

# HYDROPONICS

FOR SURVIVAL



*The Art of Growing  
a Healing Garden*

---

**WITHOUT  
SOIL**

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# WHY USE HYDROPONICS?



Hydroponics is a subset of hydroculture, a method of growing plants without soil, using mineral nutrient solutions in a water solvent. Terrestrial plants can be grown with only their roots exposed to the mineral solution, or the roots may be supported by an inert medium like gravel or perlite.

You may be wondering about the advantages of using hydroponics. For starters, plants grown this way don't have to search as hard for food, unlike outdoor plants competing with one another in the soil. Fans of hydroponics also report faster growth and greater yield, which means more healthy food and healing herbs for you and your family!

**Let's get started!**

# HYDROPONIC GROWING TIPS

While the basic concept of hydroponics is growing plants in nutrient solution with or without the use of a soilless medium, many methods have been developed over the years to suit different purposes and availability of resources. You can adopt a system based on the type of plants you want to grow, availability of continuous power supply, and time and expertise required to maintain the system.



## CHOOSE A SUITABLE SYSTEM

Of the several hydroponics systems in practice, Wick System and Water Culture, also called Deep Water Culture (DWC), do not require any power to run them. These simple setups are ideal for beginners and for growing food in remote areas or in survival situations.

You don't need any growing medium because the plants are directly suspended in the growing tank. Although easy to construct and maintain, they are suitable for growing only small plants, like salad greens. Drip System and Flood and Drain systems are suitable for growing all kinds of vegetables and many varieties of fruit, but they require an uninterrupted power supply.

## SELECT SUITABLE GROWING MEDIUM

In hydroponics, the medium is mainly for support, but it also acts as a reservoir of moisture and nutrients. Water Culture, Thin Film Technique and Aeroponics have completely done away with medium, but others like the Flood and Drain System and Drip System make use of various types of medium. Cost, local availability and ease of maintenance are some of the factors you should take into consideration when choosing the growing medium for your system.

Rockwool, perlite, vermiculite and expanded clay pellets are some of the popular inorganic mediums derived from natural materials. Rockwool blocks are ideal for starting seeds and cuttings and for growing individual plants in Wick Systems. Perlite, vermiculite and a half-half mixture of them are popular in Flood and Drain and Drip systems. They offer good support to large plants and drain well, but have a tendency to dry out faster.

Sphagnum moss and coconut fiber are organic mediums. Although they don't offer a great deal by way of nutrients, they have the capacity to hold onto the nutrients in the fertilizer solution and release





them gradually. You can mix organic and inorganic mediums in different proportions to have the right balance between drainage and moisture retention.



## INDOORS OR OUTDOORS?

You can have your hydroponic arrangement indoors or outdoors depending on space availability. Consider the type of plants you want to grow, the length of growing season, day length, and fluctuations in day and night temperatures when deciding on where you want to set up the hydroponic system.

Outdoor units, ideal for areas that have long growing seasons and mild winters, can be set up in the yard or in the balcony or terrace of buildings. Since it is not practical to move bulky hydroponic arrangements, outdoor systems are not suitable for places where the temperature falls below 55 degrees Fahrenheit.

Indoor systems are relatively costly to set up and run but they allow you to grow warm-season crops and have a continuous food supply throughout the year. Since they use artificial lighting, you can adjust day and night lengths according to the requirement of plants during different stages of growth.



## INVEST IN GOOD LIGHTING

When you set up the hydroponic system indoors, your goal is to provide the best growing conditions for your plants. Lighting is at the top of the list because no plant can survive without it. Lighting is one of the major expenses in initial setup as well as in regular running of the system, but you shouldn't cut corners here. The success of all indoor gardening hinges on the quality of lighting, whether it is hydroponics or conventional.

The minimum light requirement is 40 watts per square foot, but plants do much better with 60 watts per square foot. Fluorescent lights are cost effective, but their light output is too low for many flowering and fruiting crops. However, they may be sufficient if you're growing only herbs or salad greens.

Full-fledged hydroponic gardens in a 10x10 square foot area or room should ideally have metal halide lights or high pressure sodium vapor lamps ranging from 600 watts to 1000 watts. Reflectors should be used to amplify the light.

## PLANT SELECTION

Theoretically, any plant can be grown hydroponically as long as its specific cultural requirements are met. However, years of trial and error, and experiments by a large number of researchers and gardeners, have identified certain plants as the best for growing for hydroponics systems. It is not necessary to limit your selection of plants to the following list, but it gives you a fairly good idea of potential winners.

**Lettuce** is everybody's favorite, thanks to its fast growth rate, compact root system and low nutrient requirements. Almost all leafy greens do well in hydroponics and often give better results than conventional growing methods. **Tomatoes, radishes** and **cucumbers** are the main vegetable crops grown on a commercial scale using hydroponics.

Many types of melons, including **cantaloupe** and **watermelon**, do well in flood and drain systems if their vines are trained on trellises or other strong supports. **Dwarf blueberries** can be grown in NFT systems, but **grapes** and **strawberries** need special care to avoid fungal diseases resulting from high humidity. Most herbs thrive in hydroponic systems. Grow **chives, oregano, basil** and **sage** in NFT or Flood and Drain systems to ensure a regular supply. **Rosemary** may require a Drip System.





## TEMPERATURE CONTROL

Temperature plays an important role in plant growth, so temperature control should be given special attention. High-intensity grow lights generate a lot of heat in indoor hydroponic setups, making temperature control a big issue. Metabolic activity steadily increases as temperature rises, which places great demand on CO<sub>2</sub>. Unless you pump it in, plants will suffer, often giving up the fight when the temperature crosses 85 degrees Fahrenheit.

Exhaust fans help get rid of some heat, which make them a must for indoor setups. They work very well when the outside temperature is low. All you have to do is provide an inlet for the cold air so that an ambient temperature range is maintained in the room. This arrangement doesn't work in summer, however. Some people get around that problem by moving the unit outdoors in summer and indoors in winter. It may be practical for small setups, but it may make more sense to invest in an air conditioner.



## NUTRIENT SUPPLY

Hydroponics is precision farming, especially with regard to nutrition. Since the plants are growing in inert mediums, or without any medium, all the nutrients they require should be supplied through the solution their roots are bathed in. Plants will only absorb the nutrients they need, so any excess nutrients in the solution is not only a waste but increases salt buildup in the system, which eventually becomes toxic to the plants. That's where carefully formulated nutrient mixes come in. Try out different brands and choose what works best for you, but it's important to follow the instructions and dilution ratios to the letter.

Nutrient requirements vary at different stages of plant growth. For example, young plants need more nitrogen, as it helps them grow healthy leaves and other vegetative parts. As they mature, demand for phosphorus increases, a nutrient that promotes flowering and fruit set. Feeding schedules have been worked out for most commonly grown crops, so your best bet, especially as a novice gardener, is to take advantage of them.

## ATTENTION TO AERATION

The fact that plants take in CO<sub>2</sub> and release oxygen has been drilled into us so well that we often forget that they also need oxygen. CO<sub>2</sub> is used for photosynthesis, and it happens only when there's light. But every plant cell needs to breathe oxygen, day and night, just like we do. When the roots are immersed in water, as in the case of Water Culture, they can be starved of oxygen and die. This happens when the level of dissolved oxygen (DO) in the water goes down.

Most plants need a DO level of nine parts per million (PPM) for healthy growth, but some, especially lettuce, can survive with low DO levels, as low as two PPM. Now you know why they are popular as the foolproof hydroponics crop. When you upgrade your food farming to other crops, you may find them suffering or dying off because of low DO. Avoid this disaster by keeping your water tank aerated with an aquatic air pump similar to those used in aquariums. Air stones break up the air into tiny bubbles, increasing the surface area in contact with water. Higher temperatures reduce the oxygen carrying capacity of water, so try to keep the water temperature between 65 and 70 degrees Fahrenheit.





## pH MAINTENANCE

pH, or the measure of acidity or alkalinity of the hydroponic solution, is a factor that needs constant attention. pH 7 being neutral, most plants commonly grown hydroponically seem to prefer a slightly acidic environment ranging from 5.5 to 6.5. A few exceptions are leeks, onions, cabbage and peas; they like neutral to slightly alkaline solution. Keeping the pH close to 6.5 is generally recommended because higher pH tends to precipitate many of the minerals out of the nutrient solution. Apart from depriving the plants of nutrients, salt buildup can jeopardize the hydroponic system itself.

The pH of the nutrient solution continually changes for many reasons, such as bacterial activity and CO<sub>2</sub> from the atmosphere dissolving in the nutrient solution. Frequent checking with a paper or liquid testing kit, or a digital meter, can help you keep track of the changes and take remedial measures as early as possible. Increase or decrease the pH with the recommended amount of adjuster solutions, testing after the addition of these chemicals every time. Automatic pH testing and dosing pumps make things easy, but they have to be recalibrated on a regular basis.



## TAKE MAXIMUM ADVANTAGE OF LIGHT AND DARK CYCLES

Many plants are day length sensitive. Their lush growth, blooming and fruit set are controlled by the length of the day, which changes with the seasons due to the Earth's tilt. Long-day plants usually flower in summer when the days are the longest, but short-day plants can be fall or spring-flowering. In some cases it is not the day length that determines flowering and fruiting cycles but changes in temperature or their age.

Long-day vegetables like carrots, beets, radishes and turnips are ideally planted in spring because they flourish as the days get longer. They don't do very well when started in fall because the days start to shorten. These concerns don't affect indoor hydroponics because the duration of light cycles can be easily manipulated with a switch. But what you should do is learn about the light needs of your crops at different stages of growth and set up the light and darkness cycles accordingly. To make the best of photoperiodism, ensure complete darkness when the lights are switched off.

## MAINTAINING THE HYDROPONICS SYSTEM

No matter which type of hydroponics system you use, regular maintenance is necessary for a trouble-free operation and optimum plant growth. It involves a daily routine like checking the water level and inspecting the plants for signs of stress, diseases and pests. The water pump should not be allowed to run dry.

Nutrient concentration and pH should be tested once every three days and amended as required. Many nutrient supplements are available and



marketed with tall claims, but exercise restraint, especially when you start out. The nutrient reservoir should be thoroughly cleaned every three weeks with new water and nutrients added.

Harvest vegetables and fruit when they're ready, removing old and dying leaves promptly. Plant debris that's allowed to rot in the medium can disrupt the balance of the system. Flush out the entire system occasionally with fresh water and hydrogen peroxide to remove salt buildup and microbial colonies. This should be done between crops, too. It's also necessary to check the lights once a month, as they lose their luminosity pretty quickly, which means you should keep some spares in stock.



# HYDROPONICS IS FOR EVERYONE



Whether you're brand new to gardening or have a green thumb from years of experience, hydroponics is a great choice for growers everywhere. Once you get the basics down, you'll be able to control all the variables and perfect your system for the best plants around.

*“There can be no other occupation like gardening in which, if you were to creep up behind someone at their work, you would find them smiling.”*

*– Mirabel Osler*