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Hydroponics

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ABSTRACT

India today needs food security which entails that all people at all times have physical and economic access to safe and nutritious food to meet dietary needs. Lack of water for agriculture leads to production of lesser food which means more hunger and malnutrition. Therefore, there is a need for technology in agriculture that can contribute towards water savings and have a positive impact on food production and availability. Hydroponics is one methodology of soil-less cultivation. It is a method of growing plants using mineral nutrient solutions, in water, without soil. Soilless agriculture (Hydroponics) can be defined as growing vegetables in greenhouse systems in solid or liquid environments other than soil which is enriched by nutritional solutions. Some of the reasons why hydroponics is being adopted around the world for food production are the following: No soil is needed for hydroponics, The water stays in the system and can be reused, It is possible to control the nutrition levels accurately, It is stable and provides high yields hence economically viable, Pests and diseases are easier to get rid of, Ease of harvesting, It is better for consumption.

Key-words: Economically-viable Hydroponics, Nutritional-solution and Soilless-agriculture.

I. INTRODUCTION

Today farmers face many challenges like Drought conditions and unpredictable weather, rising temperatures, Polluted water systems, Lack of irrigation, Poor water management and Under-nourished or over nourished crops. India today needs food security which entails that all people at all times have physical and economic access to safe and nutritious food to meet dietary needs .Lack of water for agriculture leads to production of lesser food which means more hunger and malnutrition. Therefore, there is a need for technology in agriculture that can contribute towards water savings and have a positive impact on food production and availability. Hydroponics is one methodology of soil-less cultivation. It is a method of growing plants using mineral nutrient solutions, in water, without soil. The earliest published work on growing terrestrial plants without soil was the 1627 book Sylva Sylvarum by Francis Bacon. The reasons why hydroponics is being adopted around the world for food production are the following: no soil is needed for hydroponics, the water stays in the system and can be reused, it is possible to control the nutrition levels accurately, it is stable and provides high yields hence economically viable, pests and diseases are easier to get rid of, ease of harvesting and it is better for consumption

II. RESULTS OF GROWING PLANT WITHOUT SOIL

Sardare (2013) reported that with the advent of civilization, open field/soil-based agriculture is facing some major challenges; most importantly decrease in per capita land availability. In 1960 with 3 billion population over the World, per capita land was 0.5 ha but presently, with 6 billion people it is only 0.25 ha and by 2050, it will reach at 0.16 ha. Due to rapid urbanization and industrialization as well as melting of icebergs (as an obvious impact of global warming), arable land under cultivation is further going to decrease. Again, soil fertility status has attained a saturation level, and productivity is not increasing further with increased level of fertilizer application. Besides, poor soil fertility in some of the cultivable areas, less chance of natural soil fertility build-up by microbes due to continuous cultivation, frequent drought conditions and unpredictability of climate and weather patterns, rise in temperature, river pollution, poor water management and wastage of huge amount of water, decline in ground water level, etc. are threatening food production under conventional soil-based agriculture. Under such circumstances, in near future it will become impossible to feed the entire population using open field system of agricultural production only. Naturally, soil-less culture is becoming more relevant in the present scenario, to cope-up with these challenges. In soil-less culture, plants are raised without soil. Improved space and water conserving methods of food production under soil-less culture have shown some promising results all over the World.

III. RESULT OF GROWING LETTUCE IN THREE NON-AERATED, NON-CIRCULATED HYDROPONIC SYSTEMS

Kratky, B.A. (2009) reported that Three non-circulating hydroponic methods for growing lettuce are described which do not require electricity, pumps or wicks. All of the nutrient solution is added prior to planting or transplanting. In the simplest system, lettuce is seeded in a tapered plastic net pot filled with growing medium and placed in a darkened, 4- liter plastic bottle filled with nutrient solution with the lower 3-cm-portion of the pot immersed in nutrient solution. Plants are automatically watered, because the entire growing medium in the net pot becomes moistened by capillary action. Plant growth reduces the nutrient solution level, creating an enlarging moist air space. Meanwhile, the root system expands and continues to absorb water and nutrients. Leaf and semi-head lettuce cultivars are usually harvested at about 6 to 7 weeks after seeding. A typical expansion of this concept to a commercial scale employs a 14 cm high tank lined with polyethylene sheeting which is filled with nutrient solution and covered with an expanded or extruded polystyrene sheet resting on the tank frame. Lettuce is planted or transplanted into net pots filled with growing medium and placed in holes in the cover. Lettuce seedlings are initially watered by capillary action, and later, by direct root uptake. The crop is harvested before the nutrient solution becomes exhausted. Another modification of this method is a float-support system in long rectangular raceway tanks. Lettuce is planted or transplanted into net pots placed in a sheet of extruded polystyrene. The cover initially floats on the nutrient solution, and then, comes to rest on 2 parallel plastic pipes (10 cm diam) resting on the tank floor as the nutrient solution level recedes due to plant growth. The tank is filled with water immediately prior to harvesting and floating rafts may be easily moved to a harvesting station.

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Crop	Soil Agriculture Avg Per Acre	Hydroponic Agriculture Avg Per Acre
Lettuce	9-10 tons	300 – 400 tons
Strawberries	20 – 25 tons	50 tons
Cucumber	15 – 20 tons	200 tons
Tomato	10 – 12 tons	180 – 200 tons
Bell Pepper	10 – 12 tons	120 – 140 tons
Potato	8 – 10 tons	60 – 70 tons
Cabbage	6 – 7 tons	10 – 12 tons

Table: shows comparison of sample yield between soil agriculture and hydroponics.

IV. CONCLUSIONS

As conditions of soil growing is becoming difficult, combine uses of different plant nutrient inputs in soil-less agriculture, chemical fertilizers, organics bio-fertilizers etc not only increased yield, but also help in utilizing space. Specially, in a country like India, where urban concrete conglomerate is growing each day , there is no option but adopting soil-less culture to help improve the yield and quality of the produce so that we can ensure food security of our country.

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