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VERTICAL FARMING HYDROPONICS SYSTEM

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1. ABSTRACT

Recently, there has been an increase in the application of vertical farming in cities. Vertical farming is the vertical cultivation of vegetables by new agricultural methods, which fuse together the design of buildings and farms in a high rise building inside cities. This technique needs to manifested in both agricultural technology simultaneously, however little has been published on vertical farming techniques. In this study, technology as one of the important factors of vertical farming is discussed and reviewed by qualitative approach.

Hydroponics is a method of growing plants in water without soil, using mineral solution. This method can be very helpful for countries which have poor land which is not able to sustain agriculture. The purpose of this lab is to prove that hydroponic gardening can be just as effective, if not better, than conventionally grown plants in soil. Hydroponics is the fastest growing area of agriculture, and it could very well dominate food production in the future. As population increase and arable land declines due to poor land management, people will turn to new technologies such as hydroponics system. Hydroponics has also been used successfully in Israel, which has dry and arid climate. To help improve the yield and quality of produce, there is no option but to adopt soil less culture so that we can ensure the food security of our country.

Keywords: *Advanced cultivation methods, Technology, Food production, Soil-less culture, Hydroponics.*

2. INTRODUCTION

Vertical farming can relieve high yielding land, now used for fruit and vegetable cultivation. The main purpose of this technique is to have produce more in the less space. Soil is not required in the system. This is soil-less method. Less water is used in the vertical farming as compared to the traditional farming method. Nutrients i.e. NPK (Nitrogen, Phosphorus and Potassium), Calcium, Epsom salts, Micronutrients (Iron, Manganese, Zinc, Boron, Chlorine and Copper) are added in the water tank and water from the water pump goes through the pipe. Producing food in vertical stacked layers. Use indoors farming techniques and controlled environment agriculture technology. Utilize artificial control of light, environmental control (humidity, temperature, gases).

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Techniques of Hydroponics

It is also Known as liquid hydroponics method. The roots of plants grown in solution culture are directly suspended in the nutrient solution. It can be further classified as-

1). Circulating Methods (Closed system)

a) Nutrient film technique (NFT)

b) Deep flow technique (DFT)

2). Non-Circulating Methods (Open system)

a) Root dipping technique

b) Floating technique

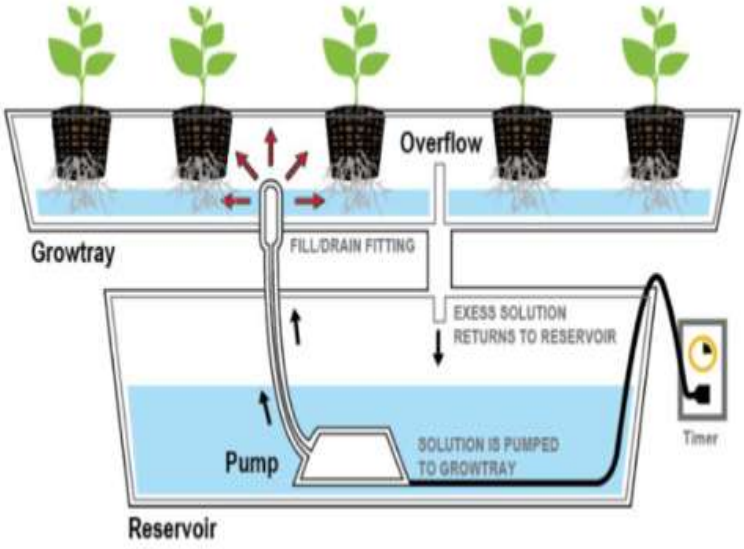

Fig.1- Vertical farming hydroponic system

3. DESIGN AND IMPLEMENTATION

Vertical farming is the practice of growing crops in vertically stacked layers. Many of the houses producing different crops on each floor, including seeds sorting facilities, distribution and continuous planting systems, development monitoring and harvesting, are working to enable urban population to produce and produce locally, including integrated linear eco system. For architecture, we need innovative design conceptualization and architectural knowledge. Our overall is to make hydroponics easier to implement and maintain at a cost- efficient level.

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4. BLOCK DIAGRAM

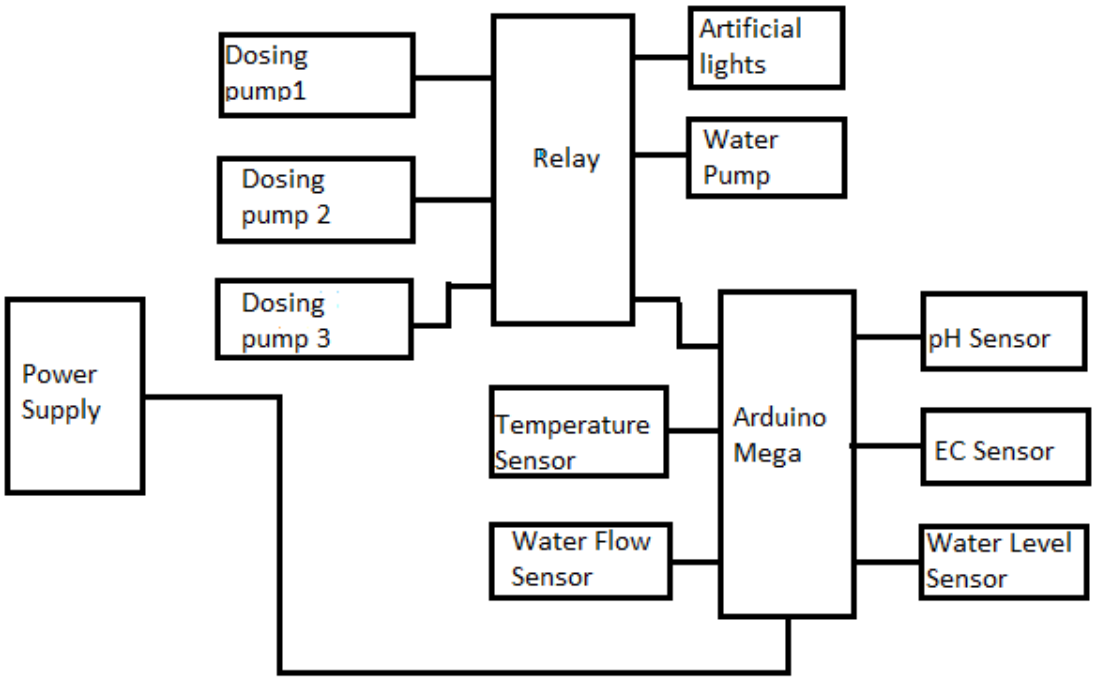

Fig2.- Block diagram of vertical farming hydroponics system.

5. LIST OF EQUIPMENT AND COMPONENTS NEEDED:-

- Arduino Mega
- Relay
- Water Pump
- Temperature Sensor
- Water Flow Sensor
- Water Level Sensor
- pH Sensor
- EC Sensor
- Artificial Lights

- **Arduino Mega :-** The Arduino Mega is a type of microcontroller board it has 54 digital I/O pins, of which 15 can be used as PWM outputs, 16 are analog inputs, 4 UARTs (Hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, and a reset button. It contains everything needed to support the microcontroller. Simply connect it to a computer with a USB cable or power it with an AC to DC adapter or battery to get started.

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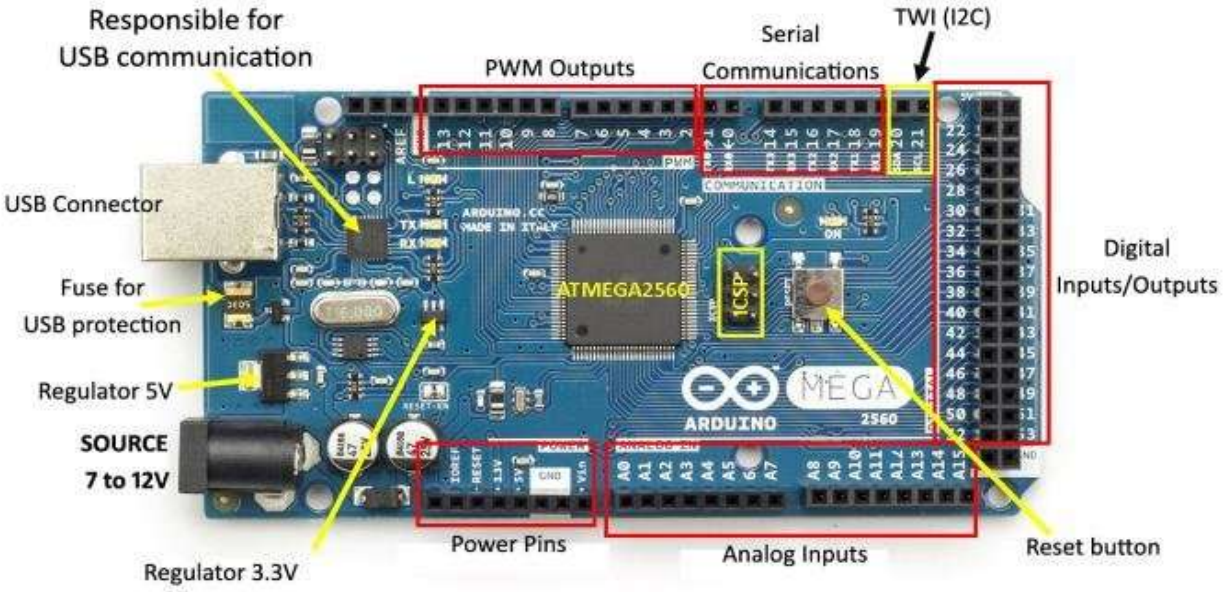

Fig3.- Arduino Mega Module

- **Relay:-** A relay can be defined as a switch. Switches are generally used to close or open the circuit manually. Relay is also a switch that connects or disconnects two circuits. But instead of manual operation a relay is applied with electrical signal, which in turn connects or disconnects another circuit.

Fig4.- Relay Module

- **Water Pump:-** A water pump is an essential tool to pump out water from the garden, pool, or under the ground. It controls the speed of the water and is incredibly useful in conserving water. The pumps come with various designs and capacities to cater to different needs of water pump.

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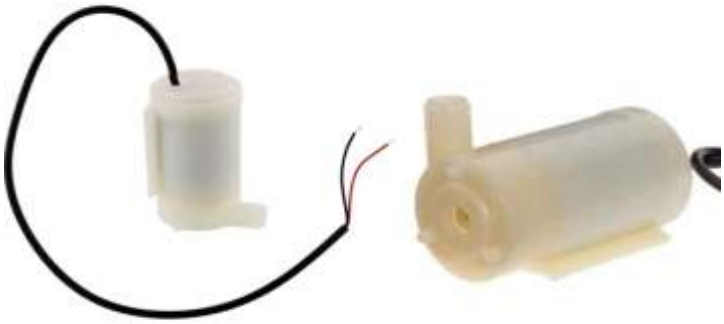

Fig5.- Water pump

- **Temperature Sensor:-** A temperature sensor is a device used to measure temperature. This can be air temperature, liquid temperature or the temperature of solid matter. There are different types of temperature sensors available and they each use different technologies and principles to take the temperature measurement.

Fig6.- Temperature Sensor

- **Water Flow Sensor:-** Water flow sensor consists of a copper body, a water rotor, and a hall effect sensor. When water flows through the rotor, rotor rolls, its speed changes with different rate of flow. This one is suitable to detect flow in water dispenser or coffee machine.

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- **Water Level Sensor:-** Water level sensor are used to detect the level of substances that can flow. Such substances include liquids, slurries, granular material and powders. Level measurements can be done inside containers or it can be the level of a river or lake.

Fig7.- Water Level Sensor

6. WORKING

Vertical farms, instead, stacks or towers plants grown in. A tower easily hold dozens of plants, which are stacked one on top of the other, and all get nutrients and natural resources through a single system. With this method farms take up 99% less land, making them easier to place in greenhouses that keep out unwanted contaminations. Hydroponics is the cultivation of plants without using soil. Hydroponics is the practice of growing plants using only water, nutrients and growing medium. Because hydroponics is based around water, this is the primary part of any system. Hydroponic herbs and vegetables are planted in inert growing media and supplied with nutrient- rich solutions, oxygen and water. They use the light's energy to split water molecules they've absorbed via their root system. For this, water should be added to the nutrients to keep the plants healthy and productive. As nutrients are sent directly to the roots, they are easily available for plant growth and health.

7. ADVANTAGES

a). Conserves Water

b). Produces higher yields

c). Require less labor

d). Needs no soil

8. FUTURE SCOPE

Hydroponics is the fastest growing area of agriculture, and it could very well dominate food production in the future. As population increase and arable land declines due to poor land management, people will turn to new technologies such as hydroponics system. Hydroponics has also been used successfully in Israel, which has dry and arid climate.

9. CONCLUSION

The industry is expected to grow rapidly in the future as well, as soil growing conditions are becoming more difficult. In a special way, In a country like India, where urban concrete agglomeration is increasing every day. To help improve the yield and quality of produce, there is no option but to adopt soil less culture so that we can ensure the food security of our country. However, government intervention and research institutes are interested in this technology.

10. REFERENCE

1). **Aju G Nair1, Akhil Chacko2, Ganga Mohan3, Tony K Francis4:** Applied Electronics And Instrumentation, Adi Shankara Institute Of Engineering And Technology, India. IOSR Journal of Electrical and Electronics Engineering (IOSR-JEEE) e-ISSN: 22781676-,p-ISSN: 2320-3331, PP 14-17

2). **Amna Rafi Chaudhary, Ved P Mishra:** A Comparative Analysis of Vertical Agriculture Systems in Residential Apartments Architecture Department Lecturer, Program Coordinator Architecture Amity University Dubai, United Arab Emirates amna.rafi@gmail.com, Computer Science & Engineering Head of Academics Engineering Amity University Dubai, UAE mishra.ved@gmail.com. All content following this page was uploaded by Ved P Mishra on 17 May 2019.

3). **Rashmi Maria Royston, Pavithra M.P:** Vertical Farming: A Concept Civil Engineering, REVA Institute of Technology and Management, Bangalore International Journal of Engineering and Techniques - Volume 4 Issue 3, May 2018.

4). **Yap Shien Chin and Lukman Audah:** Vertical Farming Monitoring System Using the Internet of Things (IoT) Wireless and Radio Science Centre (WARAS), Faculty of Electrical and Electronic Engineering, Universitiy Tun Hussein Onn Malaysia, Parit Raja, 86400 Batu Pahat, Johor, Malaysia. Conference Paper *in* AIP Conference Proceedings · September 2017.

5). Resh, H.M. Hydroponic Food Production: A Defifinitive Guidebook for the Advanced Home Gardener and the Commercial Hydroponic Grower; 19 April 2016; CRC Press: Boca Raton, FL, USA, 2016; ISBN 1439878676.