

# SMART HYDROPONIC FRAMING SYSTEM USING IOT

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**Abstract** - Hydroponics is technique of growing plants without soil using minimum usage of water. Sensors are connected to ESP32 which monitors the supply of nutrients that requires for plant growth. In this project Internet of Things(IOT) is mainly used to regulate temperature, humidity, pH level, flow of water and nutrients. Correct pH level, air temperature, relative humidity, nutrient level of the water and correct irrigation of water is critically important in hydroponics. In this hydroponic system the user enables to control certain mechanisms for refilling, sprinkling, draining and many more through web application. They can also monitor the pH level relative humidity and water level etc. which is data collected from the sensors

**Keywords:** Hydroponics, Raspberry Pi, Sensors

## 1. INTRODUCTION

Agriculture is considered as the vital piece of life for the human species as it is the fundamental wellspring of sustenance grains what's more, other crude materials required for person. It plays important part in the development of nation's economy and improvement. It additionally gives huge business openings to the general population. Development in agrarian segment is fundamental for the improvement of financial state of the nation. Tragically, numerous agriculturists still utilize the conventional strategies of cultivating which brings about low yielding of harvests and natural products. Be that as it may, wherever robotization had been actualized and human creatures had been supplanted via programmed apparatuses, the yield has been enhanced and less diligent work required. Consequently, there is need to actualize and utilize present day innovation in the agribusiness part to increase the yield of harvest.

The greater part of the project means the utilization of remote sensor organize which gathers the information from various sorts of sensors and after that send it to principle server utilizing remote convention. The gathered information gives the data about various ecological elements which in swings screens the framework. Observing natural

components are insufficient and finishes answer for enhance the yield of the harvests. Require robotization to make strides the yield of the harvests. There are number of different components that influence the efficiency to awesome degree. These components incorporate assault of bugs when product is at the phase of gathering. Indeed, even after gathering, ranchers likewise confront issues away of collected trim and some more. In this way, so as to give answers for all such issues, it is important to create coordinated framework which will deal with all components influencing the efficiency in each stage. In this particular project automation of hydroponics farming is to be done completely. In which, automatic supply of water, temperature maintenance of pH level and EC (Electrical conductivity) at required level, automation in required sunlight for farm along with that alarms and indicators for unusual conditions for farms. Also related all information is to be displays on display panel and related info will be send to owner of that particular farm.

## Objectives

- The main objective of this project is to design and construct a hydroponic system which is fully automatic that can be integrated into the agricultural curriculum while introducing business skills.
- Several benefits of this technique is ,it takes very less time in growing crops,which help to get more yield when compared with natural process of cultivation
- Commercially hydroponic technique has been used in entire world which has got very successful in agriculture field with less water usage and pesticides

For successful implementation of this technique, it is important to develop a cost effective and user friendly so that the user with less technical skill also can be able to operate.

### Methodology

In setting a controlled hydroponic system which is fully automatic with water, power controllers, that helps in circulation of water and nutrients, and also maintain the humidity, temperature, EC and pH level using sensors. This method is applied to help conclude that water circulation will be done by turning on the pump or not circulating water by turning off the pump in hydroponics based on temperature and humidity parameters

### 2. Block Diagram

Our project is based on Arduino, all the sensors are connected to ESP32. In the below shown block diagram, the sensors are connected, which is been monitored via mobile application. The person need not to go to the farm and check with the nutrients, temperature, humidity and pH. The below shown block diagram gives a view for system setup.

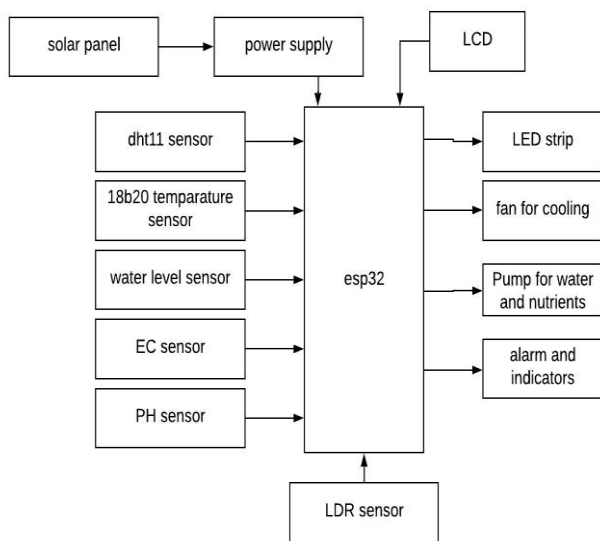


Fig.1 Block Diagram of Hydroponics System

### 3. Process Flow and Working of the System

Process flow of the system gives a clear picture of the nutrient flow, as a main objective of this project is to provide required nutrients, fertilizers and sufficient pesticides for plants, with minimum usage of water. In the process flow diagram it is shown the supply of nutrients, and working of sensors. Firstly water temperature and EC is measured, if the EC is low nutrients should be added if EC level is high no need to add nutrients again pH should be measured, if the pH is low pH down buffer should be added, if its is normal then air temperature and humidity should be

measured and should check the time that water has been pumped, if water has not been pumped since 12hours, the measurements should be saved in SD card, if water is pumped then run the water to grow tray and stop to pump water.

The data of the measurements is stored in cloud via ThingSpeak and can be viewed and monitored in mobile application

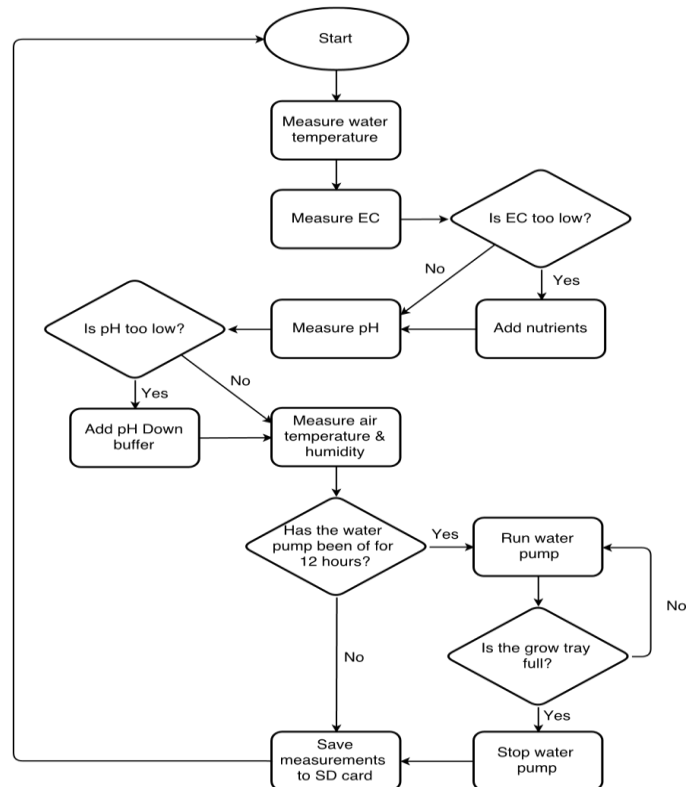


Fig.2 Process Flow of Hydroponics System

### 4. Advantages of Hydroponics

To define the purpose of this topic it is essential to know about the outcomes and benefits of Hydroponics. It works best for areas unsuitable for conventional farming such as arid, degraded or deserted, it is independent of the weather thus allows cultivation throughout the year. Thus with increase in production it allows gives better standardization of cultivation and cultivation time making better use of land, thereby increasing total yield in the greenhouse. Hydroponics is the alternative to soil sterilization to combat the chemical side effects resulting toxicity and other harmful effects. The best part about it is, the nutrients can be better controlled and monitored than in crops cultivated in soil. The recycling of green-house effluents reduces fertilization and eliminates nutrient

leaching. The reuse of the nutrient solution effluents in closed soilless culture systems entails the risk of disease spread via the recycled leachate. A disinfection system should be in-stalled to avoid infections in the reused water. Due to the above characteristics, which enable an appreciable restriction in pesticide use and nutrient leaching, hydroponics is considered not only compatible but also strongly favourable and supportive to the application of integrated crop management in greenhouses.

### 5. Limitations of Hydroponics

The major disadvantage of Hydroponics is its costing that is higher than natural way of growing plants as it requires soilless culture controlling and monitoring equipments and technical skill to cope up with it. It also requires constant supervision i.e. water-based microorganism can be easily introduced or in case of power outage setup must be handled manually. Above listed are of minor importance in comparison to cultivation on an industrial scale.

### 6. Results

The Smart Hydroponics can be implemented in small area, greenhouse and even on rooftop. Here is a graphical representation for smart hydroponics which is implemented in a closed area, by setting up all sensors to ESP32 which fulfill all requirement that is needed for plant growth.

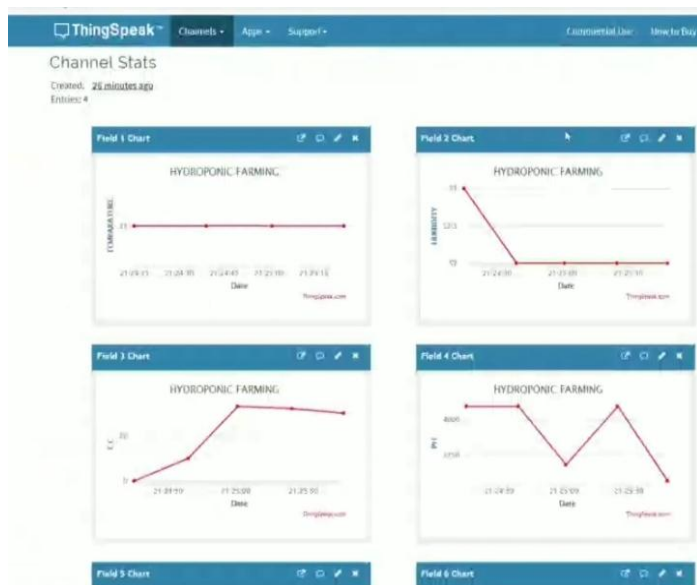


Fig.3 Graphical Representation of sensor

### 7. Future Scope

Hydroponics is the new technology for growing crops in faster way to meet the need in agriculture sector.

As India is a 2<sup>nd</sup> in population, agriculture is main need and there are lot many issues faced during farming, as population increases scarcity of land water decreases, to overcome all these crises implementation of hydroponics gives better yield in agriculture and also in Indian Economy

### 8. Conclusions

Based on the study done regarding Smart Hydroponics which is done automatically and in smart way as below stated:

- This project is successful in making a fully controlled and automatic Hydroponic system with the help of ESP32 and all sensors.
- This system is very much suitable in all region irrespective of Environment, which can be setup in even in small area.

Based on the comparison between Smart Hydroponics and natural way of harvesting, Hydroponics gives more yield with less usage of water and pesticides by giving all nutrients to the plant.

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