



Mains Marathon

Day 20: What are the Soilless farming techniques? Describe how these ensure food security for the increasing population. (250 words)

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Approach / Explanation / Answer

- Discuss the soilless farming techniques and their types.
- Write about different types of soilless farming with their advantages describing how it will ensure food security.
- Conclude suitably.

Answer:

Soilless Cultivation generally refers to **any method of growing plants without soil as a rooting medium**. The soil is used as a medium in conventional farming to provide an essential nutrient to the crops via the root. **In soilless farming**, the same essential nutrients are **pre-mixed in the water reservoir** (also known as the **aerated nutrient solution**) and **efficiently delivered to the root along with other controlled conditions** (i.e., high levels of oxygen, suitable temperature and pH, etc.). Hydroponic, aquaponic, and aeroponic are the three most common types of soilless farming of aerated nutrient solutions. The cultivation of crops using porous substrate culture as a growing medium instead of natural soil is also another type of soilless farming.

Types of Soilless Farming

Hydroponics: Hydroponics is a method of growing plants in a water-based, nutrient-rich solution. In this method, the root system is supported using an inert medium such as perlite, clay pellets, peat moss or vermiculite. The main purpose is to provide access to oxygen which is essential for proper growth.

- **Advantages:**
 - **Land and Water Efficient:** The hydroponic farming technology with closed water loop systems is a viable option for farmers with limited access to land and water.
 - **Suitable for Urban Areas:** The significance of soilless systems increases many folds when it comes to urban and peri-urban areas where the arable land is polluted.
 - **Lower Resource Consumption:** Lower and more efficient resource consumption allows this alternative farming technique to be adopted by a variety of stakeholders.
 - **Higher Yield:** According to the Food and Agricultural Organisation (FAO), the vegetable yield of soilless systems is 20-25% higher than in traditional systems as the number of plants per square metre is higher.

Aeroponics: Aeroponics is **an environmentally friendly way of farming** in which **the roots are suspended in the air and plants grow in a humid environment without soil**. It is a variation of hydroponics where both growing medium and flowing water are absent. The roots of the plants, in this method, are sprayed with water and nutrient solution. This technique enables farmers to control humidity, temperature, pH levels and water conductivity inside a greenhouse.

▪ **Advantages:**

- **Decline in Water, Fertilizer and Pesticide Usage:** The water usage in the system reduces by 98% and fertiliser usage by 60%.
- Pesticides are fully eliminated as the absence of soil reduces the chances of diseases.
- **Faster Yield:** The aeroponically grown plants can be harvested three times faster and the yields are more consistent.
- As nutrients are sprayed onto the plants and roots, there's plenty of oxygen and other gases in the growing chamber for roots to absorb.
- **Prevention from Climatic Impacts:** Farming in a confined space gives the farmer control over pest and locust attacks and sudden heat waves.

Aquaponics: Aquaponics is a system that **combines hydroponics and aquaculture within a closed system**. There are three biological components in the aquaponics process: fishes, plants, and bacteria. The system represents a symbiotic relationship between the plants and the fishes; the fish feces are used as fertilizer for the plants, and the plants clean the water for the fish.

▪ **Advantages:**

- **Environment-Friendly:** Two agricultural products (fish and vegetables) are produced from one nitrogen source (fish food).
- Such a system also prevents aquaculture waste from polluting nearby watersheds.
- **Organic Fertilizer:** Aquaponics farming doesn't involve pesticides or herbicides as these chemicals may kill fish.
- In this system, the fish feces are nutrient-rich fertilizer for the plants.
- **Extremely Water Efficient:** Aquaponics can result in huge water savings contrasted with a garden grown on the ground (80-90% water savings).
- **Space Efficient:** An aquaponics system can be set on any scale. It can be as small as an aquarium and as big as a greenhouse commercial farm.

Need for Soilless Cultivation

- **Ensuring Food Security for the Increasing Population:** To ensure global food security to meet the demands under uncertainty as COVID-19 pandemic and increasing population, food production must rise by 60% by 2050.
- **Depletion of Resources for Traditional Farming:** The natural prerequisites of agriculture, namely arable land and water, have been depleted with rapid urbanization across the globe.
- To feed the increasing population, not only does the productivity of food crops need to be increased in the existing arable land, but alternative farming techniques need to also be encouraged.

Thus, soilless farming will help ensuring food security by increasing productivity without depleting natural resources.

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