HYDROPONICS AGRICULTURE: ITS STATUS, SCOPE AND LIMITATION

Abstract

Hydroponics is a way of growing plants in water without the use of soil. This strategy can be incredibly beneficial to countries with poor land that is incapable of supporting crops.Lack of water management and waste of large amounts of water, a reduction in ground water level, and other factors are jeopardising food production in conventional soil-based agriculture; under these conditions, feeding everybody using an open field system of crop production will become impossible in the near future.To meet these issues, naturally cultivation without soil is becoming more important in the current context. Plants are raised without soil in soil-less cultivation. Improved space and water-saving techniques for cultivating food under without soil have yielded some promising outcomes around the world.

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I. INTRODUCTION

Hydroponics is the practice of growing plants in a nutrient solution in place of soil. In a hydroponic system, instead of the roots growing into dirt and receiving nutrients that way, the roots grow into a liquid solution that is supplemented with all the needed nutrients for healthy plants.

While hydroponic plants can be grown outside, the great majority of hydroponic systems are employed in greenhouses or other enclosed environments. People can cultivate hydroponic plants in their homes using a variety of tiny, commercially available hydroponic systems.

II. WHAT IS THE PROCESS OF HYDROPONICS?

The water (hydro) does the job or labor (ponos) in hydroponic gardening, as the root of the word “hydroponics” implies.

Plants require a few fundamental things to grow: sunlight, carbon dioxide (that they frequently obtain from the ambient air flow in their habitat), water, and nutrients. Plants in traditional gardening obtain their nutrition from the soil.

Instead of soaking up nutrients from soil, plants in hydroponics absorb them from a liquid solution of nutrients diluted in with the water.

Growing in soil can have a significant impact on a plant’s root architecture and capacity to produce food since nutrients may not be evenly distributed throughout the soil.

Growing in liquid solution, on the other hand, ensures that the plants’ roots have constant access to nutrients, resulting in more efficient nutrient uptake and growth. As a result, the plants develop faster and more expansive when compared to they were planted in soil.

III. THE FUNDAMENTAL ELEMENTS OF A HYDROPONIC SYSTEM

Not every hydroponics systems are alike, although they do share several components. They all have a particular kind of growth tray in which the plants develop. In certain contexts, these trays contain only water and a liquid nutrient solution, whereas in others, plant life grow in a non-soil substances such as sand, rock, or wool.

A nutrient reservoir is typically used in hydroponics systems to store extra nutrient solution. The fertilizer solution must be delivered to the operating tray via the systems. This can be accomplished either actively via the use of an electric water-pump device or passively through the use of wicks.

In order to sustain the nutrient solution moving at all times, some systems employ air flow pumps and air stones through the reservoirs.

Hydroponic growth systems are frequently equipped with growing lights. More expansive hydroponics systems will frequently include software that monitors and tracks the plants. Even tiny systems rely on timers to maintain an regular basis for watering and lighting.

IV. WHAT ARE THE POSITIVE ASPECTS OF HYDROPONICS OVER SOIL GARDENING?

Growing vegetation in a liquid nutritional mixture, as previously discussed, changes the structure of the roots of plants, triggering them to develop more effectively than in soil. This is the most obvious benefit of a hydroponics system, yet there are further benefits.

1. **The Pros:** Hydroponics systems have an advantage over standard growing methods due to their distinct nature.

2. **Increased Plant Density:** Plants can be easily transplanted as they develop because they aren't locked in dirt. Hydroponic greenhouses frequently contain a chamber specialised to seed germination and the seedling's production, allowing these preparatory procedures to be completed before introducing grownups into the main growth area.

3. **Crop Yields Increase:** Hydroponic greenhouses are known to provide larger yields and higher quality product than standard growing operations. This is especially feasible today with the use of artificial intelligence to monitor plants.

4. **Water Waste is Reduced:** Less water evaporates in hydroponics systems, where the roots are enclosed in a closed trough or tube, than in soil growing methods, resulting in less water waste. It is a closed system in this sense.

5. **The Cons:** We'd be negligent if we didn't mention the fact there are some obvious drawbacks to hydroponic farming.

6. **Increased Initial Investment:** Soil gardening requires few instruments at smaller scales, so getting started is inexpensive. Using our 25,000 sq. ft. plot as a instance, you would only need seeds, fertilizer, possibly a system of irrigation, and some hand equipment to maintain for a plot of this size.

   A hydroponics system, on the other hand, will require the purchase of a structure, pumps, tanks, controls (such as photographic equipment and an application that monitors the plants), and supplementary lighting. All of this adds up to several bucks per square foot.

7. **A Higher Level of Technical Ability is Required:** While conventional growth does necessitate some knowledge and abilities, the fundamentals are relatively natural and simple to acquire. When using hydroponics, you'll need to know chemistry, how to utilise the monitoring and growth equipment, and fundamental plant production knowledge.

8. **Costly Energy:** When growing plants in soil, the sun provides lighting and the clouds provide water. Pumps, lighting, cameras, and detection devices all require electricity in a hydroponics system, which increases your energy usage and expenditures.

V. HYDROPONIC SYSTEM TYPES

Hydroponic systems are classified into seven types. Here's how they individually function.

1. **The Wick System:** The simplest system is named because its functional similar to a candle wick. Nutrients are pushed from a reservoir to the growing media, which contains the plants, via a cable This method is popular among home gardeners who want to experiment with hydroponics. However, it is not suitable for larger plants because a cable cannot deliver enough water. In addition, improper setup or material use can be harmful to the plants.

2. **Deep Water Culture System:** This system, also known as the Kratky Method after its creator, University of Hawai'I horticulturist B. A. Kratky, works by setting down plants in container on top of a floating holder so that the roots are in the growth medium. It recirculates water, decreasing waste, and is economical and low-maintenance. However, this strategy is not suitable for huge plants or plants with long growing periods because they must be lightweight enough to be properly supported by the floating raft.

3. **System of Nutrient Film Technique (NFT):** Many vertical farms, which are basically plant skyscrapers, use this technology. Some can house hydroponic growth systems covering hundreds of square feet. Nutrient Film Technique is also the most commonly used type in residential, laboratory, and commercial settings. It operates by directing continuous nutrient flow to the plant and back to the reservoir via a tube angled slightly downward. This design has two advantages: it eliminates the need for a timer because the pump runs continuously, which saves time .Furthermore, it eliminates the requirement for a growth medium. However, it is a little more labour intensive because farmers must ensure that the plant roots do not expand in such a way that the system becomes clogged. They must also check the pump on a regular basis to ensure that the plants are receiving appropriate nutrients.

4. **System of Ebb and Flow:** This approach employs a timed pump to manage the flow of nutrients from the reservoir to the growth tray. After the nutrients have completely surrounded the plant roots, they flow back into the reservoir. This technique is adaptable to the needs of the grower and promptly uses energy and water, but it takes a substantial volume of growing material.

5. **The Drip System:** A timer controls when the nutritional solution is transported through a network of drip lines, providing tiny drips of water to the plants. It's less expensive and allows you more flexibility over your schedule. However, it is definitely overkill for a small home garden and a lot of water get wasted.

6. **Aeroponics:** Aeroponics appears to be one of the most difficult hydroponics alternatives. Plants are hung in the air and do not require any growing medium. A timer also controls a

spray system, which delivers nutrients to the roots on a regular basis. As a result, employing this technique exposes the roots to more oxygen.

7. **Aquaponics:** Aquaponics is a symbiotic system that combines fish and some other aquatic animals such as snails, prawns, and crayfish and crops. Waste compounds that, in high concentrations, can be toxic to fish are scrutinized ed out of the system by plants, which use them for sustenance. While fish farming is frequently harmful to the environment, not all fish farms are the same. Aquaponic farms are distinct in that they mix fish farming and hydroponics, and the two collaborate to create what has the potential to be a more environmentally friendly system in which each component benefits the entire.

VI. CONCLUSION

Hydroponic farming is highly popular these days because it produces organic produce. It can be extremely beneficial in locations where water is scarce. Furthermore, the water can be re-used to cultivate plants. This technique produces plants that are highly nutritious and devoid of contaminants.

REFERENCES

[1] Bowery.co/hydroponics/
[2] freshwatersystem.com
[3] http://foodrevolution.org
[4] http://iberdrola.com

