SMART HYDROPONICS

Project Reference No.: 42S_BE_1414

College: K.S. Institute of Technology, Bengaluru
Branch: Department of Telecommunication Engineering
Guide: Mr. Senthil Babu K
Students: Mr. Abhilasha H V
          Ms. Archana P S
          Ms. B V Navya

Introduction:
Agriculture is one of the most widespread activities in the world, but it is not uniform throughout. Agriculture plays a crucial role in the life of an economy. It is the backbone of our economic system. Agriculture not only provides food and raw material but also employment opportunities to a very large proportion of population. The reason that we have permanent civilization, is because of agriculture. As the population of the world continues to increase, so does the demand for high yield farmland. These resources are unfortunately finite, and in especially high demand in cities and underdeveloped areas. As time progresses, both individuals and companies will be looking for more efficient ways to produce food for human consumption that conserve space and water.

Various farming techniques have been practiced for meeting the requirements of the raising population such as:
Plantation agriculture: In this type of agriculture only a single crop like cotton, coffee, tea is cultivated in the land.

Mixed agriculture: This type of agriculture is used for crop production along with rearing livestock.

Poly house farming: Here, crops are cultivated under a controlled environment. Since we need large space and manpower for implementing, innovative and alternative food production techniques are introduced such as:

Aquaponics: It is raising of aquaculture and hydroponics. Hydroponics: It is growing of plants in water. Aeroponics: Growing plants air or in a mist environment.

Hydroponics: It is the method of growing plants without soil, using mineral nutrient solution in a water solvent.
Hydroponics is a technique to grow the plant without using the soil. This technique ensures the plant gets all nutrients needed from the water solution. There are so many types of hydroponics technique. Some are Wick System, Deep Water Culture (DWC), Nutrient Film Technique (NFT), EBB and Flow/Flood and Drain Systems, Drip Systems. We have used NFT based hydroponics technique to build the proposed system that is smart vertical hydroponics.
Objectives:

This project will look to tackle the disadvantages of agriculture and promoting soilless cultivation while bringing to the consumer a product that allows them to take all the benefits from their system, the main goal is to grow their very own, organic food in the comfort of their home with unprecedented accessibility to their system.

- Hydroponic gardening uses only 1/20th of water compared to traditional gardening.
- Hydroponic system requires small space.
- Provide highest yield per area.
- Plants grown using this system are chemical free.
- Plants grow faster in hydroponics system than in the traditional gardening.
- Climatic changes does not effect hydroponics gardening.
- Plants grown in hydroponics system are less affected by pests and diseases.
- Hydroponic gardening require less man power.

METHODOLOGY

Smart farming is seen to be the future of agriculture as it produces higher quality of crops by making farms more intelligent in sensing its controlling parameters. Analyzing massive amount of data can be done by accessing and connecting various devices with the help of Internet of Things (IOT). However, it is not enough to have an Internet support and self-updating readings from the sensors but also to have a self-sustainable agricultural production with the use of analytics for the data to be useful. A sensing system comprising of a Raspberry Pi and commercial sensor circuits and probes that measure Dissolved Oxygen (DO), pH, water temperature, humidity, light and nutrient level.

Continuous monitoring of this data, and making necessary adjustments, will facilitate the maintenance of a healthy ecosystem that is conducive to the growth of plants, while utilizing about 90% less water than traditional farming. This designed Vertical hydroponic system is composed of sensor devices that sense and collect information of various essential parameters and display on a screen. This means that the human intervention would be considerably less when compared to other traditional methods. The plants can be grown effectively without the need for pesticides and other synthetic chemicals and inputs, all of which are known to destroy the environment and human health when used in conventional agriculture settings. In order for the controller to be used for growing and automation, requirements are mentioned. In hydroponics system, plants are grown in water. So, with the help of water pump water is continuously pumped to the vertical channel.

Figure 1. Block diagram of Vertical hydroponic system
The vertical hydroponics system can be placed in balcony’s, terrace. The plants on one side of the vertical channel receives sunlight but, plants on other side won’t receive proper amount of sunlight so the vertical channel is rotated using a dc motor so, that all plants placed on the vertical channel receive proper amount of sunlight. Water level is continuously monitored in the system. Float sensor is used to check the water level in the water tank of the vertical hydroponics system. If the water level is less than the threshold then the buzzer will be turned on. And once we fill the water tank the buzzer will turn off. The LDR sensor is used to check the intensity of light. If the light intensity is less than the threshold LED is turned on. LEDs are controlled and customized to a desired time for nurturing the vertical hydroponics system. Environmental ambience can be replicated by the use of a LED grow light system.

The temperature and humidity values of surroundings where the vertical hydroponics system is kept are continuously read and logged into the notepad. The ph electrode is kept inside the water tank and operated periodically with the help of microcontroller. As the time propagates
ph value varies. If ph value is less then the ph up dispenser is turned on, if ph value is high then ph down dispenser is turned on. If the ph value of water becomes almost neutral both the dispenser turns off. Microcontroller operates periodically and make decision according to need and repeat this whole procedure continuously.

**Result and Conclusion :**
A prototype of the vertical hydroponics system is developed that is shown in the Figure3.

![Figure3](image)

**Figure3.** (a) Vertical hydroponics structure; (b) Data logged in notepad

In this paper we have proposed a smart vertical hydroponics system with the additional features to existing hydroponic system by both functionality and performance dimension. The vertical hydroponics system which uses less space can be used for simple home gardening. And thus this paper is proposed to reach the system to produce vegetative growth in a sustainable ecosystem with spectrum targeted LED lighting and electronic monitoring and automatic alerts.

**Scope For Future Work :**
In the proposed system temperature and humidity values can be changed by using foggers, sprinkler, cooler and exhaust fans. A procedure can be identified to know the faulty sensors.

**References :**
1. A2S: Automated Agriculture System Based On Wsn-Seong-Eunyoo, Jae-Eon Kim, Taizhong Kim, Sungjin Ahn, Jongwoo Sung, Daeyoung Kim.
2. The soil moisture active passive (smap) mission- Dara Entekhabi, Eni G. Njoku, Peggy E. O’Neill, Kent H. Kellogg
6. Hydroponic growing system with increased accessibility-Richard Bell, Oxnard.