Hydroponics: A New Way of Farming

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ABSTRACT

Hydroponics is a method of growing plants without soil, using mineral nutrient solutions in a water solvent. benefits of hydroponics are that this growing methods like DWC, NFT, Aeroponics etc. needs no soil, conserves water, crops grow faster, maximizes space utilization along with few disadvantages like high installation cost and the systems are also very vulnerable to equipment failure or power outage, which can kill the plants within a few hours.

INTRODUCTION

Hydroponics or hydroponic farming is the approach of cultivating vegetation in a nutrient medium solution of water without the presence of soil. Yes, it could sound wonder; however, scientists have efficiently advanced a technique of cultivating numerous plants without soil.

The term hydroponics has been taken from root words, `hydros` that means water and `ponos` that means operating water. William F. Gericke is attributed with being the father of modern hydroponics. Visual examples of hydroponic farming may be visible on the placing gardens of Babylon and floating gardens of China. Hydroponics is the technique of growing plants in soil-less condition with their roots immersed in nutrient solution (Maharana *et.al.* 2011).

The use of a hydroponic growth system is most advantageous in situations where the

nutrient media need to be well controlled and when intact roots need to be harvested for downstream applications. NASA has extensive hydroponics research plans in place, which will benefit current space exploration, as well as future, long-term colonization of Mars or the Moon (Nguyen *et.al.* 2016).

Leafy vegetables like lettuce, fruits like strawberries, tomatoes and condiments etc can be grown hydroponically. The nutrient solution or the fertilizer solution consists of macronutrients and micronutrients, ready in a tank and pumped via the device periodically.

SENSORS AND CONTROLLERS OF HYDROPONIC FARMING

1. **pH sensors:** it reveal the acidity or alkalinity of the nutrient solution. pH sensors offer real-time data, permitting growers to regulate the pH to optimize plant health.

2. **Electrical conductivity (EC) sensors:** it measures the awareness of dissolved salts and minerals within side the nutrient solution.

3. **Temperature sensors:** it regulates and monitors the temperature of the nutrient solution and the encircling environment.

4. **Humidity sensors:** it measures the moisture content around the air for controlling mold, mildew, and fungal illnesses in plants.

5. **Light sensors:** it regulates and monitors the intensity of light requires for plant growth.

6. **Carbon dioxide (CO2) sensors:** it measures the absorption of CO2 around the air and keeping it in optimum level.

7. **Nutrient dosing controllers:** it regulates the transport and flow of nutrient solution to the plant based on sensor readings and predefined set points.

8. **Irrigation controllers:** it manages the timing and length of nutrient solution transport to the plant life.

9. **Climates manage structures:** it integrates diverse sensors and controllers to manipulate environmental parameters consisting of temperature, humidity, CO2 degrees, and airflow.

10. **Data logging and tracking structures:** it collects and store sensor data over time, allowing growers to track environmental trends, identify patterns, and make informed decisions about crop management.

ADVANTAGES OF HYDROPONIC FARMING

1. **Water efficiency:** Water is re-circulated in hydroponic setups, lowering water wastage and making hydroponics an extra sustainable option, particularly in areas going through water scarcity.

2. **Faster boom rates:** Plants grown hydroponically regularly develop quicker than the ones grown in soil due to the fact that they have direct contact to vitamins and water.

3. **Space efficiency:** Vertical hydroponic setups, for example, permit growers to stack more than one growing layers vertically, successfully multiplying the developing area.

4. **Controlled environment:** Hydroponic structures allow specific manipulate over environmental elements which includes

temperature, humidity, light, and pH levels.

5. **Reduced dependency on soil:** Hydroponic farming gets rid of the want for fertile soil, making it viable to develop plants in regions in which soil first-rate is negative or unavailable.

6. **Year-round protection:** With hydroponics, growers can create synthetic developing situations which might be conducive to round year production, no matter outside seasonal variations.

7. **Nutrient manages and efficiency:** Hydroponic structures permit specific manage over nutrient composition aims to more healthy vegetation and minimum nutrient wastage.

8. **Minimized Environmental effect:** Hydroponic farming commonly calls for fewer insecticides and fertilizers as compared to regular agriculture.

DISADVANTAGES OF HYDROPONIC FARMING

1. **High initial funding:** Setting up a hydroponic device can require a huge preliminary funding in infrastructure which may be a barrier for small-scale or aspiring growers (Van *et. al.* 2002).

2. **Complexity and technical information:** Hydroponic structures require technical information and know-how to installation and preserve effectively.

3. **Risk of device failure:** Hydroponic structures are susceptible to device malfunctions, energy outages, and different technical troubles.

4. **Dependency on power and electricity:** Most hydroponic structures depend on power to energy pumps, lighting fixtures, and weather manage device.

5. **Nutrient imbalance and pH fluctuation:** Maintaining the right stability of vitamins and pH tiers in hydroponic structures is crucial for plant fitness and productivity.

6. **Limited crop variety:** While hydroponic structures may be used to develop a huge variety of plants, a few vegetation are better perfect to soil- based cultivation.

7. **Dependency on inputs providers:** Disruptions within the delivery chain or fluctuations in input expenses can affect the viability and profitability of hydroponic operations.

8. **Perception and customer preferences:** Despite the blessings of hydroponic farming, a few clients might also additionally understand hydroponically grown produce are less flavorful as compared to soil-grown counterparts.

TYPES OF HYDROPONICS

1. **Deep Water Culture (DWC):** In DWC structures, flora/plants are suspended in a nutrient solution with their roots submerged. An air pump gives oxygen to the roots. This approach is quite easy and inexpensive.

2. **Nutrient Film Technique (NFT):** NFT structures contain a skinny film of nutrient solution flowing over the roots, imparting them with vitamins and water. The roots are uncovered to air, making sure and correct oxygenation. NFT structures are appropriate for developing leafy vegetables and herbs.

3. **Ebb and Flow (Flood and Drain):** In this system, floras are placed in trays full of growing medium. Periodically, the nutrient solution floods the container, saturating the medium and roots. Then, the solution drains away, permitting air to attain the roots.

4. **Aeroponics:** Aeroponic structures mist the roots of flora with a nutrient solution. The roots are suspended around the air inside a darkish chamber, and misting durations are managed through a timer or sensor.

5. **Drip Systems:** Drip structures supply a nutrient solution immediately to the bottom of every plant through drip emitters or tubing. This technique is flexible and may be used with numerous developing media. Drip structures are famous in industrial hydroponic operations.

6. **Vertical Hydroponics:** This system utilizes vertical space by stacking growing layers vertically. Nutrient solution is generally introduced from the pinnacle and flows down through the developing medium or roots. Vertical hydroponics maximizes area performance and is frequently utilized in city farming or limited-area environments.

CONCLUSION

Hydroponic systems offer several advantages over traditional soil-based farming, including faster growth rates, higher yields, and better control over nutrient levels and environmental conditions. They can be used in a variety of settings, including indoor farms, greenhouses, and urban environments where space is limited. Additionally, hydroponics can be more water-efficient compared to traditional agriculture, as the nutrient solution can be reticulated and reused.

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