

Indoor Garden Development using Hydroponic Agricultural Farming and Automation

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Abstract- Agriculture is major source of Economy of India is an agricultural country. Agriculture industry is facing problems due to inconsistent rain, flood, drought and industrialization Based on this scenario, the present study has been focused on approached used to flourish indoor garden using automated hydroponic systems. In hydroponic systems, instead of soil, the roots of crops are cultivated using an medium like perlite, rockwool and clay pellets. The concept behind the hydroponics is to nullify as many barriers as possible between plant roots and the water, oxygen and nutrients which they require for its growth. Hydroponics basically involves growing healthy plants without traditional soil and replacing soil using mineral rich water solution. Generally, a plant requires nutrients, water and sunlight for its growth.

Keywords –Hydroponic, soil-less farming, nutrient rich water, perlite, Rockwool, clay pellets.

1.0 INTRODUCTION

The word hydroponics is developed from two Greek words, "hydro" meaning water and "ponics" meaning labor. Hydroponics is the method soilless farming.

Hydroponics implies the growth of plants using a nutrient added water without the use of traditional soil. Plants are grown in rows or on trellises, just like in a traditional garden, but roots of plant are deepen in to water rather than in soil. Most of the time soil is confused as source of nutrients. In fact, soil provides strength and stability, not

the actual nutrients, for plant roots. The food is composed from other materials mixed in the soil, such as compost, broken-down plant waste or fertilizers. Instead of soil the plants are grown in an inert medium such as gravel, clay stones and coconut coir. These mediums will not provide any nutrients to the plants but much like soil they supply the plants with a place to anchor as well as a reservoir for the nutrient solution.

Temperature of a nutrient solution is one of the key factor affecting the oxygen level of the solution. In fact, ability of water to hold oxygen is directly related to its temperature. When water temperature (or the nutrient solution) gets increased, the oxygen level decreases. As the temperature of the water decreases, the dissolved oxygen level increases. Since oxygen is good for the plant's roots, we have to maintain coldest nutrient solution as much as possible. If the temperature gets too low, a whole new set of problems are created. Temperatures that are too cold will cause slow growth of plant and eventually stop altogether. For this temperature sensing system has been adopted. Along with temperature we proposed to control humidity of soil. Humidity of soil plays vital role in healthy growth of roots. if humidity increases, roots ma get damaged and for the same purpose we added control circuit to maintain humidity at the desired level.

2.0 METHODOLOGY

2.1 Existing system

In current scenario, farming is done by using soil and fertilizer. This conventional system is not feasible where soil is in the form of rock stones ,pebbles.

2.2 Proposed solution

In our proposed hydroponic system we are going to grow healthy plants with the help of nutrient reach water in the absence of soil

2.2.1 Steps to implement a Hydroponic System:

Step1- We constructed a system which consist of 12 growing tubes made up of 4" PVC pipe.

Step 2- Mix the Nutrients and Water in the Tank.

Step 3- Add Plants to the Growing Tubes.

Step 4- Tie the Plants to the supportive pipe.

Step 5- Start the water Pump and Monitor the System Daily.

Step 6-Observe Plant Growth and monitor temperature, humidity,sunlight(warm white light).

2.3 Block Diagram:

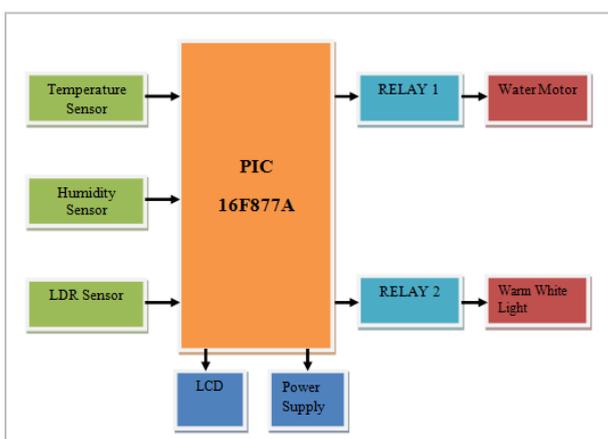


Fig. 1. Block Diagram

Block diagram consist of display four section. Input section, output section, control section and power supply section .In input section there are three sensors temperature, Humidity and LDR. These all sensors are analog in nature. We will give input from this sensor which is analog data to PIC 16F877A.

At PIC controller we get 0 to 5 varying voltage so we compare that voltage with 0 to 1024 ASCII code. So we develop a program at PIC which will give only desired value (limit). We use water motor for providing water supply for five min after interval of one hour. Further Warm white light will be started, if sufficient sunlight is not detected. Also if humidity decreases, we will use warm white light to maintain humidity . All the values like temperature, humidity is shown by LCD display. For our system we use 230v AC power supply.

2.4 Flow chart

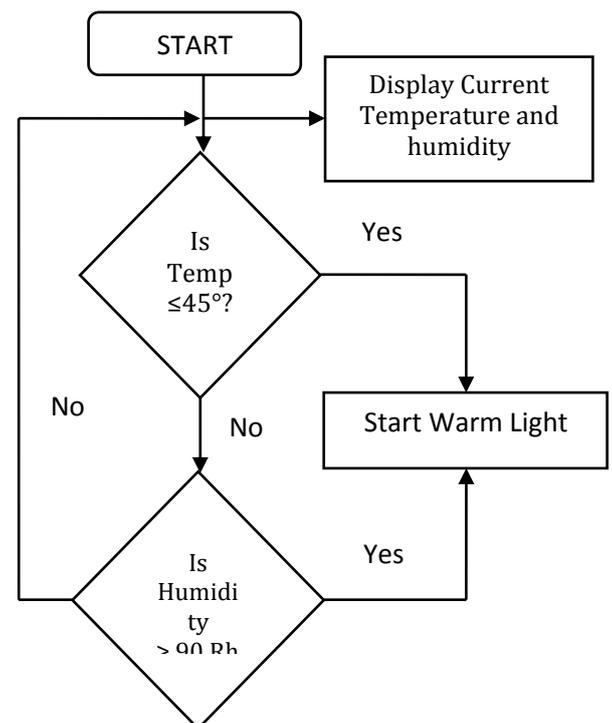


Fig. 2. Flow Chart

3.0 SIGNIFICANCE AND SCOPE:

There are following advantages of the hydroponics system:-

- a) To grow fresh produce for the health of our bodies to the health of the environment.
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- c) It uses only 1/20th of water compared to traditional (soil based) gardening.
- d) The growth rate of hydroponic plants is 30-50% greater than soil plants and yield is doubled leading to more production from same amount of space.
- e) Regular nutrient testing ensures all elements are present in their desired concentrations. Unwanted build ups of undesirable nutrient concentrations, such as nitrites, can be avoided.
- f) Tastes superior and much healthier than its soil counterparts.
- g) Nutrient solutions may be recycled or re-used in other areas such as potted plants and turf management
- h) Further hydroponics system can be introduced in:
 - Areas of the world with poor or infertile soils.
 - Places where there is scarcity of water.

4.0 RESULT:

We observed that, when either temperature is $< 45^\circ$ or humidity > 95 Rh, warm light is on to maintain either temperature or humidity at 45° and 90 Rh respectively. We further observed that plant growth is healthy due to controlled flow of nutrient rich water, temperature and humidity.

5.0 CONCLUSION:

In this project we successfully implemented hydroponic system using control circuit. This control circuit provides automation in various processes such as checking humidity and temperature automatically. Based on this date white light is get on and off to maintain required humidity and temperature level of soil. In our project we supplied nutrient rich water for five minutes after every interval of one hour. Proposed system uses less water and fertilizer as compared to

soil system. Hence overall automated hydroponic system provides more flexible and more efficient operation than manually operated hydroponic system.

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