TO DEVELOP CROP PRODUCTION WITHOUT SOIL ON A LARGE SCALE

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ABSTRACT

This article describes the development of crop production without soil .As we know growing plants without soil is known as hydroponics. So in this article ,various methods, techniques are describe to help those farmer who want to develop crop production without soil Hydroponics works in a variety of scenario from growing a small collection of herbs in a kitchen all the way up to numerous plants in a large-scale commercial operation. People with limited or no outdoor space, such as urban residents, apartment dwellers, or renters who can't have an outdoor garden, find hydroponic growing especially useful. Many types of plants grow well hydroponically. Some of the best plants to grow in a hydroponics system include herbs, lettuce and greens, tomatoes, peppers, and strawberries. As a rule, avoid plants that grow tall like corn, have deep taproots like potatoes, or grow in a vining nature. This information provided here is beneficial to gardening enthusiasts who want to try hydroponics as a hobby. The commercial Production of food utilizing hydro-culture techniques is complicated. It demands competency in farming and business.

.**Key words: Crop Production, Hydroponic, Soil.**

INTRODUCTION

Hydroponics is a type of horticulture and a subset of hydroculture which involves growing plants (usually crops) without soil by using mineral nutrient solutions in an aqueous solvent. Terrestrial plants may grow with their roots exposed to the nutritious liquid or in addition, the roots may be physically supported by an inert medium such as perlite, gravel, or other substrates. Despite inert media, roots can cause changes of the rhizosphere pH and root exudates can affect rhizosphere biology. The nutrients used in hydroponic systems can come from many different sources, including fish excrement, duck manure, purchased chemical fertilizers, or artificial nutrient solutions.

Hydroponics is appropriate for use in developing countries as it efficiently produces food in arid and mountainous regions, on city rooftops, or, in other words, pretty much anywhere. In highly populated tourist areas, for example, *where rising land prices have driven out traditional agriculture, hydroponics can provide specialised, locally-grown crops of high nutritional value. it is the science, the art, and the technique of growing plants without soil, where the essential elements for the growth and development of plants are supplied through a nutrient solution that provides, in accurate and constant measure, all the nutrients that the plants need. Hydroponics is a method for growing crops without soil where water serves as the substrate for growing the plants with the addition of fertilizers to supply the plants essential nutrients and promote its commercial success.

METHOD OF CROP PRODUCTION WITHOUT SOIL

The hydroponics growing method is relatively simple and involves placing containers on the ground or on tables through which water with essential nutrients flows continuously. The water is enriched with oxygen continuously to facilitate the proper functioning of the roots' system. The plants are inserted into buoyant pads floating on the water's surface; usually the work begins with the containers of seedlings at one end and ends at the far end with mature plants, which are picked easily, shifting the pads along the water's surface is easy.

There are four methods of crop production without soil-**water culture, sand culture, gravel culture, and adsorbed-nutrient technique**.

1. WATER CULTURE.

It is a hydroponic method of plant production by means of suspending the plant roots in a solution of nutrient-rich, oxygenated water. This method uses a rectangular tank less than one foot deep filled with a nutrient-rich solution with plants floating in Styrofoam boards on top. This method of floating the boards on the nutrient solution creates a near friction-less conveyor belt of floating rafts. Typically, it is used to grow short-term, non-fruiting crops such as leafy greens and herbs. The large volume of water helps mitigate rapid changes in temperature, pH, electrical conductivity (EC), and nutrient solution composition.

2. SAND CULTURE

Sand culture is a popular soilless growth technique that is suitable for different types of plants. Because of its efficiency, sand culture is commonly used in arid and dry Middle Eastern regions. Sand culture is also known to be one of the most affordable types of soilless growing methods due to the abundance of sand on the planet and the fact that it can be re-used over and over again. However, due to its high salt content, the sand must be treated before use. Sand culture is thought to be more efficient than traditional hydroponic methods because the sand largely decreases the risk of botanical ailments such as verticilium and fusarium. Because the plants receive fresh nutrient solutions after each watering cycle, they also tend to remain healthy, with no nutrient imbalances.

3. **GRAVAL CULTURE**

Gravel culture refers to a branch of hydroponics whereby pea-sized gravel is used to support the plants while helping distribute nutrients across their root systems.

In gravel culture hydroponics, nutrient solutions drip through the coarse gravel and filters down the plant stems before being absorbed by the roots. The nutrients can be recirculated through the system, which means that gardeners only need to replenish the solution around once a week, depending on their system. The gravel can also be re-used over and over. Gravel also has the advantage of being quite inexpensive and carries no risk of becoming waterlogged. Additionally, it is also one of the easiest medium to keep clean. However, one of its drawbacks is that it is extremely heavy to work with, making it less suitable for commercial production facilities.

4 .**ADSORBED NUTRIENT TECHNIQUES**

This method differs from others in that the plant nutrients are adsorbed on synthetic ion-exchange resins similar to soil-clay particles. These exchange materials then mixed with sand or gravel to supply the plants needs much the same way as colloids in natural soil supply nutrients for plant use. This method has produce excellent results in experiment works done by senior author. The ion exchange material used is so expensive at the present time that this method is not suitable for commercial exploitation.

Some techniques are also used-

NUTRIENT FILM TECHNIQUE SYSTEM (NFT)

This technique involves plants being grown in specific tubes, through which a solution of water and dissolved nutrients, balanced according to the need of each plant species .This system has a reservoir where the nutrient solution is stored. From the reservoir the nutrient solution is pumped to the top of the cultivation bench, passing through the channels and collected in the lower part of the bed, before returning to the tank in a closed system.It saves between 80 to 90% of water compared to traditional farming.

NEW GROWING SYSTEM (NGS)

This is a re-circulating hydroponic cultivation technique with or without soil, which is particularly suited to growing vegetables and strawberries. This technique allows crops to develop in an optimal environment where they receive water, oxygen and all the nutrients they need. The NGS represents a new crop-growing system that achieves high yields of excellent quality, regardless of the soil, using flowing water with nutrients.

SEMI-HYDROPONIC SYSTEM

This technique is used to sustain fruit, flowers and other crops, whose root system and above-ground section are more developed. Channels, bags or vases filled with inert material, such as sand, perlite, stone wool, peat and coconut fiber, are employed. The nutrient solution is percolated through this material and drained by the plant via a drip irrigation system. The semi-hydroponic system is widely used in Europe, where it is known for allowing the best usage of growing space, .where it is known for allowing the best usage of growing space.

AEROPONICS

This technique consists in growing plants in stacks, supported by the root plugs, allowing the roots to directly receive small droplets or mist of nutritive solution, by means of sprinklers, providing the ideal growth of the vegetal crop. It allows a farmer or even a homeowner to produce a large amount of food in a small space. Advanced technology differentiates this model from all others, allowing farmers to achieve high profit rates.

ADVANTAGES

1 .**No soil involved**

Hydroponic farming involves growing crops without soil, it is an ideal option for anyone who has limited accessibility to land. During the mid-nineties, Hydroponics was used for supplying fresh crops to the troops in the distant Wake Islands.

2. **Optimal Use of Location**

Since every requirement of the plant is provided for and duly maintained in a structured system, Hydroponic Farming can be performed anywhere. So, if you live in a space-crunched apartment, you can always consider Hydroponic Farming where the plants will be grown in your bedroom or balcony.

3. Control over climate

As with greenhouses, hydroponic growers have absolute control over the climate. They can adjust the temperature, the intensification of light, and the humidity levels as per their requirements.

4. Saves water

The plants grown in a Hydroponic system barely use around 10% of the water when compared to the conventionally field-grown plants. The water used here is drastically less because unlike conventional farming water is reused or re-circulated. Plants take in their required water, while the excess water is captured and trapped back in the system. Water loss, therefore, occurs only through two pertinent forms: evaporation and system leaks. With that being said, an efficient Hydroponic setup will minimize leaks or won’t have it in the first place.

5. Optimal Use of Nutrients

When it comes to Hydroponics Systems, you have absolute control over the nutrients as required by the plants. Even before proceeding with the farming, you can check what kind of nutrients your plants require and then mix particular amounts of those nutrients with water at different stages. Since the nutrients are duly conserved in tanks, there is no possibility of nutrient loss.

. Additional advantages of growing crops on an isolated substrate:

- No need for soil as a growing substrate;
- Unconsumed water and fertilizer can be recycled;
- Control over the nutrients' levels;
- Minimal ecological and environmental pollution;
- No need for difficult pest and disease eradication methods;
- Clean produce with little waste;
- Marketing the produce in "waves";
- Growing cycles all year round.

CONCLUSION

Hydroponics should preferably be carried out in a greenhouse environment, wherever there is a commercial and large-scale production interest. But it is also possible to have small hydroponic backyard gardens, on terraces or in your home kitchen thanks to the simplicity of the structure required for a small crop.

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