

HYDROPONICS –A SOILLESS TECHNOLOGY

Hydroponics is a method to grow crops without soil. In horticultural crop production, the definition soilless cultivation encompasses all the systems that provide plant production in soilless conditions in which the supply of water and of minerals is carried out in nutrient solutions with or without a growing medium (e.g. stone wool, peat, perlite, pumice, coconut fibre, etc.). Soilless culture systems, commonly known as hydroponic systems, can further be divided into open systems, where the surplus nutrient solution is not recycled, and closed systems, where the excess flow of nutrients from the roots is collected and recycled back into the system [1].

This practice has actually been used for thousands of years. The famous Hanging Gardens of Babylon in around 600 B.C. are the earliest record of hydroponics. These gardens were built along the Euphrates River in Babylonia. In this method, water was pulled from the river and flowed up along the chain system and dropped to the steps or landing of the garden [1].

Nowadays, soilless growing systems are common in horticultural practice in most European countries, although not in every country does this occur on a large-scale. The advantages of soilless systems compared to soil grown crops are: it's a possible solution to avoid soil-borne diseases; growth and yield are independent of the soil type/quality of the cultivated area; better control of growth through a targeted supply of nutrient solution; the potential for reusing the nutrient solution allowing for maximizing resources [1].

Concept of vertical farming was given as the farm using farming method such as hydroponics to produce more yields faster. Vertical farming can be defined generically as a system of commercial farming whereby plants and fungi are cultivated by artificially stacking them vertically above each other. Vertical farming is large-scale agriculture in urban high-rise structures. Vertical farming is a step ahead technology from green houses as it involves harnessing of resources in vertical arrays and can feed the demands of food supply with the resources of mega cities [2].

Most important, hydroponics allows the grower to select where to locate the business, without concern for outdoor environmental conditions such as soil, precipitation or temperature profiles. The concept foresees the cultivation of fruits, vegetables, medicinal, fuel producing plants and other

plant products in the cities and their sales directly within the cities, thereby reducing the transportation costs and efficient utilization of land and water resources. Sizable hydroponic facilities can be found in the U.K., the Netherlands, Germany, New Zealand and other countries. One leading example is the Eurofresh Farms in the Arizona desert, which produces large quantities of high-quality tomatoes, cucumbers and peppers 12 months a year [2, 3].

Organic farming also known as ecological agriculture or biodynamic agriculture, works in harmony with nature i.e. the agricultural practices followed in organic agriculture do not cause any harm to the environment. Due to eco-friendly nature of the organic farming it is considered as a viable alternative in comparison to chemical based farming, where excessive use of chemical based fertilizers and pesticides have raised the concerns for ecotoxicity and health hazards. Vertical farming will facilitate production of organic crops in large-scale production. Further adoption of this technology will help in reduction in use of chemical pesticides. Vertical farming will reduce the dependency on land resources and help in regrowth of forests. [2].

There has been extensive research carried out on hydroponics without using chemical fertilizers, however, integrating this system with wastewater reuse is a developing area. Some studies have found the possibility of using treated effluent for plant growth in a hydroponics system. Wastewater hydroponics is a potential system to treat and reuse wastewater as treated water still contains residual quantities of organic matter and biogenic elements. However, there are few questions concerning the nutrient availability in secondary treated effluent for optimum plant growth, pathogen contamination in edible parts of the plant and nutritional quality of vegetables grown in treated effluent using the hydroponics system [4].

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