

# A Review on Hydroponics and It's Utilisation in Present Day

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**Abstract:** --In this paper a short review on hydroponics system is presented. Hydroponics is that branch of agriculture in which the plants are growing without the use of soil by applying mineral nutrient solution. Agricultural activities like production of vegetables and fruits without soil are totally a new revolution in the era of agriculture. The paper mainly focuses on evolution of hydroponics system for growing plants. Under the same grown condition, the growth rate of a hydroponic plant is 30-50 percent faster than a soil plant. As per the national report, 5334 tons of top soil layers are getting washed every year due to various reasons and the level of eutrophication is also increasing day by day, all such issues can be easily controlled by hydroponics to a greater extent. This process is also very effective in culturing various rare medicinal plants. The paramount motive of the paper is to put forward the concept of hydroponics for its better use.

**Keywords:** --Soilless Culture, Eutrophication, Hydroponics, Agriculture.

## Introduction

The term hydroponics is derived from greek word 'hydro' meaning water and 'ponos' meaning to culture [1]. It is a method in which plants are cultured without soil. In this technique the plants are grown in nutrient medium. In hydroponics the roots are emerged in nutrient solution.[1]. Hydroponics was introduced by Dr. W.F. Gericke in United States [2].In India hydroponics was first brought by Dr. W.J.ShaltoDuglus. A laboratory in kalimpong area of Westbengal was established by Dr. Duglus. In 1990 this technique became famous and play a effective role in providing food to famine effected people in WestBengal.

## Journey of Hydroponics from 17th Century to 20th Century

### INFORMAL STUDIES DONE UNDER HYDROPONICS.

- Jan Baptista van helmont in 1600 conducted a random experiment on willow shoot.The willow shoot was kept on same soil for five years. At lastthe conclusion drawn from this experiment was that 73kg of water was taken up by the tree and only 57g of soil weight got reduced [2]. His experiment signified that water is main source of plant , thus the concept of hydroponics got started.
- In 1699, an english naturalist Jhon woodland conducted an experiment on spearmint .he concluded that spearmint grows better in water nutrient medium.Thus supported soilless culture [4].
- Juilius von sachs was a German scientist ,who conducted an experiment in 1860 and concluded that plant can be easily grown in waternutrient solution. He said that proper nutrient supply in water medium can easily result to excellent development of plants .He coined this as nutriculture [1,4] .

## FORMAL STUDIES DONE ON HYDROPONICS

- Dr.W.F.Gericke a scientist of califonia university was the first person to term these senerio formally as 'hydroponics'.The term was coined as hydroponics in 1937 [4]. He performed an experiment by growing tomato plant in totally water dependent medium in which nutrient are suspended as per requirement.He observed the plant with 25 tomatoes.
- In 1938 a new discover a Dennis Robert hoagland in 1938 and the solution was further revised by Aron in 1950.The main constituent of this solution is nitrogen and potassium as essential nutrient.
- The concept of 'hydroponics' was than commercially used by the American troops in 1940s.They cultivated vegetables by using the tecnique of hydroponics in rocky shore of pacific ocean.
- In 1970,Dr.J.Shloto Douglas worked on Bengal hydroponics system. It was the first time introduced in India, as a labrotary was introduced in kalimpong, westbengal to work on the hydroponics [2,3].

### Functioning of Modern Hydroponics System

#### Diagram of the Hydroponic System

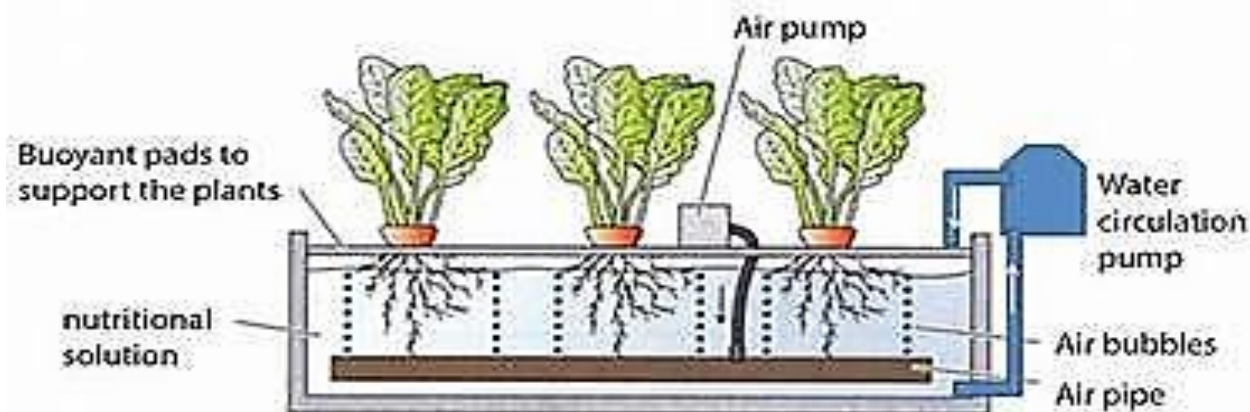


Fig:1 set up of hydroponics system

#### Nutrition Uptaking Mechanism of Plants in Hydroponics

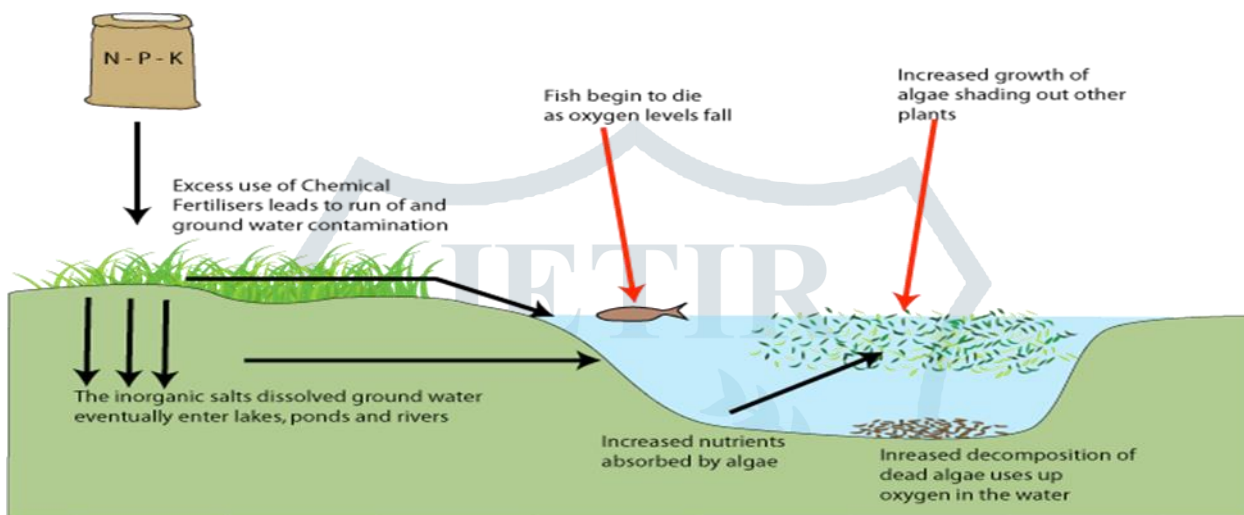
Nutrient in the form of inorganic salt is dissolved in the water medium

The nutrient medium is supplied to the root of the plant directly as shown in fig 1.

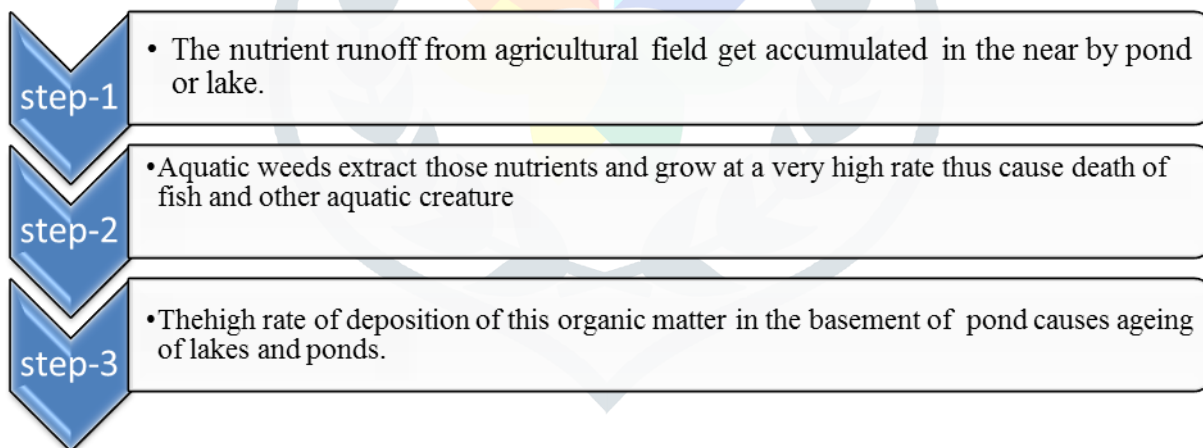
The directly supplied nutrients are pulled up by the plant to utilise it for their growth and development

**Advantages of hydroponics**

There are many advantages of hydroponics. This system is easily manageable as the system is self mechanized. The adequate amount of nutrient could be supplied and there is no wastage of nutrient medium as in field cropping [5, 6]. It requires less space for culturing plants. The plants grown by using hydroponics is not affected by external climatic conditions [6]. The comparative analysis of crop grown in soil and hydroponics clarify that the yield is more in case of hydroponics. Example: The yield of tomato in one hectare soil field is 5-10 tonnes while the yield of tomato by hydroponics in one hectare is 180 tones [5].The time period of crop maturation is also reduced by using hydroponics.[7]. Eutrophication i.e., excessive richness of nutrient in lake. It occurs due to frequent runoff of nutrient medium and fertilizers from agricultural field. These runoff induces excessive plant growth i.e.; mainly aquatic weeds and algae. These processes usually cause depletion of oxygen level in water causing death to fishes and also cause aging of lakes and other stagnant water bodies. The use of hydroponics is highly effective to control the phenomenon of eutrophication.



**Fig: 2 Eutrophication leading to ageing of lake thus reducing lake’s age [ 7].**



**Fig: 3 Flow chart of ageing of stagnant water bodies**

**Disadvantages of hydroponics**

Hydroponics is basically a technical process which requires proper skill and knowledge, thus only a skillful person can handle the setup. The system requires proper and regular examination. The start up of hydroponics system is very expensive as compared to traditional farming.

**Use of Hydroponics in Present Day**

The scientists of NASA have planned to grow crops using hydroponics in space [9]. As the length of mission on space is very long so the scientists have decided to find an alternative source by culturing crops in space.

Recently the Indian governments have launched the union budget of 2018-19 as Rs.500 crore for green operation. Under green operation the hydroponics can be effectively used to grow tomato and onion. Hydroponics is an effective technique in cultivation

of medicinal plants. In university of pisa an experiment was conducted on cultivation of Echinacea and basil (*Ocimum basilicum*). The experiment proved that the biomass yield is good and even contamination is also less [10].

### Conclusion

Hydroponics is a technique of culturing crops with difference. Though the method of crop production is expensive still the yield is very high. It is beneficial to grow medicinal plant and other rare plant species. Recently Indian governments have launched operation green for production of certain crops. Tomato production through this process can be increased to a high extent so somehow it can be effective to boost operation green. As this technique is environment friendly, so I basically think that we should slowly switch to hydroponics as one of the major method of culturing crops.

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