

Hydroponics: A Better Way to Grow Food

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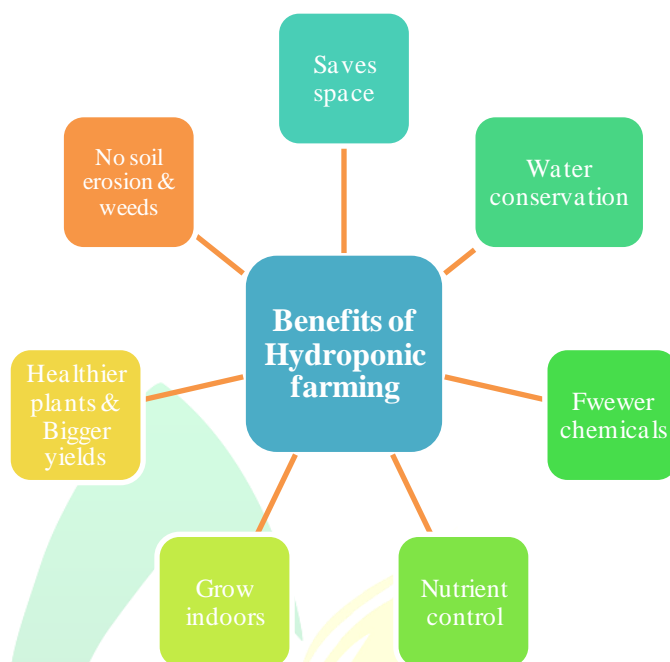
Introduction

When you think about the produce grown for concession food service operations, do you picture acres of open fields, rows of tilled soil, and seedlings lining the tops of the mounds? While much of the world's fruits and vegetables are grown this way, there are other ways to grow produce without large amounts of land and even without soil.

Hydroponic plants are exposed to light to allow for the process of photosynthesis, and plant roots are exposed to air allowing the roots to capture oxygen that they need to grow. Nutrients mixed into water include: Phosphorus, Nitrogen, Calcium, etc. In some hydroponic systems, a growing medium is used to support the plant roots and allow for more effective water absorption to the root structure. One type of growing medium commonly used is coconut coir a shredded fibrous product made from coconut husk. A subset of hydroponics, called aeroponics, requires only light, water and nutrients, and does not use a growing medium.

BENEFITS OF HYDROPONIC FARMING





1. Saves Space

Plants grown in soil need to spread their roots in order to find water and all the nutrients they need to survive. In hydroponic systems, roots don't need to spread because water and nutrients are delivered right to them. As a result, hydroponic system can grow more plants in the same amount of space as soil-based systems.

2. Water Conservation

Field farming uses so much water because so much of it is lost. Hydroponic systems use about 10 times less water because it's delivered in a controlled way.

3. Fewer Chemicals

While hydroponic systems don't eradicate pest issues, it does lower the potential of this happening, resulting in less need for pesticides and herbicides.

4. Faster Growth

Plants grown in hydroponic systems grow 30% to 50% faster than those grown in soil. Crops grow faster in hydroponic systems because they receive an ideal amount of nutrients and, if grown indoors, have less environmentally induced stress (like weather and pests).

5. Nutrient Control



Hydroponic systems feed plants a nutrient solution mixed with water, giving the farmer better control over what nutrients their crops soak up.

6. Grow Indoors

Another benefit of hydroponic farming is that it's easy to do indoors. Growing indoors comes with its own benefits such as the ability to grow year-round, temperature and climate control, and fewer pests.

7. Healthier Plants

In hydroponic farming, plants grow healthier than in soil. For one thing, soil-borne diseases aren't an issue in hydroponics because there is no soil for those diseases to fester and spread in.

8. Bigger Yields

Because more plants can be grown in small spaces with hydroponic farming than soil farming, hydroponic systems typically yield more per square foot. Additionally, plants are healthier and grow faster, generating more produce faster.

9. No Soil Erosion

Field agricultural practices have eroded half of the soil on Earth in the last 150 years, decreasing the availability of arable land. Hydroponic systems don't use soil. No soil means no soil erosion. It's that simple.

10. No Weeds

Hydroponic systems are not habitable for the seeds of weeds. Weeds need the same things as other plants to sprout, but seeds aren't typically sowed in hydroponic systems. Since the seeds can't start germinating, weeds won't take root and steal your crops' precious nutrients.

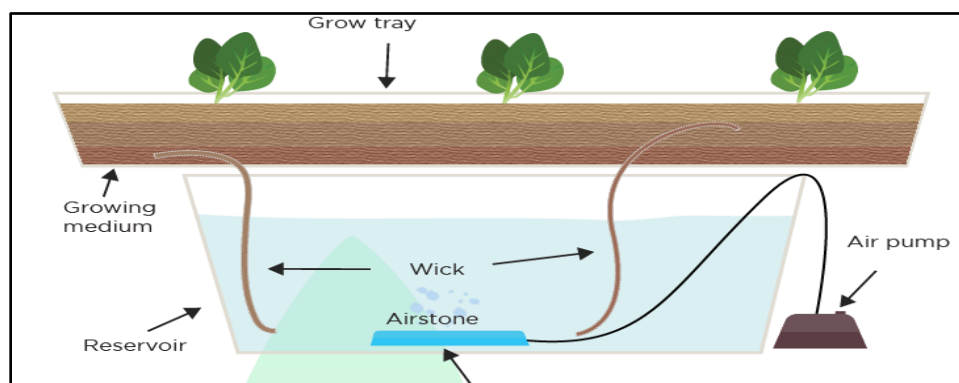
Hydroponic Structures and Their Operation

Hydroponic system is customised and modified according to recycling and reuse of nutrient solution and supporting media. Commonly used systems are wick, drip, ebb-flow, deep water culture and nutrient film technique (NFT) which are described below

1. Wick

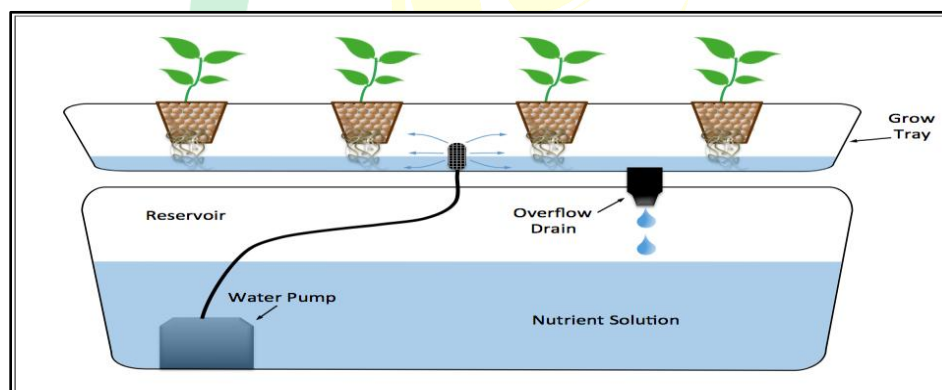
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Plant roots grow down through a medium while an absorbent “wick” draws nutrient-filled water up from a water reservoir to the root system zone. The growing medium allows for air (oxygen) to reach the roots.



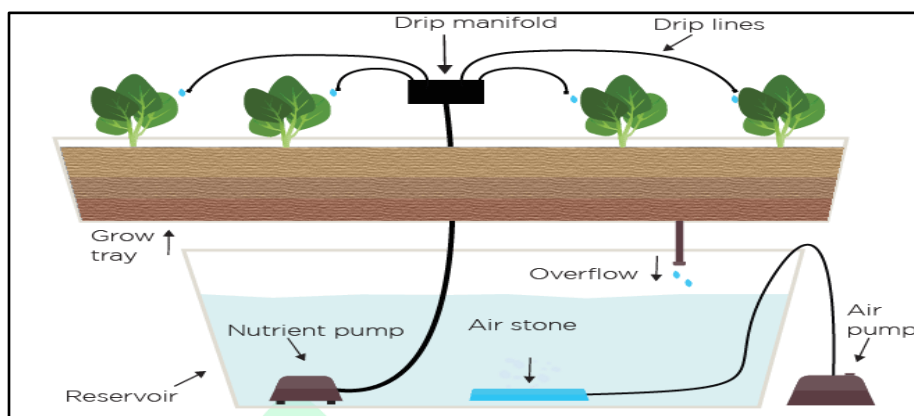
2. Ebb and Flow system

Plant roots grow through a medium. Nutrient-filled water is pumped on a frequent basis (e.g., every 30 minutes) to the root zone area and allowed to drain back into a water reservoir.



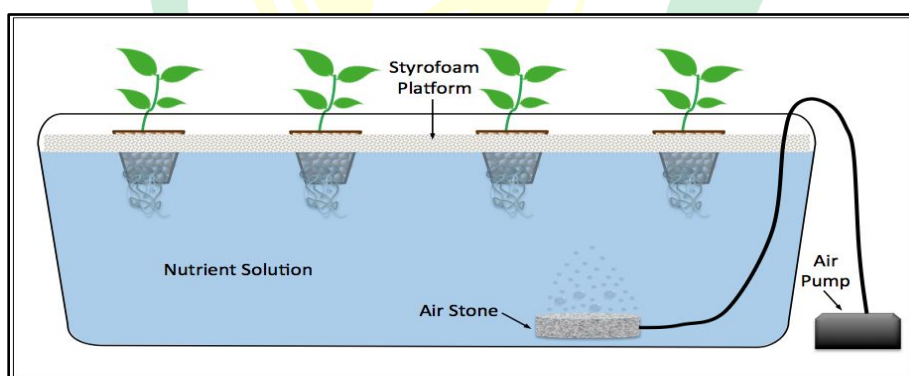
3. Drip system

The drip hydroponic system is widely used method among both home and commercial growers. Water or nutrient solution from the reservoir is provided to individual plant roots in appropriate proportion with the help of pump. Plants are usually placed in moderately absorbent growing medium so that the nutrient solution drips slowly. Various crops can be grown systematically with more conservation of water.



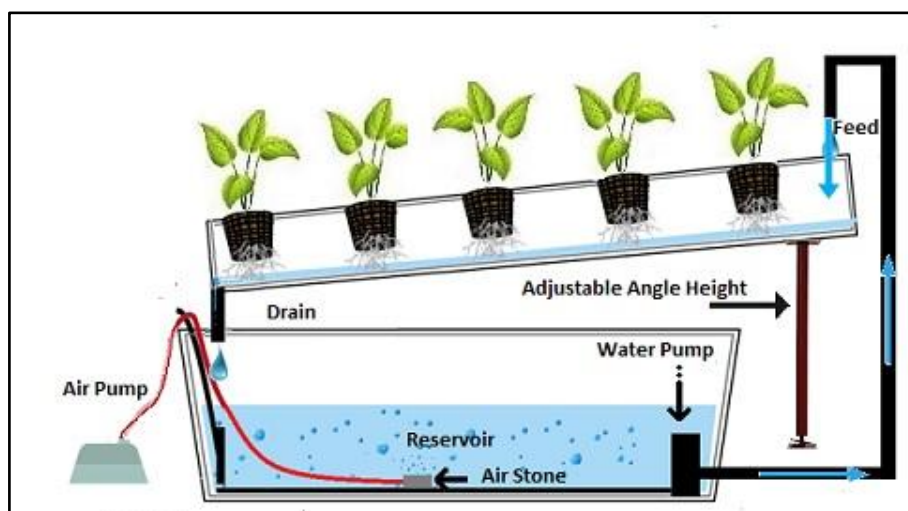
4. Deep water culture system

In deep water culture, roots of plants are suspended in nutrient rich water and air is provided directly to the roots by an air stone. Hydroponics buckets system is classical example of this system. Plants are placed in net pots and roots are suspended in nutrient solution where they grow quickly in a large mass. It is mandatory to monitor the oxygen and nutrient concentrations, salinity and pH as algae and moulds can grow rapidly in the reservoir. This system works well for larger plants that produce fruits especially cucumber and tomato, grow well in this system.



5. Nutrient Film Technique (NFT) system

Plants are positioned on a floating surface hanging in a trough that is slightly tilted. The plant roots hang with the upper part of the root system exposed to air (oxygen). The bottom part of the roots is exposed to nutrient-filled water that is pumped into the trough at the upper (higher) end. The water flows past (down) the other root systems and back into a water reservoir.



Global Hydroponic Market and Commercial Hydroponic Production

The market for hydroponic systems is estimated at USD 9.5 billion in 2020; it is projected to grow at a CAGR of 11.3% to reach USD 17.9 billion by 2026. The pressure on the agriculture industry to meet the growing demand for grains and food leads to the search for high-yielding farming techniques, such as precision farming and urban farming. Hydroponics thus is looked upon as a potential solution for the growing concern about food security in the coming years. By crop type, global hydroponics market includes tomato, cucurbits, lettuce & leafy vegetables, peppers and other food crops. As the consumers are becoming increasingly aware of the superiority of quality greenhouse-grown vegetables, the demand for hydroponics culture is rising in Europe and Asia Pacific. Leading countries in hydroponic technology are Netherland, Australia, France, England, Israel, Canada and USA. Currently, demand of hydroponics cultivation has been increased in all the developing and developed countries.

In India, several tracts of wastelands having poor quality soil but plenty of water can be brought under hydroponics. Now a day's peoples in various big cities like Delhi, Chandigarh, Noida and Bangalore are growing some leafy greens and small herbs and spices on their roof tops and balconies for fresh consumption. The future for hydroponics appears more positive today than any time over the last 50 years. The start up costs to implement a hydroponic farm can vary widely but, they are usually higher than soil-based farming costs.



Therefore, to foster the hydroponics industry's growth, it is important to implement technologies that reduce dependence on human labour and lower overall start-up costs.

Conclusions

In recent years hydroponics is seen as a promising strategy for growing different crops. As it is possible to grow short duration crop like vegetables round the year in very limited spaces with low labour, so hydroponics can play a great contribution in areas with limitation of soil and water and for the poorer and landless people. In India, the hydroponic industry is expected to grow exponentially in near future. To encourage commercial hydroponic farm, it is important to develop low-cost hydroponic technologies that reduce dependence on human labour and lower overall start up and operational costs.

