

Hydroponics Course - 1 AGRI Grovestudies

Module 1

Definition of Hydroponics



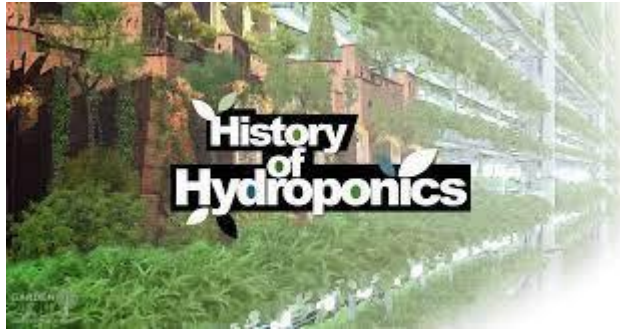
Hydroponics refers to growing plants without soil, where the roots are suspended in either a static, continuously aerated nutrient solution or a continuous flow or mist of nutrient solution.



Hydroponic culture can be practised with or without an artificial medium, such as sand, gravel, vermiculite, rock wool, perlite, peat moss, coir, or sawdust, to provide mechanical support. The most common aspect of all definitions of hydroponics is that it involves growing plants without soil, with nutrient solutions, or nutrient-enriched water.

It is a soilless culture, which refers to growing plants in an inorganic or organic substance that is periodically watered with a nutrient solution. While hydroponic systems can vary in solution delivery and plant support media, they have been proven to produce reasonably good plant growth.

History of Hydroponics



Hydroponics means working water. The word "hydro" means "water," and "ponos" means "labour." It is a method of growing plants in water without using soil. Various civilisations have utilised this technique throughout history, including the Babylonians, Aztecs, and Chinese. Egyptian hieroglyphics dating back several hundred years B.C. also describe growing plants in water.

In the last century, scientists and horticulturists experimented with different hydroponic methods. During World War II, hydroponics was tested to grow fresh produce in areas that were unarable during World War II. The Pacific Islands were supplied with fresh produce grown in hydroponic systems established locally by troops stationed there.

Later, hydroponics was integrated into the space program as NASA considered the practicalities of locating a society on another planet or the Earth's moon. This research is ongoing. By the 1970s, hydroponics had attracted scientists, analysts, traditional farmers, and eager hobbyists.

Commercial growers are now adopting hydroponics like never before. Educators realise the fantastic applications that hydroponics can have in the classroom. Ambitious individuals strive to make their living in their backyard greenhouse, selling their products to local markets and restaurants.

Advantages of Hydroponics



Extended growing season: Hydroponics allows farmers to grow crops year-round, regardless of the weather conditions outside. This means that fresh produce can be grown and harvested even in the dead of winter, increasing availability and reducing costs.

Improved growth and yield: Hydroponic plants grow faster and produce larger yields than those grown in soil. This is because they have easy access to all the necessary nutrients, allowing them to focus their energy on growth and reproduction.

Higher plant density: Plants can be grown closer together without competing for root space, allowing for higher plant density.

Plants can grow anywhere: Hydroponics systems are easily incorporated into many homes, regardless of size or location, making it possible to grow plants anywhere.

Less water consumption: Hydroponic systems use 80 to 90% less water than plants grown in the ground, as the water immediately reaches the roots with little evaporation loss.

Advantages of Hydroponics (Continued)

Fewer pest problems and diseases: Since hydroponic systems are closed, there is no need for pesticides or herbicides, reducing the risk of pest and disease problems. Additionally, since the nutrient solution is sterile, the risk of soil-borne pathogens is eliminated.

More straightforward to harvest mature plants: Mature plants are more accessible to harvest, as plants are typically grown on counters, benches, tables, etc., which puts them at waist height for most growers.

Sustainability: Hydroponics is a sustainable method of farming that can be used to grow crops in areas where soil quality is poor or non-existent. It also reduces the need for transportation and storage of produce, lowering carbon emissions and supporting local food systems.

Space Efficiency: Hydroponics systems can be designed to maximise space utilisation, making them ideal for urban farming or indoor growing. Since the plants are grown vertically rather than horizontally, more plants can be grown in a smaller area.

Disadvantages of Hydroponics

Expensive to set up: Compared to a traditional garden, hydroponics systems are more expensive to acquire and build.

Vulnerable to power outages: Hydroponics systems depend on electricity for different power components, such as grow lights, water pumps, and aerators, making them vulnerable to power outages.

Risk of system failure: Hydroponic systems require many components to work together seamlessly, such as pumps, sensors, and timers. If any of these fail, it can lead to catastrophic crop loss.

Requires constant monitoring and maintenance: Hydroponics systems require more monitoring and micro-managing than growing plants, with constant vigilance for lights, temperature, nutrient solution, and cleaning.

Waterborne diseases: Waterborne diseases are a significant risk, as the water continuously circulates through the system, allowing infections to spread quickly throughout the growing system, potentially killing all plants in the system within hours.

Lack of natural pest control: Hydroponic systems are typically grown in controlled environments that exclude pests and diseases. However, this means that there are no

natural predators to help control pest populations, which can lead to the need for chemical pesticides.

Problems affect plants quicker: Without soil to act as a buffer, plants grown in hydroponics react much more quickly to problems like nutrient deficiencies and disease.

Environmental concerns: The materials used in hydroponic systems, such as plastics and fertilisers, can have negative environmental impacts if not disposed of properly. The high energy usage required to run hydroponic systems can also contribute to greenhouse gas emissions.

Applications of Hydroponic

1. **Agriculture in Challenging Environments** - Hydroponics is ideal for areas where the soil is barren or has low fertility. For example, Wake Island and Ponape Island, where the lack of soil made traditional agriculture impossible, successfully used hydroponics to grow crops.

2. **Space Exploration** - Hydroponics is being explored to grow crops in space for long-term space missions. NASA's CELSS program aims to create a closed-loop system to support astronauts for years

Urban and Commercial Farming - Hydroponics is ideal for urban farming because it requires less space and less resources than traditional agriculture. Urban farms can be set up on rooftops or abandoned buildings, providing fresh produce to city dwellers.

Hydroponics is used commercially to grow crops such as tomatoes, cucumbers, and peppers. In Arizona, a farm company sold almost 200 million pounds of hydroponic tomatoes in 2007.

3. **Research** - Hydroponics is used extensively to understand plant growth and development. The precise control over the growing conditions allows researchers to study the effects of specific factors on plant growth.

4. **Home Gardening** - Hobbyists can use hydroponics to grow plants indoors or in small spaces. It is a fun and easy way to grow fresh products at home.

Note - Hydroponics has numerous applications, from feeding astronauts in space to growing fresh produce in urban areas. It is a flexible and efficient method of agriculture that is becoming increasingly popular worldwide.

Quiz Required -