

# WHAT EXACTLY IS HYDROPONICS

## A Primer on the Art of Hydro



### What is hydroponics?

Hydroponics is simply the growing of plants without soil. Plants don't need soil, but they do need the vitamins and minerals that soil can provide for them. Plants also need light, water, carbon dioxide and oxygen at the root zone. In hydroponics, plants are grown in an inert medium such as rocks or coco coir fiber, and they are fed a solution containing a perfected mix of primary, secondary and micro-nutrients. Almost any kind of plant can be grown hydroponically, including veggies, herbs, fruits and flowers. Hydroponics is widely used by farmers and growers throughout California. You might have noticed hydroponic tomatoes or 'living' lettuce in the refrigerated section at your grocery store. You might also have seen hydroponic roses and other cut flowers at the florist.

Hydroponics provides an advantage over soil growing for several reasons. Plants can be grown year-round since climate conditions can be controlled in a greenhouse. Because their roots do not need to reach for nutrients, the plants can be grown closer together. The plants grown are significantly larger because of so many available nutrients and not having to waste time growing extensive root systems. This makes the yields bigger. The nutrient solution also keeps the same amount of nutrients available all the time, whereas soil tends to "wear out" as the nutrients are taken up. The combination of all these things makes hydroponics more productive than soil growing. Many farmers in California are beginning to switch over to hydroponics for all of these reasons. The concern about water use is also a BIG reason hydroponics is becoming more popular - it significantly conserves water over the usual growing methods.

### Why grow with hydroponics?

Hydroponic gardening is an easy and environmentally sound way to grow a wide variety of healthy plants. With hydroponics, gardening is possible in areas where it would normally be impossible. In poor soil for example, or in rocky areas, balconies and rooftops. With the use of artificial lighting it is even possible to successfully garden in a spare room or garage. Hydroponics will produce a much higher yield than growing in soil, so if you want to max the production of your garden, hydroponics is a great way to do it! Hydroponics is also great because:

- Plants grow up to 50% faster than in soil because they have easy access to food and water
- Hydroponic produce often has many times more nutrition than conventionally grown produce
- Hydroponically grown fruit and veggies have increased flavor and texture
- Plants start out in a sterile medium, are fast growing and resistant to pests and diseases
- Smaller containers can be used because the roots can grow without being root bound
- Plants do not need to compete for nutrients, thus more can be grown in a smaller area
- The increased control over growing conditions makes it easier to provide the best possible environment for plants, leading to better quality produce and higher yields
- Less labor is required than growing in soil because no digging or weeding is required

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### How to Grow using Hydroponics

With all the great advantages of hydroponics, you might think that it is difficult or complicated to try growing plants with it. That couldn't be farther from the truth. Anyone can try growing with hydroponics. All you need are some basic tools and a little bit of knowledge. There is a bit of a learning curve, but that is part of the fun! You should become familiar with the following:

#### Growing Medium

An inert growing medium is used in pots to support plants and protect roots from the sunlight. It gives the roots something to hold on to. These pots usually sit in a tray or a channel of some sort. Plants roots need air just as much as they need water, and the key element to a successful grow medium is its ability to hold an abundant amount of oxygen. A grow medium must drain well and provide good conduction of nutrient and moisture to the root zone. Common materials are expanded clay, rockwool, and coconut fiber (coco-coir), but gravel, or a mixture of perlite and vermiculite can be used as well.

#### Light

Light is not an issue for outdoor plants, but in order for sun-loving plants to thrive indoors, artificial light of the correct spectrum and intensity must be supplied. This is accomplished with grow lights known as High Intensity Discharge (HID) Lights. There are two types of HID lights, Metal Halides (MH) and High Pressure Sodium (HPS), each covering part of the light spectrum. MH lights reproduce the blue end of the spectrum and are used for plants in the vegetative state as well as for leafy green vegetables such as lettuce or spinach. HPS lights are used to produce fruits or flowers, such as tomatoes, roses or melons.

#### Nutrients

Proper nutrient formulation is essential to hydroponics. All minerals that the plants need are dissolved in water which is then circulated through the system to the plants. The nutrient solution should be monitored to keep levels at optimum strength. There are numerous hydroponic nutrient solutions that are available on the market today. We carry 1 part, 2 part and 3 part solutions as well as organic solutions. We also carry a wide variety of supplements to help with the vigor, flavor and yield of your plants.

#### pH

The pH of a solution is a measurement of how acidic or basic it is. The pH level controls what nutrients will be readily absorbed by a plant's root system. The pH of your solution should be adjusted according to what plants are being grown. Usually the pH should be between 5.8 -6.5. pH levels can be easily and inexpensively checked with a shaker tester which allows you to check pH via water color. The levels can be adjusted by using pH Up or pH Down.

#### Ventilation and Carbon Dioxide

The current of air that circulates around plants is as important in a grow space as light, water, or nutrients. Proper ventilation removes excess heat and humid air, while providing plants with healthy supplies of CO<sub>2</sub>, which plants need to thrive. A grow area should at least include a fan which moves air gently past your plants. We are experts in CO<sub>2</sub> enrichment and can offer you the information and tools you need to further increase plant health, vigor, and yield.

#### Temperature & Humidity

Plants are heat and cold and moisture sensitive just like people. Most indoor grow rooms get plenty of heat from the lamps, although greenhouses often need heating in the winter. In most situations, proper venting can keep temperatures or humidity from getting too high, although some grow rooms (especially those using CO<sub>2</sub> enrichment) need an air conditioner to lower heat and humidity. No matter what your growing level, it is important to learn the environmental requirements for the plant you are trying to grow.

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### Getting Started

If you are ready to try your hand at hydroponics, you will need several basic tools: pots to hold the plants and some sort of growing media; a tray to catch the nutrient and return it to the main reservoir if you are using a recirculating system. The main nutrient reservoir has a pump in it that circulates the nutrient and water to the plants.

It is not necessary to use a pump and nutrient reservoir to grow hydroponically. You can still water by hand if you choose. The trick is not to let things dry out. We are big fans of using coco coir fiber as a growing medium for hand watering. Coco Coir is an amazing product (that happens to be organic) and it only needs to be watered once per day. There are naturally occurring enzymes in the coconut fiber which promotes rapid fuzzy root growth like you've never seen with soil.

You will need hydroponic nutrients, a pH tester and optimally, a nutrient level tester. There are numerous inexpensive kits that provide all of this in one package - these are great if you want to grow just a few plants. If you are interested in growing on a larger scale, we offer package systems which we have put together, or you can piece your own together using our catalog and the local hardware store.

### What type of Hydroponic System?

There are five main types of hydroponic systems: Ebb & Flow (also known as flood and drain), NFT (Nutrient Film Technique), Deep Water Culture, Drip Systems and Aeroponic systems. No matter what kind of system you choose, the goal is the same: to provide an optimum environment in which plants will thrive, growing faster and healthier than you've ever seen before.

### Ebb & Flow Systems

The plants are usually grown in pots with a growing medium. The pots sit in a plastic tray which sits above a reservoir filled with nutrient solution. Since the system relies on gravity to do the work, the growing tray must be higher than the reservoir. A pump in the reservoir is connected to the bottom of the tray. When the pump turns on, the tray fills with water, temporarily submerging roots. When the pump turns off, the water runs back down through the pump into the reservoir.

### Nutrient Film Technique

Nutrient Film Technique, NFT, is mostly used in large commercial applications. A basic NFT set up involves a thin layer of nutrients flowing over the roots of the plants in the system. NFT is really only suitable for small, fast growing plants like lettuce.

### Deep Water Culture

Deep water culture systems are some of the least expensive and easiest systems to start up. They are usually made up a bucket filled up 1/3 of the way with water and a net-pot-bucket-lid, filled with HydroCorn (Grow Rocks) that sits on top of the bucket allowing the roots to grow through the net pot and then into the water. The water is continuously being bubbled with air from an air pump / air stone combination. The water solution is filled with nutrients and pH'd to the proper levels. Voila!

### Drip Systems

Drip systems are the most widely used hydroponic systems in the world. They're commonly used in commercial facilities for growing long term crops like tomatoes and peppers. Similar to your backyard irrigation system, nutrient solution is literally 'dripped' onto plant roots before being recycled through the system's reservoir. These systems are great for budget-minded beginners. At GreenCoast we'll show you how to build your own, whatever your level may be. . . And we will also explain the benefits of Drain to Waste!

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### **Aeroponic Systems**

Plant roots are suspended in the air and misted by high pressure sprayers which break nutrient into small particles and saturate the roots. The roots are grown in a misty, humid environment, with minimal grow media. Due the water's constant circulation and the action of a high pressure pump, the levels of oxygen in the water are kept high.

### **What are the advantages of hydroponics over soil?**

Hydroponically grown plants maintain optimum nutrient and moisture levels, so they grow faster and healthier. No soil means no weeds and no soil-born pests or diseases. Another advantage is root systems stay smaller on hydroponically grown plants, allowing the plant to focus its growth energy on producing plant mass rather than roots. This means you can have more plants per square foot of growing space, and more yield! Lastly, Hydroponics is a water wise way to grow.

### **What kind of plants can I grow with hydroponics?**

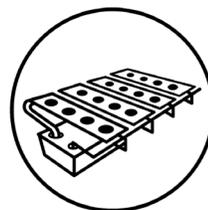
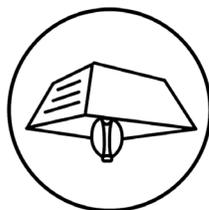
Just about anything, although some plants are more delicate or require more space than others. Here some of the veggies we suggest: tomatoes, sweet peppers, cucumbers, squash, snow peas, beans, spinach, lettuce, chard, hot chilies, and broccoli. Also, you can grow all kinds of herbs, leafy greens, flowers and house plants.

### **Can hydroponic plants be organic?**

Growing organically and hydroponically can be done but it can be a bit of a challenge. Hydroponics is based on immediate and 100% availability of nutrients. Organic fertilizers typically break down over a period of time via bacterial action in the soil. Organic hydroponic nutrients are available, however because the nutrients are in a more raw form, your plants may grow a bit slower. Beneficial microbes have come along way in last 3-5 years. Now, with a proper balance of microbes you can break down all organic materials and feed them to the plant quickly and directly, thus speeding up growth to even faster levels than that of mineral-based nutrition alone. Organic nutrients also tend to clog drippers and small tubing. Many growers still use standard hydroponic nutrients and supplement them with organic additives such as humic and fulvic

### **How does the flavor compare to veggies from my outdoor garden?**

Don't be surprised if your hydroponic vegetables taste better than the ones from your garden. Because hydroponically grown plants get everything they need, when they need it and without stress they are able to grow much healthier than their organic cousins. Remember with soil, important micronutrients are often "locked away" where your plants cannot take full advantage of them. That's why hydroponics is so great! You have complete control over the type and quantity of minerals your plants are feeding on. This advantage often produces fruits and vegetables that are far superior to organic produce in taste, color, size and even, nutritional value.



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