as a pH sensor are used to measure the pH level of water, a DHT11 is used to measure temperature and humidity, and a circuit is used to measure the conductivity of water level. For single bus data format, synchronisation between DHT11 and MCU sensor is used. One communication process takes 4 milliseconds. The sensors are connected to the Node MCU, which serves as a microcontroller. The controller obtains the values of each parameter using the WIFI module. The data is sent to a mobile app, which allows users to view the parameters of each sensor. After submitting the data to Blynk, the user will be alerted via text message or email, and he will be able to take further action. Block diagram of an IOT-based hydroponics system (Fig.4.1).

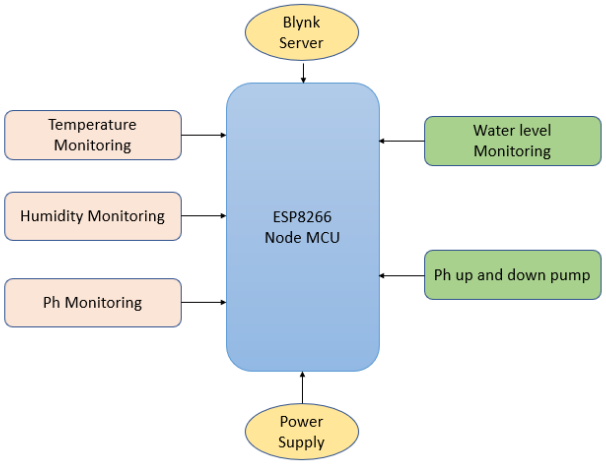

Fig.4.1Block diagram for IOT based hydroponics system.

5. EQUIPMENTS

Node MCU:NodeMCU is an open source low-costIoT platform. It can be easily programmed with Arduino language with 12-bit ADC. It has 128 KB RAM and 4MB of flash memory.

*Temperature and Humidity:*DHT11 is a Humidity and Temperature Sensor, measures both moisture and air temperature around the surrounding environment. The operating voltage is 3-5V.

*PH Sensor:*A pH sensor is used to measure the acidity or alkalinity of the water. It ranges from 0-14. If the pH value is below seven it is acidic and if the pH value is above seven it is considered as alkaline. Each type of pH sensor works differently to measure the water quality.

Buzzer:A buzzer is an audio signalling device that makes a buzzing or beeping sound.It is used in alarm devices and timers.

*Dallas Temperature:*DS18B20 is a temperature sensor of 12bit ADC. The sensor communicates over a one-wire bus. It is not like normal temperature it measures beyond negative degree Celsius.

6. ADVANTAGES

The water system can be reused, which allows you to save water. With increased production, there is a better normalisation of crops and a better use of land, resulting in a higher total yield. Nutrient levels can be better regulated and monitored than in soil-grown crops. We can have full control over nutrients, and it takes up 20% less space to grow, reducing human effort, time, and, most importantly, saving water and land.

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7. APPLICATIONS

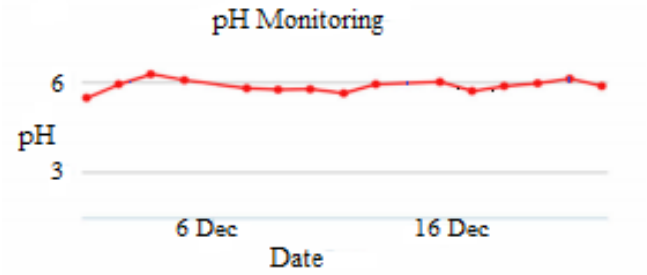
Smart agriculture is a type of farming that uses a variety of programming and instruments to produce effective results. With the help of sensors and water robotization, an intelligent IoT-based farm has been developed to track the crop yard. Farmers may monitor the status of their crops from anywhere, even if they are not physically present. In comparison to conventional farming, IoT-based intelligent farming is very successful. The adoption of IoT-based smart farming has boosted agricultural crop production as well as emerging trends such as organic farming, family farming, and highly transparent agriculture.

8.CONCLUSION

With the help of WIFI module owners will get the information of all parameters.After sending the data to Blynk sever user action takes place the user will get notified via text message or email and the owner can take further action.Thetable 8A shows the data sheetof the hydroponics system. In figure 8B, a Blynkapp web-interface is shown and as it can be seen that the automated hydroponics system was successful in maintaining a stable environment for the plants to grow in maintaining the temperature, humidity, Ph level and water flow level as shown in the flowchart.In figure 8C,shows theexperimental setup for mobile application interface for hydroponics systemandan SMS or alert message is sent immediately to the user to take actions. The outcomeof the results is shown as:

Slno	Temperature (℃)	Humidity (%)	pH	Water level	SMS
1	10-20	20-25	<5	0	Everything is under control
2	20-25	25-28	<5	1	Start water pumping.
3	22-28	32-40	>6	0	Impurity of water (more alkaline)
4	25-32	46-60	<5	0	Hightemp and humidity turn on the AC.

Table 8A: Data sheet of hydroponics system.



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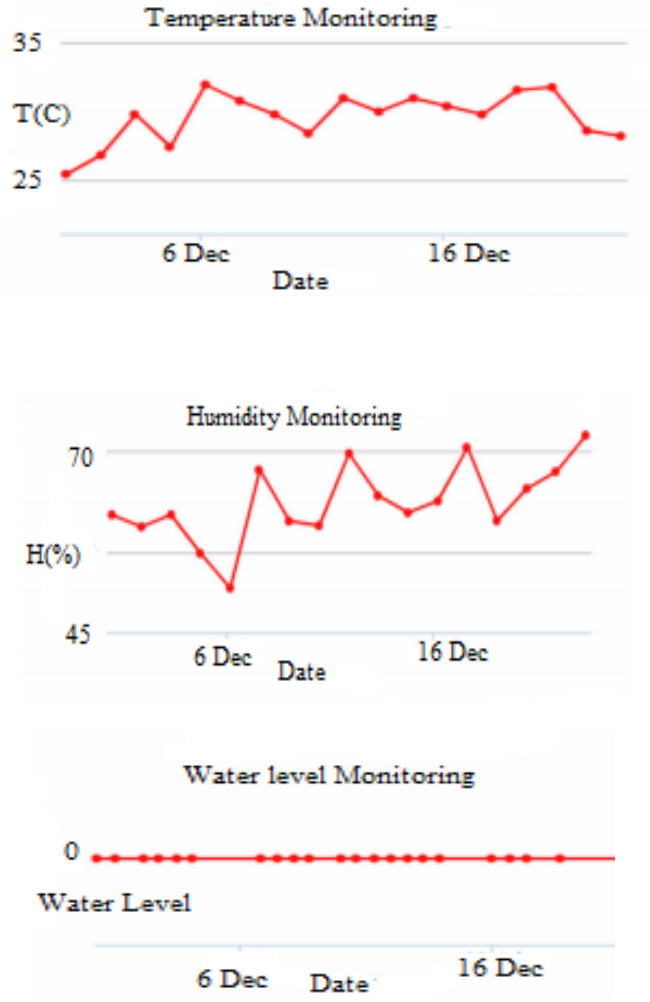

Fig 8B: Sample graphs from Blynk app of IoT platform
A) PhB) Temperature C) Humidity D)Water level monitoring

Fig 8C: Experimental setup inmobile application interface for hydroponics system.

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9. CONCLUSION

Rapid progress and result are obtained from various different countries by using hydroponic farming by giving better and healthy yields. The main advantage of hydroponic system is soilless cultivation and also helps to save water, land and times reduces human efforts. People in the urban areas can grow fresh vegetables in their home garden or backyard. Barren areas can be used for hydroponics at relatively low cost. This technology is trending in agriculture farming for farmers as it gives better yields than the traditional farming.

9. FUTURE SCOPE

Sensor networks are considered as the important empowering retailers for the IoT paradigm. Hydroponicswith IoT gives better results not only when the nutrient solution monitoring is done butalso its management has to be implemented. The water base system can be completely automated so the farmers need not be present every time to ensure the high-quality crop. and notifying the user to take action whenever needed. With the advancement and quick adaption of new techniques of growing we can see cost differential is reducing. In coming years, we can see rapid progress in growth of plants when farmers will adopt new technologies like hydroponic farming. So, in future, hydroponicssystem there is an enormous increase in urban areas and even when it is combined with Internet of Things. By using hydroponic technique space problem in India will be solved in future.

REFERENCES

[1]Khanna, A. (August 2016). Internet of Things: An Indian Context. Mumbai: KPMG.

[2]Mathurkar, S., Lanjewar, R., Patel, N., &Somkuwar, R. (2014). Smart Sensors Based Monitoring System for Agriculture using Field Programmable Gate Array. International Conference on Circuit, Power and Computing Technologies [ICCPCT], 339-344.

[3]Ramrez, Department of Agronomy University of Guanajuato, Mexico – SolutionControl Technology, 2012 .

[4]Nachankar, P., Somani, M., Singh, D., &Katkar, P. (Apr-2018). IOT in Agriculture. International Research Journal of Engineering and Technology (IRJET) - Volume: 05 Issue: 04, 592-596.

[5]Sharma, V., & Tiwari, R. (February 2016). A review paper on "IOT" &It's Smart Applications. International Journal of Science, Engineering and Technology Research (IJSETR), Volume 5, Issue 2, 472-476.

[6]Srivastava, S. (2018, October Sunday). What is Internet of Things and How does it work? Retrieved from https://appinventiv.com/blog/what-is-internetof-things - Explained: What is Internet of Things and How does it work?

[7]Zeinab Kamal AldeinMohammeda, E. S. (February 2017). Internet of Things Applications, Challenges and Internet of Things Applications, Challenges and. World Scient News 67(2) , 126-148.

[8]TATA COMMUNICATIONS. (2018). INDIA IoT REPORT - EMERGENCE OF A NEW CIVIC OS. Mumbai: TATA COMMUNICATIONS.

9]Helmy ; Marsha GresiaMahaidayu ; ArifNursyahid ; Thomas AgungSetyawan ;Abu Hasan-Nutrient film technique hydroponic monitoring system based on wireless sensor network,2017

[10]Li and Cheng, College of Horticulture, Northwest A&F University, China.- healthyappearance, high biomass and high photosynthetic activity,2015.