



## An Overview about Hydroponics Technology in Vegetable Crops and Also Impact of Hydroponics Present and Future Prospective for Farmer's Welfare

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### Introduction

As the world-wide population continues to grow, the challenge is to produce more amount of food; due to this to maintain the sustainability the new modern technologies were introduced. In 2015, United state assumed that the world population will grow to 9.6 billion by 2050 and 70% of people will live in the urban areas. More than 70% food is needed but 80% land is already in use for cultivation practices. Due to the development of human and social behaviour the traditional method of cultivating crops facing the serious problem, Soil is the growing medium for the plant till the human being knows how to do cultivation in the land, soil losses its fertility due to the continuous cultivation of crops in the same method by applying the heavy dosage of inorganic fertilizers and pesticides to the soil. Soil borne diseases also the serious problem for the cultivation of plants in the soil. In 1900 the world population is around 3 billion, during that time per capita land is 0.16 ha. By 2050 it was reduced in to 0.6 ha. To overcome these problems the new technique hydroponics has been introduced. It is technique for growing plants without soil. Utilizing this technology, the roots absorb balanced nutrient dissolved in water that meets all the plant developmental requirements. Many aggregates and media support plant growth, also called as "Cultivation of plants without using soil." The word was derived from the Greek words, HYDRO (water), and PONOS (labour), literally "water working".

### History of Hydroponics: -

- Hydroponics became popularized by the news media in the 1920s when a scientist named Dr. William F. Gericke of the University of California when he put laboratory experiments in plant nutrition on a commercial scale. So, he termed these nutri- culture systems HYDROPONICS.

### How does Hydroponics work?



Stand in your plants in a plastic trough let a nutrient solution trickle past their roots (with the help of gravity and a pump).

**Basic Requirements of Hydroponics:** These are Nutrient solution, Temperature, Air, supporting materials, Water, Mineral nutrient, Light and most important Growing media like Saw dust, Bark, Chips, Straw, Gravel, Rockwool, Perlite, Sand and vermiculite etc.

**Advantages of Hydroponics: -**

- Higher yields achieved in a smaller space.
- Nutrients precisely controlled.
- Grow, bloom and boost formulas used at the appropriate growth stage.
- Indoor gardens grown using full-spectrum horticultural lighting.
- Soil-borne pests and diseases are eliminated.
- Weeds are eliminated.
- Plants are healthier and reach maturity faster and Automation is possible.

**Disadvantages of Hydroponics: -**

- Cost of initial investment Production is management, capital and labour intensive.
- A high level of expertise is required.
- Daily attention is necessary.
- Specially formulated, soluble nutrients must always be used.
- Some water borne diseases can spread rapidly in recirculation system.

**Limitations of Hydroponics: -**

- Putting together a hydroponic system isn't cheap.
- Constant monitoring is required.
- Hydroponic systems are vulnerable to power outages.
- Micro-organisms that are water-based can creep in rather easily.
- Growing a hydroponic garden demands technical expertise.

**Materials Used in Hydroponics: -**

1. **Coco Coir:** - Coco coir is a by-product of outer husk of coconut. It has an excellent air to water ratio with great water retention.



2. **Rockwool:-** A fibrous material made from melted rock. Not Biodegradable. Hazardous to health. Must be pH balanced. Excellent water retention.



3. **Expanded clay Pellets:-** Most popular media. Drain quickly & PH neutral Reusable. Used in ebb & flow, water culture. 50/50 mix of clay and coco creates a breathable medium.



- 4. Potting soil (Perlite):** Perlite + Coco Coir + Vermiculite. Synthetic materials are puffed/ heated to produce light and porous material.

**Nutrient solutions: -**

- In Hydroponics, nutrient control is easy.
- A nitrogen-rich Grow Formula.
- A phosphorous and potassium-rich Bloom Formula. The results Bumper crops of delicious fruits and vegetables every time.

**Types of Hydroponics system: -**

- 1. Ebb and flow system :** - Floods growth tray with nutrient solution. Drains solution into reservoir Pump and timer failures can dry out plants. Uses medium such as sponge or rock wool to retain water and Chemicals.



- 2. Drip system:** - Drip systems are probably the most widely used type of hydroponic system in the world. Operation is simple; a timer controls a submersed pump.



- 3. Wick system:** - The Wick system is by far the simplest type of hydroponic system. This is a passive system, which means there are no moving parts.

- 4. Waterculture:** - The water culture system is the simplest of all active hydroponic systems. The platform that holds the plants is usually made of Styrofoam and floats directly on the nutrient solution.

- 5. Nutrient Film Technique (NFT):** - This is the kind of hydroponic system most people think of when they think about hydroponics. N.F.T. systems have a constant flow of nutrient solution so no timer required for the submersible pump.



## WHICH CROPS CAN BE GROWN IN HYDROPONICS?

- Basically, all high value crops can be grown. Popular are tomatoes, cucumbers and peppers, broccoli, kale, spinach, cucumber, red cabbage in drain to waste systems and lettuce and herbs in gravel flow systems.

### Impact of Hydroponics Present and Future Prospective for Farmers in India

Hydroponics technique presents a "new" door of science helping more crop production for food and ornamental use. It can decrease the environmental impact of greenhouse and nurseries as well as produce improved yield quality (Putra and Yuliando, 2015). Hydroponics can supply high yield of local crops, such as leafy vegetables or flowers in the over-populated areas. If it is possible to modernize the hydroponics technique, all plants and crops can be cultivated through all over the world. Hydroponics has the ability to feed millions in areas of Africa and Asia, where water, land and crops are insufficient. Thus, hydroponics gives the ray of hope for the management of crop and food production. Japan has started rice production by hydroponics technique to feed the people. Israel grows large quantities of berries, citrus fruits and bananas in the dry and arid climate. It makes an appropriate support for biological research and to analyse interactions between multiples factors, both biotic and abiotic, influencing plant growth. To speak the truth, hydroponics technique can be a versatile knowledge in both rural or town and high-tech space stations. This can be a proficient practice for food cultivation from adverse environmental ecosystems such as deserts, mountainous regions, or arctic communities. Currently, demand of hydroponics cultivation has been increased in all the developing and developed countries. So, government should make public policies and give subsidies for such production systems.

The driving force of future agricultural industry is to provide sufficient yield that satisfy the needs of consumers and meet their interests in terms of quality. Soilless cultivation is intensively used in protected agriculture to improve control over the growing environment and to avoid uncertainties in the water and nutrient status of the soil. Recently the type of soilless culture transformed from open to close-loop system. This system is known for better result in water use efficiency, while maintaining the quality of the yield. This study aims to describe the specific purpose of soilless culture specifically in close-loop system and how substrate nutrition produces the better quality of the yields. Hydroponics is a widely and frequently used technique for growing plants without soil, providing for a considerable degree of control of the elemental environment surrounding the root. The technique has an interesting history of development and use dating back into the mid-18th-century, although the growing of plants in nutrient rich water may have dated Growing plants in a nutrient solution offers a number of advantages such as Applying plant nutrients in fertilizers directly to the roots without the problems associated with the soil's composition or the fertilizer's inability to infiltrate into the root system; No need for heavy machinery to prepare beds for seeds or planting; Weeds and diseases can be controlled without spraying chemicals and no irrigation systems have to be installed for fertigation; Erosion of the soil by repeated cultivation is avoided.

### Conclusion

This Hydroponic system has Made more results obtained in various countries have proved that this technology is thoroughly practical and has very definite advantages over conventional methods of crop production and also this hydroponics system can useful to feed growing population in India. The main advantages of soil-less cultivation are the much higher crop yields. People living in crowded city streets, without gardens, can grow fresh vegetables and barren and sterile areas can be made productive at relatively low cost.

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