Automated Hydroponics Fodder Grow Chamber Using Arduino

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Abstract- ***The Hydroponic systems are one of the most effective modern agricultural systems based on growing crops in water without using soil. A hydroponic system can grow plants and vegetables faster and year-round with an efficient use of resources. The previous system doesn't have the artificial light along with the system. This paper is proposed to a model for designing a miniature farmhouse system, providing temperature, humidity using the appropriate sensors and it have controller along with them and in addition to, we are having the GSM and artificial lights for the growth of plant. Here we designed a system, where the temperature and humidity of the room is controlled regarding the growing nature of the cultivated crops. The fan is controlled by the DHT22 sensor, the motor is controlled by water sensor and ultrasonic sensor. If the level of water needed for the growth is decreased, then the GSM is intimated by the Arduino to immediately send the text message to the user. This proposed system is majorly applicable in cattle farming and it is also beneficiary in the Martian environment.***

Indexed Terms- ***ATmega microcontroller, GSM, GSM to mobile communication, LCD.***

I. INTRODUCTION

Since hydroponics takes much less water to grow , it could be possible in the future for providers in harsh environments with little accessible water to grow their own food. In recent decades, NASA has done extensive hydroponic research developing a Martian environment using LED lighting to grow in a different color spectrum with much less heat. They believe hydroponics will create advances within space travel as a bio regenerative life support system.

Figure -1: Physical structure.

Hydroponic Farming can be a better alternative to traditional farming along with options like automation of monitoring and controlling the environment through grow lights and heaters as required by the plant. The purpose of this project is to interface an electronic circuit of sensors and actuators to a hydroponic system in order to develop an IOT based automated hydroponic system for remote monitoring and control.

II. LITERATURE SURVEY

Rapid industrial development of the global economy and ominously increasing population forces countries like India to upgrade their agricultural techniques to meet the needs of the people. Soil less agricultural techniques like hydroponics have gained a lot of importance over the years, one of the most popular hydroponic technique in which the crops are grown in nutrient solutions is now gradually being employed for commercial agriculture. India, in spite of being an agro-based nation, has found it very stimulating to implement hydroponics on a commercial scale due to the lack of knowledge and special apparatus required

and other agriculture encounters. Sensitivity of hydroponics to technical faults is a major limiting factor when it comes to their commercially wide scale implementation. In addition to this, agriculture in India is largely being practiced by unskilled farmers which makes imparting knowledge on hydroponics even more challenging. Considering the wide range of advantages which hydroponics offer over conventional agriculture techniques and increasing need to meet the goods requirements of the growing population with the limited agricultural land available, practicing hydroponic procedures has become the need of the hour.

TABLE I. Nutrients deficiency.

Sr. No.	Nutrients Deficiency Symptoms	Deficiency
1	Plant colour is light green; yellow leaves.	Nitrogen
2	Plant colour is bluish-green, leaves are yellow, growth may be stunned.	Phosphorous
3	Dead areas along the edges of the leaves; growth is stunted.	Potassium
4	Lower leaves turn yellow along the tips and margin and between the veins; the lower leaves wilt.	Magnesium
5	Young and new leaves die	Calcium
6	Leaf tissue is lighter in colour; yellowed; papery in appearance.	Zinc
7	Leaf tissue may be yellow in colour, veins are green.	Iron
8	Leaf edges may be dark green or blue in colour; young leaves wilt	Copper
9	Young leaves may change to pale green. Older leaves remain green; plant is stunted.	Sulphur
10	Growth is stunted; lower leaves may have yellow and green coloured pattern.	Manganese

The two major components in hydroponics is plant nutrient solution and growing medium. In water solution-based system like Nutrient Film Technique (NFT), Deep Water Culture (DWC) and Aeroponics, plants can be grown directly in rich mineral and nutrient based solution. These system works best for plants that have shallow roots and can be grown in short periods of time. The plants best suggested would-be lettuce, radish, spinach and other herbs and flowers. Plants like tomatoes, cucumbers, peppers, strawberries, celery that have deep roots and need support, either Wick systems or Ebb and Flow systems which is also called as flood and drain system are preferable. In these systems growing medium such as clay pebbles or Hydroton are used which help to provide support to the root system and ideal for big plants. Many vegetables, herbs, fruits and flowering plants are best suited in this design system.

III. METHODOLOGY

The block diagram above is a basic representation of how the automated hydroponics system will work. It starts off by taking the data from the sensors such as temperature and humidity sensor, LDR, and Ph sensor located in the system. Then, with the settings for the grow system that are programmed into the microcontroller, it will find the difference between the desired value and the actual value for the PH and nutrient levels. With this calculation the software will know the approximate amount of Acid/Base or nutrients that is needed to be added to the system.

The power supply will give power to a central unit that will house the Arduino and relays which we will be using for this project. The Arduino will receive data from the hydroponic system via many sensors located throughout the system. Using this data, the microcontroller will control parameters such as temperature, humidity, light intensity and run time of pumping motor.

The solution is pumped into the grow tray where plants are grown with suitable supporting cups. The roots of the plants directly absorb water and minerals. The temperature and conductivity of the solution can be monitored simultaneously for control. The automation enables easy graphical user interface based programmable timing control and other monitoring of system. The system can be scaled as per requirement to add new features.

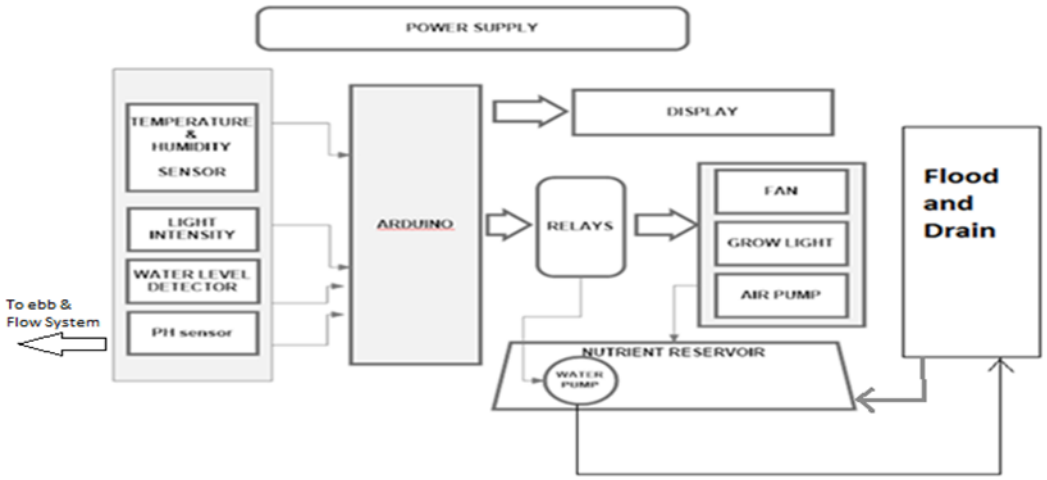

Figure 2. Block Diagram of controlling system using Arduino.

APPLICATIONS:

- It is useful in areas having infertile and dry soils.
- It is useful to cultivate plants in the areas deficient in one or more nutrient.
- It provides better nutrition yield
- Can provide complete automation for a large organic farm.
- It is used in the martian environments.

IV. RESULTS OF THE EXPERIMENT

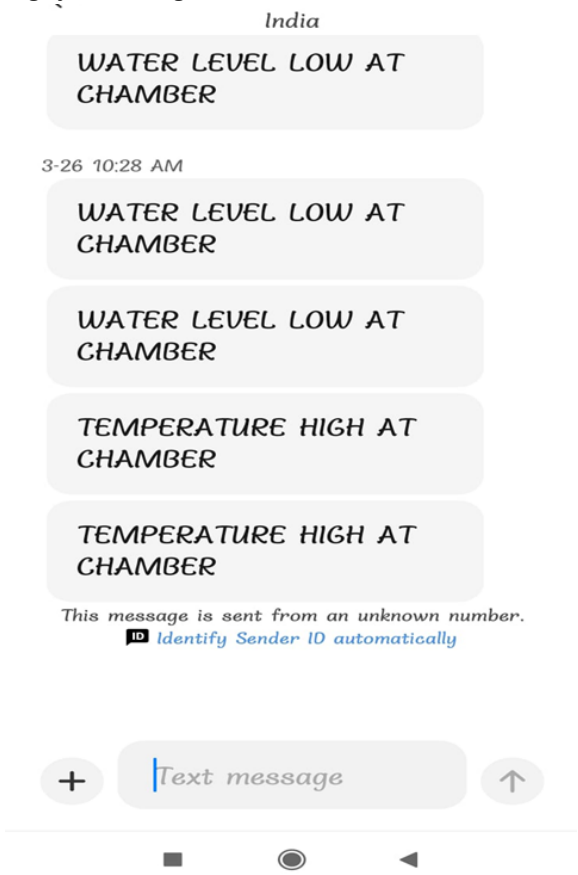

Figure 3. Text Message from GSM

The system makes use of Arduino to control the water flow, indoor optimum temperature. The system uses the motor to ensure and adjust the water level, the moisture and temperature sensors are monitored to maintain best temperature and moisture conditions for

growth. In addition to, we are using the artificial light to provide the sophisticated environment for the growth of plant.

This entire operation is efficiently managed by an Arduino controller to ensure the process is regularly maintained without fail. Based on explanations from previous researches, the researchers concluded that to cover the shortcomings of the hydroponic system can be overcome by building a simple system that can reduce maintenance costs and high production costs. The temperature and the water level status will be sent as the text message to the user's mobile phone.

V. CONCLUSION AND FUTURE SCOPE

The system designed in this project fulfills the primary need of every person's indoor farming need. As we see, now a day's drought is major problem in front of us. In this condition, this system will be more helpful as it uses less amount of water and gives more yield in less time interval. This system also help crops to grow where soil is unsuitable and also Reduces plant disease generated due to soil. If automation is introduced in hydroponics, no more attention is required. Thus using this system will be considered wise.

Hydroponics is the fastest growing sector of agriculture, and it could very well lead food production in the future. As population increases and arable land declines due to poor land management, people will turn to new technologies like hydroponics and vertical farming to create additional stations of crop production. The system can be made completely automated for food industries where freshly prepared yield can be provided directly to the industries. System can also be designed to house a GSM module which will notify the user, also zigbee technology can be implemented. Instead of using batteries and power supply, the system can completely powered by renewable energy like piezo electricity.

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