Sensorex

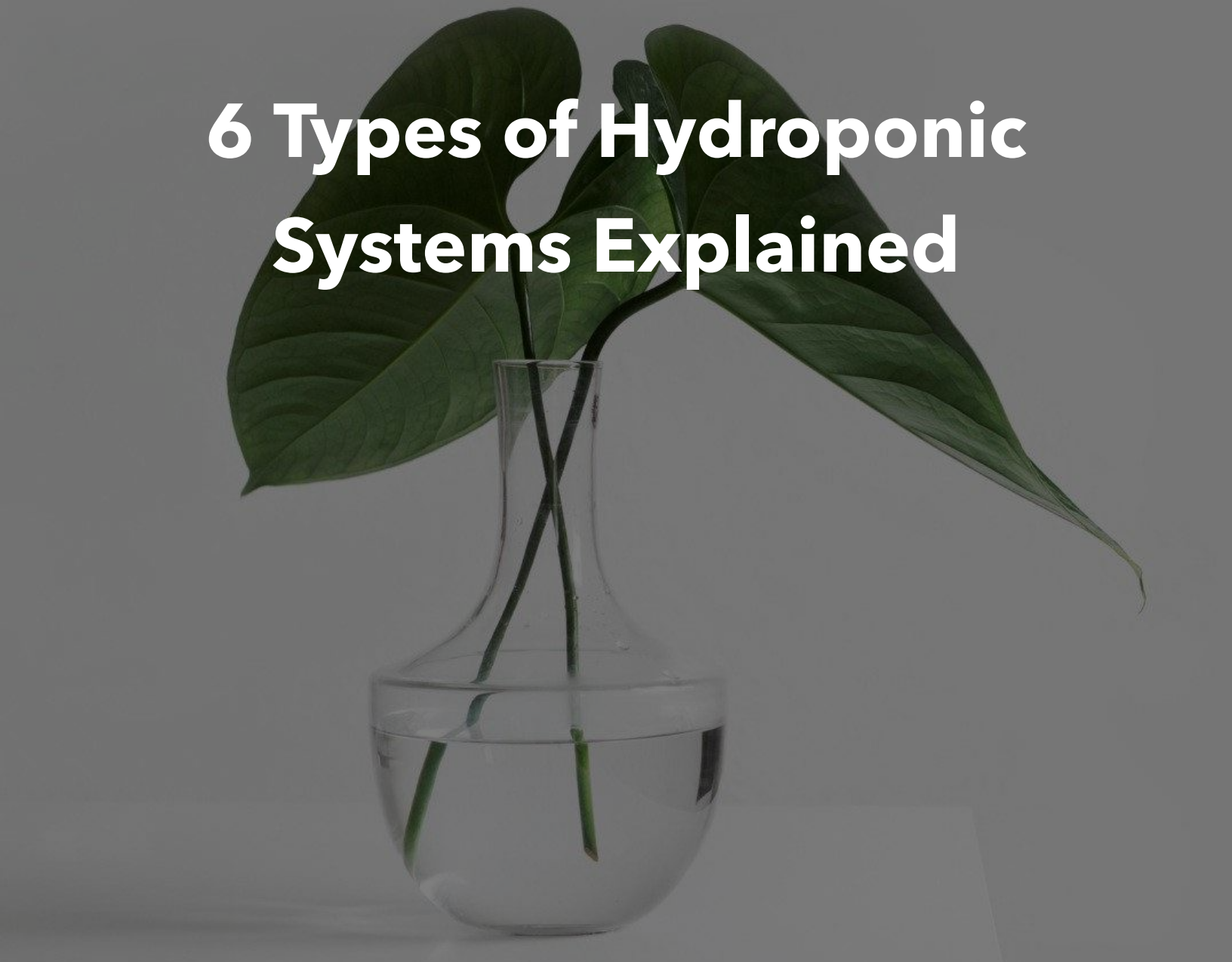
The Complete Guide to Thriving Hydroponic Systems

Learn about the concept of hydroponics and building and maintaining hydroponic systems. From choosing the right type of system to selecting the best plants to grow, this guide covers all the basics of hydroponics.

Table of Contents

Read about hydroponics and the specifics about growing plants without soil, using a nutrient-rich water solution instead.

6 Types of Hydroponic Systems Explained



6 Types of Hydroponic Systems Explained

Hydroponics is an increasingly popular method of growing plants that uses a nutrient-rich solution with a water base, which means that soil isn't used at all in a hydroponics system. Instead, the roots of the plants are supported by such substances as peat moss, clay pellets, perlite, and rockwool. When you're looking to create or use a hydroponic system to grow plants, there are hundreds of variations of hydroponic systems available for you to use. However, there are only six types of hydroponic systems under which all variations are situated.

Each type of hydroponic system works in a different way, which means that all six hydroponic systems have their own distinct pros and cons for you to consider. When you're getting ready to use a hydroponic system for growing plants, you should know how each system works to fully understand how to use the one that you select. The following offers an extensive and thorough look at the six types of hydroponic systems, which should make it easier for you to determine which system is right for you.

The Basics of Hydroponic Systems

Hydroponics is an effective method for growing plants that places the plants in a water solution that's rich in nutrients. Instead of using soil to grow the plants, the roots of the plants come into direct contact with the nutrient-rich solution. The plants will also have access to a substantial amount of oxygen, which helps to facilitate growth. The primary advantage of using hydroponics to grow plants is that it allows for a much quicker growth rate.

If you create the right hydroponic system and keep the water free from impurities with the right sensors, the growth rate can be up to 30% faster than soil-based planting methods. There are six separate types of hydroponic systems that you can use, which include the following:

1. Wick System
2. Water Culture
3. Ebb and Flow
4. Drip
5. N.F.T. (Nutrient Film Technology)
6. Aeroponic systems

1. Wick System

The wick system is easily the simplest type of hydroponic system that you can use to grow plants, which means that it can be used by practically anyone. The wick system is notable for not using aerators, pumps, or electricity. In fact, it's the only hydroponic system that doesn't require the use of electricity. With the majority of wick systems, the plants are placed directly within an absorbent substance like perlite or vermiculite. Nylon wicks are positioned around the plants before being sent straight down into the nutrient solution.

If you're thinking about using a wick hydroponic system to grow plants, the simple nature of this system means that the plants are unable to obtain a significant amount of nutrients. As such, the system is ideal for small garden plants and herbs. Any plant that doesn't require a substantial amount of water will grow well in this specific system. While this system is fantastic for smaller plants, you'll want to avoid growing plants like peppers and tomatoes. These plants are considered to be heavy-feeding plants, which means that they require more nutrients than the wick system will be able to provide. Another negative aspect of this growing system is that water and nutrients aren't absorbed evenly, which could lead to the buildup of toxic mineral salts. When you use this system, make sure that you flush any extra nutrients with fresh water every 1-2 weeks.

2. Water Culture

A water culture system is another highly simplistic type of hydroponic system that places the roots of the plant directly into the nutrient solution. While the wick system places certain materials between the plants and the water, the water culture system bypasses this barrier. The oxygen that the plants need to survive is sent into the water by a diffuser or air stone. When you use this system, keep in mind that the plants should be secured into their proper position with net pots.

The best aspect of the water culture system is that the plant roots are placed directly into the nutrient system, which means that the nutrients can be easily absorbed by the plants. Because of the direct access to nutrients and oxygen, plants that are grown with the water culture method will grow very quickly. The best aspects of the water culture system is that it's very easy to make and works well with any kind of plant. Even large plants with sizable foot systems will grow quickly with this method. the only potential issue with this hydroponic system is the development of root diseases, which is caused by dirty growing conditions.

3. Ebb and Flow (Flood and Drain)

The ebb and flow system is another popular hydroponic system that's mainly used among home gardeners. With this type of system, the plants are positioned in a spacious grow bed that's packed with a grow medium like rockwool or perlite. Once the plants are carefully planted, the grow bed will be flooded with a nutrient-rich solution until the water reaches a couple inches below the top layer of the grow medium, which ensures that the solution doesn't overflow.

The water pump that floods the grow bed is outfitted with a timer that will switch the pump off after a certain amount of time. When this occurs, the water will be drained from the grow bed and sent back into the pump. The ebb and flow system has been found to be effective at growing nearly all types of plants, which includes certain root vegetables like carrots and radishes. However, it's recommended that you don't use particularly large plants with this system. Because of how much space these plants will require, you may not be able to fit enough of the grow medium and nutrient solution into the grow bed with larger plants. The main issue with the ebb and flow system is that the pump controller can malfunction, which halts operation until the pump is fixed or replaced.

4. Drip Systems

A drip system is an easy-to-use hydroponic system that can be quickly altered for different types of plants, which makes this a great system for any grower who plans to make regular changes. The nutrient solution that's used with a drip system is pumped into a tube that sends the solution straight to the plant base. At the end of each tube is a drip emitter that controls how much solution is placed into the plant. You can adjust the flow to meet the needs of each individual plant.

These systems can be as small or large as you want them to be. They can also be circulating or non-circulating systems. A circulating system will drip almost constantly. Any extra nutrients will be sent back into the tank that holds the nutrient solution. Since you can readily alter the size and flow rate of this hydroponic system, it can be used to grow practically any plant. If you decide to use a circulating system, the main problem that you'll run into is that you'll need to consistently maintain the fluctuating nutrient and pH levels that occur when the solution is recirculated.

5. N.F.T. (Nutrient Film Technology)

The N.F.T. system has a simple design but is widely used because of how well it scales to a variety of different applications. When you use one of these systems, the nutrient solution is placed into a large reservoir. From here, the solution is pumped into sloped channels that allow the excess nutrients to flow back into the reservoir. When the nutrient solution is sent into the channel, it flows down the slope and over the roots of each plant to provide the right amount of nutrients.

It's highly recommended that you use net pots with this type of hydroponic system. In most cases, the N.F.T. system won't make use of a growing medium. Since the channels that are used with this system are relatively small, it's recommended that you pair them with plants that have smaller roots. Even though this system can't readily accommodate larger plants, it does scale well, which means that you can alter it to allow for the growth of a large number of plants at the same time. Since it scales well, this system is commonly used by commercial growers alongside home growers.

6. Aeroponic Systems

Aeroponic systems are easy-to-understand but somewhat difficult to build. With this type of system, the plants that you wish to grow will be suspended in air. A couple of mist nozzles are positioned below the plants. These nozzles will spray the nutrient solution onto the roots of each plant, which has proven to be a very effective hydroponic method. The mist nozzles are connected directly to the water pump. When the pressure increases in the pump, the solution is sprayed with any excess falling down into the reservoir below.

As long as you use the right dimensions for the reservoir, you can grow nearly all types of plants in an aeroponic system. However, the reservoir will need to be very deep if you plan on growing larger plants. Otherwise, mist nozzles may not be able to reach all of the roots. Since plants with an aeroponic system are suspended in air, they get all the oxygen that they need. This system also uses less water than any other hydroponic system, which is great for efficiency. However, there are a couple of issues with this system. For one, they can be costly to build. The nozzles that spray the nutrients might also become clogged from time to time, which can be frustrating to clean.

Determining The Best Method for You

In order to determine which of these hydroponic systems is right for you, it's important that you know the features of each and have identified what your hydroponic needs are. For instance, if you're a home grower and want to be able to use a simplistic system that requires very little setup, you should definitely consider using the wick or water culture systems. If you want to grow a wide variety or large number of plants, the drip system or N.F.T. system may be right for you. Take a look at the pros and cons of each hydroponic system to determine what the best method is.

If you need help with your hydroponic system or would like to look at the many different sensors that we offer, contact Sensorex today! The sensors that are available at Sensorex include every type of sensor that you would need for water treatment and measurement, which extend to pH sensors, TDS sensors, dissolved oxygen sensors, and ORP sensors.

Benefits and Advantages of Hydroponic Farming Over Traditional Agriculture

Benefits and Advantages of Hydroponic Farming Over Traditional Agriculture

Hydroponic systems are among the most environmentally friendly farming systems that you can use when you want to grow crops. While you may be unable to avoid using chemicals completely with this type of system, you should significantly reduce the amount of herbicides and pesticides that are required to manage your farm. Typical sensors for monitoring the water quality and nutrient concentration, that are available at Sensorex include pH sensors, TDS sensors, dissolved oxygen sensors, and ORP sensors. Since water conservation is simple with a hydroponic system, there are multiple ways that you will be helping the environment.

The Benefits of Hydroponics Over Field Farming

Using hydroponics will provide you with an ample number of benefits over traditional field farming. There are some major concerns with field farming today, the primary of which include illness breakouts from food, high amounts of water consumption, and soil erosion. When you properly use hydroponics, you should be able to avoid all of these concerns. For instance, hydroponics farming solves the issue of soil erosion by not using soil at all throughout the growing process. While hydroponics is based on water, this method of farming allows for water conservation.

Hydroponics Saves Space

Among the more notable advantages of using hydroponic farming as your main method of farming is that you will be able to save space. When plants are grown in soil, they spread out their roots to locate water and nutrients that they require to stay alive. On the other hand, hydroponic systems don't require nearly as much space because the water that the plants are situated in is already filled with nutrients, which means that the roots of the plant don't need to spread out to obtain these nutrients.

Crops can be planted very close to one another with a hydroponics system since root growth is limited. When you opt for using a hydroponics system, you should be able to grow a much higher number of plants when compared to traditional farming methods. While there are some additional farming methods that help with saving space, hydroponic farming is the most advantageous in this regard.

Hydroponic Systems Save Water

You will also be able to save a substantial sum of water when using hydroponic farming since hydroponic systems are able to effectively recirculate water for lower consumption. The reason that farmers typically use too much water with traditional farming is because a large amount of the water is lost before it reaches the intended destination.

Along with water evaporation, water can be lost during field farming when it puddles or rolls away. It's important to understand that upwards of 80 percent of all water that's used throughout the country is used within the agriculture industry. Anything that you can do to lower this consumption can benefit the environment.

Hydroponic Systems Use Less Chemicals

A top reason that many modern farmers have decided to use hydroponic farming is because it allows them to use less chemicals when compared to traditional forms of agriculture. Even though pest issues can still be a problem with hydroponic farming, these issues occur on a more infrequent basis, which means that you won't be required to use as much herbicides and pesticides.

Since hydroponic systems are controlled tightly, you shouldn't have a problem with weeds. The lack of weeds to kill means that you should be able to avoid the use of herbicides. Keep in mind that the majority of hydroponic systems are kept indoors, which makes it more difficult for pests to get into these systems. If you want to do your part to protect the environment and keep the use of chemicals at a minimum, hydroponic farming is likely the best option for you.

More Growth in Hydroponic Systems

When you grow plants with the hydroponic system, you'll likely notice that there is more growth with the plants in question. When plants are grown in a hydroponic system, they grow at a rate of 30-50 percent faster when compared to traditional farming methods. The reason for this quickened growth is because crops within these systems are provided with the perfect amount of nutrients and will receive much less stress from the environment.

This stress typically includes pests and weather problems. There are certain species of plants that will grow at a faster rate than others. For instance, tomatoes and lettuce are known to grow faster when placed in a hydroponic system. Pairing your hydroponic system with the right plants can produce high yields.

More Control of Nutrients

Hydroponic systems are based on a solution that combines water with a substantial amount of nutrients, which allows for a nutrient-rich solution. Farmers are able to use the exact nutrients that a plant requires in the solutions that they create. Certain plants require some fertilizer in order to survive when planted in a field. On the other hand, this isn't necessary with hydroponic systems.

The plants will always have the right nutrients as well as the exact amount of nutrients that they need. Before you start to take part in hydroponic farming, it's important that you're aware of the nutrients that your crops will need once they are planted.

Indoor Environment

Another highly unique benefit that comes with hydroponic farming is that it's possible to grow plants indoors, which means that you could potentially grow crops in non-rural settings. When you grow plants indoors, you will benefit from the ability to control the temperature and climate, having less pests to deal with, and the ability to effectively grow your crops all throughout the year.

With field farming, you must adhere to seasonal guidelines with certain crops and are unable to grow anything during the harsher winter months. The environmental control that farmers have with hydroponic farming is considered to be a main reason why many opt for this type of farming. When you're able to precisely control the environment that your crops grow in, these crops will be able to grow stronger and at a quicker rate.

Hydroponics Produces Healthier Plants and Bigger Yields

When you use hydroponic farming, your plants will grow to be healthier than they would be when grown in soil. For instance, you won't be required to manage soil-borne diseases that can spread quickly and damage a large amount of your crops. Since plants don't need to expend energy in the search for food, they will be able to use their energy for the sole purpose of growing.

Along with plants from hydroponic systems being able to grow healthier than plants from traditional farming methods, this method of farming also produces higher yields. Since these plants are able to grow in relatively small spaces, your yields should be higher for every square foot of space that you use. If you decide to grow these crops within an indoor environment, you can also grow throughout every season of the year, which helps to increase yields as well.

No Soil Erosion or Weeds

As was mentioned earlier, farmers who decide to use hydroponic systems will benefit from avoiding soil erosion and weeds, which are two of the top concerns with traditional agriculture. Over the past 100 years, field farming has resulted in nearly half of all soil throughout the world eroding, which reduces the amount of arable land that people have access to. Because hydroponic systems don't use any soil to grow crops, soil erosion isn't an issue.

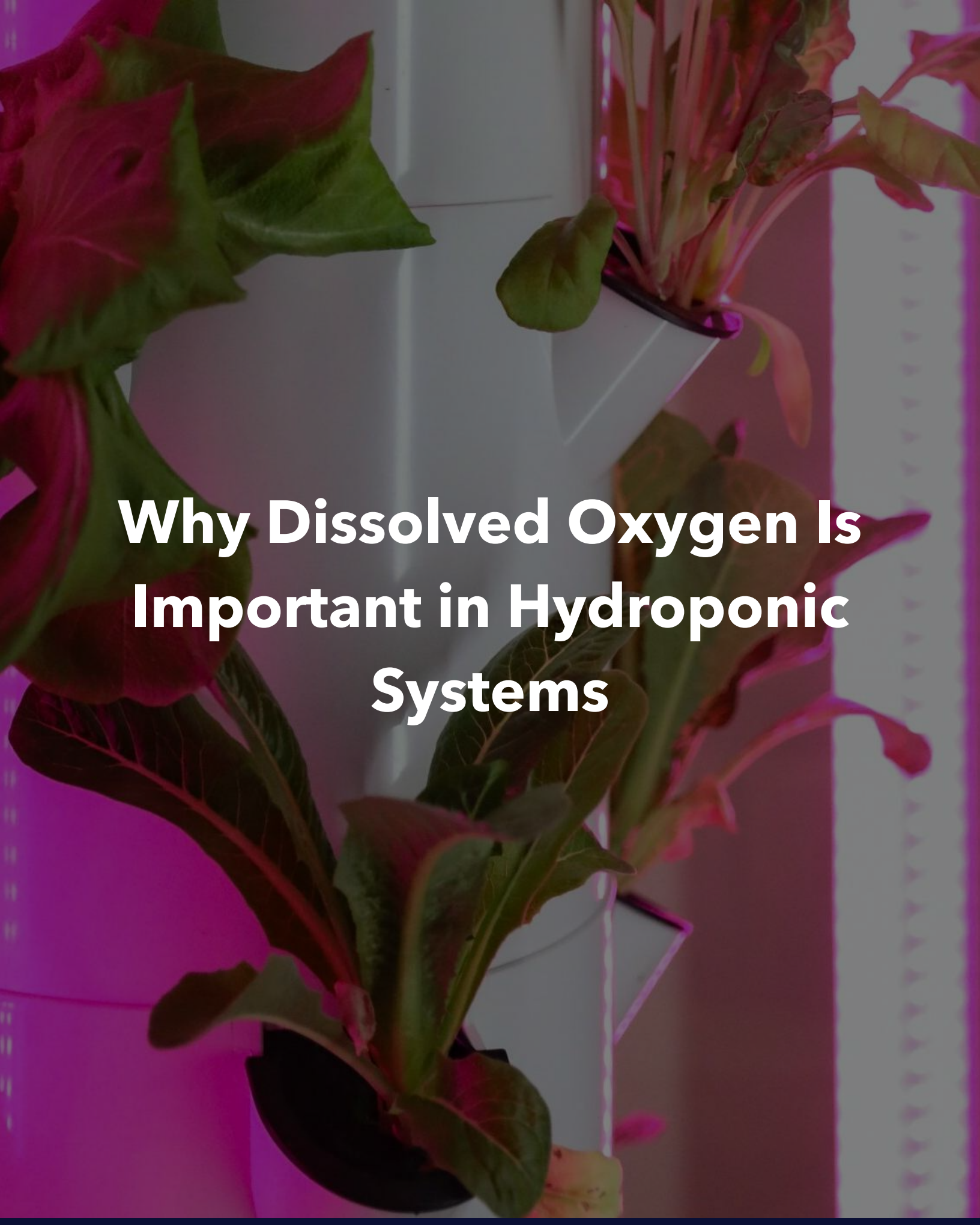
The same is true of weeds. Hydroponic systems don't provide weeds with an environment that's conducive to growth. Even though weeds grow in much the same way as all of the other plants that can be grown in hydroponic systems, seeds aren't usually sowed within these systems. By eliminating weeds, your plants will receive all of the nutrients that they require.

Costs of Hydroponic Farming

There are numerous costs of hydroponic farming that you should take into account before you start. If you're starting an indoor farm that extends to 500 square feet in space, you can expect the initial costs of the system and all of the necessary equipment to be around $100,000 or more. Keep in mind that upgrades to the actual facility that you're using aren't included in this cost estimate. The equipment that's included in these costs extend to:

- Nearly 200 towers
- Dozens of lighting units
- Over a dozen racks that provide support for the towers
- Two separate light racks that are able to provide support for the lighting units
- CO2 supplementation
- A spacious nutrient reservoir of more than 300 gallons, which should come with features like automated management of nutrients and UV filtration

You should obtain yields that are between 2-4 times higher than what you would obtain from regular farming with this type of system in place. Some of the additional factors that you might want to take into account include the energy and lighting costs, the amount of labor that's required to harvest the crop, and the price that you would like to sell the crops at. Once you understand more about these factors, you should be ready to start a hydroponic system of any kind.



Why Dissolved Oxygen Is Important in Hydroponic Systems

Why Dissolved Oxygen Is Important in Hydroponic Systems

If you've been looking to grow crops but don't want to use traditional farming practices that rely on perfect outdoor weather and healthy soil, you should think about having a hydroponic system installed. Hydroponics is the growing of plants without soil. Any crops you want to grow in a hydroponic system are planted directly in inert growing media, after which they are supplied with oxygen, water, and nutrient-rich solutions.

When implemented properly, a hydroponic system should facilitate fast growth, high quality, and strong yields. If you decide to grow a plant in soil, the roots will be constantly searching for nutrients that will support the plant in question. By exposing the root system directly to nutrients and water, the plant won't need to waste energy attempting to sustain itself.

All of the energy that the plant saves can then be used to grow and mature in a shorter timeline. With this solution, leaf growth and flower blooming should be enhanced. Even though every component in hydroponics is essential for the system to function correctly, new hydroponic farmers have a tendency to overlook the importance of dissolved oxygen in these systems. Many of the nutrients that crops need to survive are only able to be absorbed if the right amount of oxygen is available. Without having access to oxygen, crops won't grow at the normal rate and could experience deficiencies. This article takes a close look at dissolved oxygen and how it's applied in hydroponic systems.

What is Dissolved Oxygen?

Dissolved oxygen is the total amount of oxygen that's been dissolved in water. Oxygen can get into water via rapid movement, a waste product from photosynthesis, or the atmosphere. Oxygen usually dissolves quicker in cold water as opposed to warm water. The right amount of dissolved oxygen is necessary to keep aquatic species healthy and to maintain high water quality.

If dissolved oxygen levels dip below 5.0 mg/L, the aquatic life in the body of water could experience undue amounts of stress. In the event that oxygen levels drop below 2 mg/L for a period of several hours, a large percentage of fish in the water could die. There are several different factors that determine how much oxygen is able to be dissolved in water, the primary of which is the water's temperature. Fluctuations in temperature will affect dissolved oxygen readings.

Why is Dissolved Oxygen Important in Hydroponics, and What are its Benefits?

Dissolved oxygen is highly important for hydroponic systems and has numerous benefits for any crops you grow. For one, dissolved oxygen provides plants with the ability to convert CO2 over to energy during the photosynthesis process. Dissolved oxygen also stops the formation and development of harmful fungi and bacteria, which are known to cause diseases like root rot. Keep in mind that dissolved oxygen can increase nutrient intake with plant roots.

An essential aspect of the photosynthesis process is plant respiration. While all plants have a certain amount of oxygen that flows through them, the plant circulators are unable to distribute oxygen in the same way as humans do. In this scenario, plants are required to obtain oxygen through their roots, which is then released onto the leaves.

The importance of dissolved oxygen also depends on the type of hydroponic system you use. If you opt for an NFT system, the lowermost portion of the root system will need to be situated in a very thin film of your nutrient solution. The roots will then absorb nutrients as the solution flows below. However, these roots are unable to survive if the water doesn't contain enough dissolved oxygen. Without high DO concentrations, the feeder roots will effectively suffocate, which means that the plant would likely be unable to survive.

Warmer solutions hold lower amounts of oxygen than cooler solutions. Once the nutrient solution reaches a temperature that's higher than 81 degrees Fahrenheit, it becomes very difficult for the water to hold dissolved oxygen. If you use a drip fertigation system, these systems need to be fed regularly while plants are grown in a sizable media buffer. While oxygen depletion is an issue with NFT systems as a result of how thin the solution is, this problem can still affect drip fertigation systems in the event that the system is poorly designed. It's possible to maximize availability of dissolved oxygen in one of these systems with:

- An air compressor or air blower
- A cycle timer controller
- The right growing media

Do You Need to Oxygenate the Water in Hydroponics?

If you want the nutrient solution in your hydroponic system to have enough dissolved oxygen, you'll need to oxygenate the water.

How Do Roots Get Oxygen in Hydroponic?

Regardless of the types of crops you plant in your hydroponic system, the roots of these plants receive oxygen from the nutrient-rich solution that's placed inside. This solution mainly consists of water. Dissolved oxygen is regularly produced via processes like circulation and aeration. When it comes to hydroponics, the water should have enough dissolved oxygen to provide the roots of plants with optimal oxygenation and growth.

What to Do if Your Plants Aren't Getting Enough Oxygen

If the crops in your hydroponic system aren't receiving enough oxygen, it's possible that you'll need to boost the amount of aeration you perform. You can also increase the water's circulation. Both of these techniques should cause dissolved oxygen levels to instantly increase. Adding extra plants to the hydroponic system should also cause oxygen levels to rise.

How To Oxygenate Plant Roots or Increase the Oxygen Level in the Hydroponic System?

There are numerous techniques that can be used to oxygenate plant roots or increase current oxygen levels in your hydroponic system, which include everything from an air pump to an oxygen gap. Consider testing out several of these techniques to determine which one is right for you and your hydroponic system.

1. Air Pump and Air Stone

Air stones are available as an affordable solution for oxygenating water in your hydroponic garden. With the use of an air pump, it's possible to push air directly into the stone, which results in the air splitting into smaller bubbles. The bubbles that are produced will oxygenate your nutrient-rich solution, which should make it easier for you to maintain the health of your plants. Air stones are available in numerous shapes and sizes to ensure that the needs of every hydroponic system are taken into account.

2. Auto Siphoning System

An auto siphoning system is likely the most effective option when you want to introduce more dissolved oxygen into your water. Once the water level in your garden bed increases, the excess water will flow into the tube before reaching your garden bed.

When the tube is filled, a vacuum is created that drains water from your garden bed. Including this device in your hydroponic system will simplify the process of draining and refilling your garden bed while also increasing the amount of circulation that occurs.

3. Air Diffuser Tube

Air diffuser tubes are commonly used to oxygenate water with hydroponic systems. These devices come with curved tubes that have enough holes to release some oxygen into the water. During this process, large bubbles develop and rise quickly without touching the plant roots. Small bubbles are also created, which are able to be situated in the water for a lengthier period of time. These bubbles help roots receive more oxygen.

4. Oxygen Gap

Oxygen gaps refer to areas in a hydroponic system that consist entirely of air. You can create these gaps by outfitting your reservoir with an overflow system, which ensures that some water drains out before reentering the system. You could also create an oxygen gap by making sure that a portion of the grow bed isn't placed in your nutrient-rich solution. The area that's exposed to air allows oxygen to contact the roots and improve the health of your plants.

5. Hydrogen Peroxide

When making a solution to place in your hydroponic system, you should consider using hydrogen peroxide to effectively increase oxygen levels in the solution.

6. Hanging Roots

There are pros and cons to using hanging roots with your hydroponic system. This type of root can be an issue with certain aeroponic systems since the roots are known to dry out quicker. On the other hand, this option can be effective since the roots have more direct contact with oxygen. As long as you're able to spray down the roots regularly to keep them humid and moist, you should obtain a high growth rate with hanging roots.

Dissolved oxygen helps plants achieve and maintain a normal growth rate. Without having access to enough dissolved oxygen, plant roots could die, which mitigates the benefits of using a hydroponic system. By aerating or circulating the water in your hydroponic system, DO levels should remain high.

Aquaponics vs Hydroponics: Which One Is Best For You?

Aquaponics vs Hydroponics: Which One Is Best For You?

Aquaponics involves growing fishes and plants together within the same environment, which is considered to be a sustainable process. On the other hand, hydroponics is a gardening method that allows for plants to be grown without the use of soil.

Both of these methods can be effective and beneficial depending on the application you are using them for. However, certain plants grow more effectively with one method or the other, which is why it's recommended that you learn more about the differences between aquaponics and hydroponics.

This article goes in depth about these two growing methods so that you can identify which option is best for you.

What is Aquaponics?

Aquaponics is a growing method that involves fishes and plants being grown in the same environment. When you use this growing method, the waste from the fishes is converted directly into nitrates by the surrounding bacteria. These nitrates are used as food for the plants before the remaining water is returned to the fishes free from harmful contaminants, which creates an effective and efficient growth cycle that's referred to as the nitrogen cycle.

While accumulation of the waste eventually becomes toxic for the fishes inside of the tank, the bacteria that's introduced to the water converts the waste into helpful nitrates before any of the fish can be adversely affected. While the aquaponics farming and growing method is straightforward, there are many different systems that you can use for this method, which include everything from media beds and vertical towers to the Nutrient Film Technique.

What is Hydroponics?

Hydroponics is a popular method of growing plants that uses only chemical nutrients and water, which means that this method grows plants without using soil. This growing method is the primary technique that's employed for growing basil, lettuce, and tomato throughout the U.S. While there are many notable benefits of using hydroponics to grow plants, hydroponics is commonly used because results are consistent and are able to produce high yields.

Hydroponics works by growing plants in a water-based solution that's rich with nutrients. The roots of the plants are suspended directly in the nutrient-rich water, which gives them access to the substances they need to grow. At the same time, the remainder of the plants will have access to oxygen, which allows the growing process to continue without issue. There are many different types of hydroponic systems, most of which alter how the water flows and reaches the plants.

The Differences Between Aquaponics vs. Hydroponics

Despite the fact that both hydroponics and aquaponics are highly effective as growing methods for plants, there are some significant differences between the two techniques that you should be aware of before identifying which option is best for you. Since both of these methods are able to grow plants without the use of soil, both of them can be beneficial to you when you're trying to avoid using soil. However, you will need to take time to learn about the method that you choose, which is why it's important to know the differences between the two options.

Cost of chemical nutrient

Hydroponic systems require the use of chemical nutrients, which can be very costly. These nutrients have also become somewhat scarce in recent years, which has driven up costs even more. On the other hand, the fish feed that's used in an aquaponics system is much more affordable.

Retain nutrient solution

While hydroponic systems require a high concentration of nutrients in the water, the systems will occasionally accumulate too much salts and chemicals to the point that the water would become toxic to the plants. As such, the water will need to be disposed of regularly. When using an aquaponics system, nitrogen is perfectly balanced in the water, which means that the water should never have to be replaced.

Productivity

After an aquaponics garden is fully up and running, which takes around six months, the plant growth results should be slightly more efficient and quicker when compared to a hydroponics system.

Ease of maintenance

An aquaponics system requires very little maintenance. On the other hand, the electrical conductivity of the water in a hydroponic system will need to be checked on a daily basis. Because of the natural ecosystem of growth that occurs in an aquaponics system, the water chemistry will remain relatively consistent. You will only need to check ammonia and pH levels around once per week as well as nitrate levels on a monthly basis.

Organic growth

The environment in a hydroponic system is man-made in nature. An aquaponics system is designed to replicate a wholly natural ecosystem, which makes the system organic. The nutrients that are used in a hydroponic system can be comprised of various salts and chemicals, which isn't ideal for the environment.

Pesticides

While insects are far less problematic in these systems because of the lack of soil, certain insects like thrips and spider mites can still be a nuisance that will need to be addressed. With a hydroponic system, you may need to use pesticides to get rid of these insects. However, aquaponics systems require non-chemical methods to make sure that the fish aren't harmed.

pH

pH is a core component of any growth method that relies on water. When using a hydroponic system, the water should have a pH reading of 5.5-6.0, which makes for slightly acidic water. On the other hand, the pH level in an aquaponics system should be right around 6.8-7.0, which is considered to be neutral.

Similarities Between Aquaponics vs. Hydroponics

While these two systems have some notable differences, there are also several similarities that they have between them, which include:

Growing season

Both of these systems are known for having lengthy growing seasons when compared to traditional growing methods. Because these systems are typically placed indoors, you will be able to grow plants all throughout the year, which means that certain produce can be grown even during the off-season.

Lessened negative environmental impacts

Because plants are grown indoors with aquaponic and hydroponic systems, there are very little weed and pest issues to deal with. Because these systems rarely have to contend with such problems, you won't be required to use as many chemicals in your garden, which reduces the possibility of adverse environmental impacts.

Faster growth

Because these plants are placed in systems that don't use soil, they are able to grow at a rate of 30-50 percent faster than their traditional soil-based counterparts. This quick growth occurs because the plants have access to a higher amount of oxygen. The additional oxygen helps to encourage root growth and nutrient absorption.

Higher yields

Plants that are grown in a hydroponic system or aquaponics system are typically able to yield around 30-40 percent more than other growing methods. Higher yields are produced by decreased insect pressure and the plants receiving higher amounts of food on a consistent basis.

The Bottom Line Between Aquaponics and Hydroponics

Because of the faster growth and higher yields produced by both aquaponics and hydroponics, there's no consensus on which of the two is the better growing method. Instead, you should make your decision based on the resources you have access to and which method you believe you would prefer. For instance, if your main goal is to get the growing system up and running as quickly as possible, hydroponic systems usually have quicker setup times since you won't need to focus on growing fish alongside the plants. If, however, you care more about the costs associated with the growing methods, aquaponics may be the best option for you since the chemical nutrients with hydroponic systems can be costly. In the end, the effectiveness of both systems means it doesn't really matter which one you choose.

Sensorex's Water Sensors

Here at Sensorex, the various water sensors that we provide can help you maintain the efficiency of aquaponic and hydroponic systems. If you set up an aquaponics system, you will need to conduct daily testing of the water to ensure that the water chemistry has the right balance. It's highly important that you measure the conductivity of the water, the pH levels, and the dissolved oxygen levels. Since the fishes in your tank require a significant amount of oxygen to survive, your dissolved oxygen levels should be high. Shallow water fish require as much as 4-15 mg/l of dissolved oxygen, which is why testing the DO in the water is essential. You can do so with our Lumin-S optical sensor.

With a hydroponic system, your two most important measurements are electrical conductivity and pH, both of which are essential to make sure your nutrient-rich solution has the right chemistry. The best pH range for hydroponics is between 5.8-6.2, which you can measure daily with the S272CD pH sensor. As for electrical conductivity sensors, these are important if you want to precisely control the concentration of nutrients in your solution. Electrical conductivity can be accurately measured with the CS700 contacting conductivity sensor. No matter which sensor you choose, you'll be provided with consistent and accurate results.

How to Monitor Water Quality in Aquaponics Systems

How to Monitor Water Quality in Aquaponics Systems

Aquaponics has emerged as an increasingly popular food production method. A basic aquaponics setup combines fish farming with hydroponic agricultural farming. Hydroponic agriculture refers to growing plants without soil, instead using nutrient enriched water. By combining hydroponics with fish farming, food producers can increase their output, create a sustainable farming system, and maximize space usage. However, Aquaponics system design is complicated by the widely different needs of both plants and fish.

When aquaponic fish farming is combined with hydroponics to create a well-designed aquaponics system, both plants and fish can coexist in a balanced microcosmic ecosystem. It's even possible to build a near closed loop aquaponics system that is largely self-sustaining. The fish will eat algae and plant waste. The fish then excrete waste, including ammonia. Bacteria then convert the ammonia into nitrogen in the form of nitrate ion. If the ammonia were allowed to accumulate, it could prove fatal for the fish. Instead, it is converted into nutrients. The nitrogen (nitrate ion) can then be used as a fertilizer for the hydroponic plants, thus creating a self-contained ecosystem.

Throughout this process, pH levels will rise and fall as acids and alkalines are produced. Other potentially deadly substances, such as nitrite (NO_2), are created. If these factors are not closely monitored, the delicate balance could quickly be upset.

The Right Aquaponics System Design Includes Frequent Monitoring

Water chemistry requirements are especially difficult to balance. First, a proper water source must be identified. After all, a painting can only be as good as its canvas. As such, even a basic aquaponics setup must be supplied with good water. However, even the best source water will not ensure a proper balance between the hydroponic needs of the plants and the needs of aquaponic fish farming.

Good aquaponics system plans will include frequent testing. When first building and implementing your aquaponic system, daily testing should be conducted. Dissolved oxygen, pH levels, conductivity or total dissolved solids, ammonium ion (NH4+), and nitrate ion (NO3-) must all be closely monitored.

As you set up your aquaponics system, you should make daily adjustments until achieving the desired results. Once a balance has been achieved, you can cut testing back. However, aquaponics systems should be tested at least once a week. More frequent testing is often recommended.

Monitor Your Aquaponic System and React Quickly

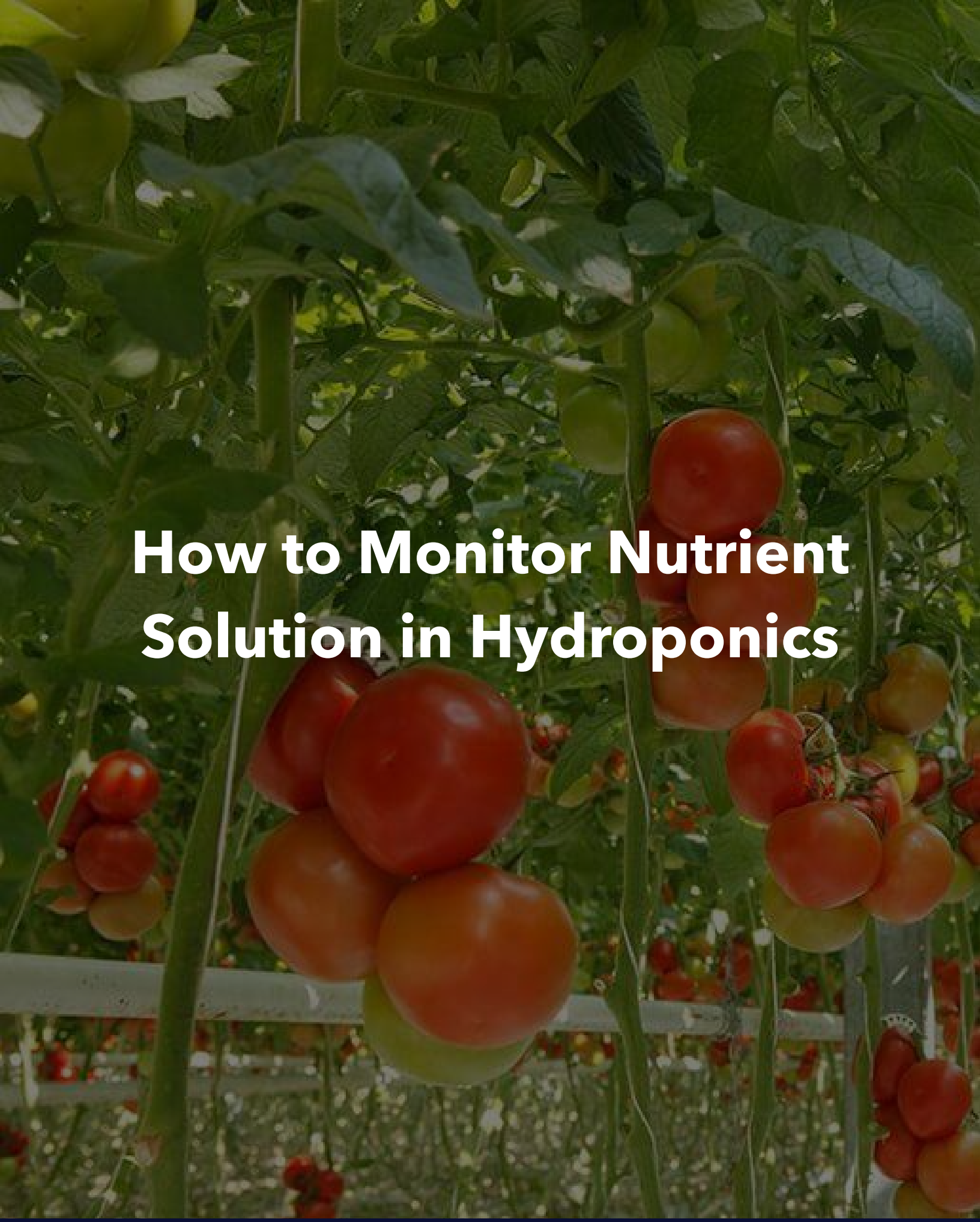
It's important to keep an eye on dissolved oxygen, pH levels, dissolved solids, and other factors. If one element is out of sync, the entire system could be threatened. If you do not react quickly enough, both plants and fish could be harmed. On the other hand, if the problem is identified early on, it may be possible to address it with relative ease.

Consider dissolved oxygen, for instance. Oxygen levels are extremely important for fish. If oxygen levels are not optimized, fish could suffer from slowed growth and are more likely to perish. Oxygen levels are also important for nitrifying bacteria, which in turn are essential for converting fish waste into needed plant nutrients. Improper oxygen levels could thus hurt both fish and plants.

A fully closed loop aquaponic system may not be possible as pH levels, dissolved oxygen, dissolved solids, and other factors must often be adjusted. However, a well-designed and implemented aquaponics system can be very efficient. When combined with appropriate monitoring, it is possible to grow both fish and plants efficiently. A well-designed hydroponics and aquaponics system will usually require only minor tweaks.

Takeaway: Aquaponic Systems Are Efficient but Delicate

The balance between fish, bacteria, and plants is delicate. However, balancing this system is relatively easy if you constantly monitor conditions and react quickly when needed. For example, if ammonia levels are too high, cutting back on fish feed will reduce ammonia output. If ammonia levels are too low, you can add more fish to the aquaponic system. Likewise, low pH levels can easily be adjusted with base additives. However, you need to know the exact pH levels while making adjustments.



How to Monitor Nutrient Solution in Hydroponics

How to Monitor Nutrient Solution in Hydroponics

Monitoring the nutrient solution in hydroponics is a critical aspect of maintaining healthy and thriving plants. Proper monitoring of the nutrient solution involves regular testing of the pH, electrical conductivity (EC), and temperature.

What is Hydroponics?

Hydroponics is the art of growing plants without soil. There are several different categories of hydroponics systems:

- Wick
- Water Culture
- Ebb and Flow (Flood & Drain)
- Drip (recovery or non-recovery)
- N.F.T. (Nutrient Film Technique)
- Aeroponic

Hydroponic Nutrients

The commonality of all the systems listed above is that they are heavily dependent on nutrient solution in order to ensure proper plant growth. The plants in all the above systems grow in media that provides no nutritional value, so having proper nutrient solution is vital to plant life. It is crucial that the nutrient solution is monitored and fed properly to the plants.

Monitoring Nutrient Solution

The two most important parameters of your nutrient solution to monitor and control are the pH and EC (electrical conductivity).

pH of Hydroponic Nutrient Solution

The pH of the nutrient solution indicates whether it is alkaline, acidic or neutral. If a the pH is greater than 7, it is alkaline; if the pH is less than 7, it is acidic. A pH of 7 indicates that the solution is neutral. The plants ability in a hydroponic garden to absorb nutrient solution depends on the pH of the nutrient solution. When the nutrient solution is above or below the optimal pH level, the plant may not receive enough nutrients. Different nutrients are available at different pH ranges. In hydroponics, the ideal pH range is between 5.8 and 6.2, compared to a pH of 6.5 for soil gardens.

EC of Hydroponic Nutrient Solution

Hydroponics gardens may contain different varieties of plants, and different plants require different nutrient solution concentrations for growth. It is important to control nutrient solution concentrations in order to provide the optimal conditions in the root zone. This allows the maximum uptake of nutrients into the rest of the plant's cellular structure. Nutrient solution concentration can be monitored and controlled using electrical conductivity measurements. Electrical conductivity is measure of the ionic strength of a solution and can be converted into concentration.

Conclusion

Hydroponics is an extremely useful technique used for growing, but is heavily dependent on monitoring the pH and EC of the nutrient solution being used. With the proper measurement and control of pH and EC, growers will be able to get the most out of their hydroponic systems and grow large, healthy plants.

Looking to design a hydroponics monitoring system?

Check out our Agriculture and Hydroponics page on our web site for a more detailed explanation of hydroponics water treatment systems, including a system diagram and product selection tips.

Finding the Best Hydroponic Timers for your Hydroponic System

Finding the Best Hydroponic Timers for your Hydroponic System

When you want to grow any type of plant, there are numerous growing methods at your disposal, which include everything from vertical gardening to hydroponics. The hydroponics growing method has become increasingly popular over the past decade because of its ability to grow plants without the use of soil. Instead of soil, hydroponics uses a nutrient-rich solution to provide plants with everything they require to survive and thrive.

Keep in mind that there are numerous types of hydroponic systems that you can use to grow plants. These systems include a wick system, an ebb and flow system, a drip system, and an aeroponic system. Regardless of the type of system you opt to use, you will need to pair the plants with a substrate, which is a material that's used in place of soil. The various substrates that plant roots can be positioned in extend to perlite, rockwool, and peat moss.

The steps involved with creating a hydroponic system largely depend on the type of system that you're using. For instance, a wick system is ideal for growing smaller plants and herbs. You'll also discover that the wick hydroponic system can be set up without needing to use electricity, which isn't the case with all types of hydroponic systems.

Managing a hydroponic system is also relatively straightforward. Make sure that the plants you use all have a similar composition to one another. Unless you have multiple hydroponic beds, you will be tasked with circulating a nutrient-rich solution through the system to provide your plants with all of the nutrients they require. Each plant has its own nutrient requirements, which you should take into account if you want your plants to survive.

A goal of yours when maintaining a hydroponic system should be to do so efficiently and effectively. If you waste too much of your nutrient-rich water or find that your plants aren't getting the types of nutrients they need, costs can quickly balloon. One item that can help you improve your hydroponic system is a timer, which will allow you to automate the process of nutrients being circulated to the plants. This article examines the numerous hydroponic timers on the market to determine which one is right for you.

Benefits of a Hydroponic System

One of the reasons that hydroponic systems have become increasingly popular in recent times is because of the many benefits that they provide. The primary benefit of this growing method involves the high yields that it produces. You have the ability to control how much and what types of nutrients your plants receive, which increases the likelihood that a high percentage of these plants will survive.

The same isn't true with traditional growing methods. When you grow plants outdoors in soil, you'll need to contend with pests as well as a lengthier growing cycle. These issues make it more likely that a high percentage of plants won't survive for long. The top benefits that are derived from using a hydroponic system include:

- Much faster growing cycle than traditional farming
- No pests to contend with
- Larger yields in most situations
- Aesthetically pleasing
- Nutrient dosing is easy
- Issues can be identified early on
- Automation is simple
- Doesn't require much space

While this form of farming is highly advantageous for most growers, there are also some issues that you should be aware of. The main problems that you might encounter with hydroponic growing include:

- Upfront costs are usually higher
- You will need to use nutrients
- Without automation, growing can take longer
- Beginners might find this growing method challenging
- Setup can be complicated

Why Use a Hydroponic Timer?

Timers can be highly beneficial when you're using a hydroponic system to grow any type of plant. Depending on what type of hydroponic garden you're using, you can use a timer to control numerous aspects of the growing process. The right timer gives you the opportunity to automate such functions as nutrient flow and ventilation. More automation means that you will be able to reduce the amount of time you spend managing your hydroponic system, which isn't possible with a traditional garden. Overall, hydroponic timers allow you to improve a system's efficiency.

Applications & Uses of Hydroponic Timers

There are numerous applications associated with hydroponic timers, which include everything from lighting control to ventilation control. The applications you use a timer for depend on the type of hydroponic system that's installed in your home or facility. In many cases, timers are used to effectively control how a hydroponic garden is lit.

Since different plants require different amounts of light, the duration of your lights may need to be changed at different intervals throughout the growing process. By using a hydroponic timer, it's possible for you to create the ideal lighting schedule that keeps the lights on and turns them off at the right times.

You can also use a hydroponic timer to control the ventilation system that's paired with your hydroponic garden. Once the timer has been installed correctly, it can signal when the time is right for your ventilation system to turn off and on.

As touched upon earlier, you could also look into using a hydroponic timer to manage the flow intervals of the nutrients that you're using in your garden. While ebb and flow hydroponic systems are already set up to accommodate different flow intervals, other hydroponic systems don't have this function. When using a hydroponic timer, you can regulate how often your garden is watered.

Within the agricultural industry, hydroponic gardens are on the rise. Because of the benefits derived from this growing method, commercial and residential plant growers alike are having hydroponic systems installed. Commercial growers tend to use large slide bench systems or ebb and flow systems to grow a high number of plants at a time. Home hydroponic systems tend to come in the form of water culture hydroponic systems.

Our Favorite Hydroponic Timers

While there are dozens of great hydroponic timers that you can pair with your garden, the following is a detailed overview of our favorite timers that are currently on the market.

Geeni Smart WiFi Surge Protector (4.2 ⋆)

Technically, the Geeni surge protector is a power strip as opposed to a timer. However, you can control this WiFi-enabled device with a mobile app. This app gives you the ability to control how much power is delivered to each outlet. You're also provided with the option of setting schedules for each outlet, which allows the surge protector to function as a timer.

The primary benefits of this timer include:

- Surge protection capabilities
- WiFi functionality that allows for remote control
- Ability to control individual outlets
- Six outlets available for entire hydroponic garden

The main issues attributed to this timer include:

- You need a smartphone to schedule timer intervals
- Does not have full timer functionality

Review & buy the Geeni Surge Protector now

GE Heavy-duty Mechanical Timer (4.6 ⋆)

This is a basic mechanical timer that provides you with the ability to set a daily schedule for your hydroponic garden. Despite the simplicity of this device, it has the highest user rating of all of the products in this guide. Once you set the timer to a specified schedule, it will repeat this schedule on a daily basis.

The primary benefits of this timer include:

- Consistent and reliable
- Easy to use
- Very affordable

The main issues attributed to this timer include:

- Only a single outlet
- Doesn't have as many features as other outlets

Review & buy the GE Mechanical Timer now

APC Surge Protector (4.1 ⋆)

The APC surge protector offers dual functionality that allows the device to function as a surge protector and a timer, the former of which can be useful if you have numerous grow lights in your garden. This device is outfitted with four outlets that can be placed on the same schedule. Because the outlets are only able to work on one schedule, this device is ideal for a small hydroponic garden.

The primary benefits of this timer include:

- Surge protection
- Very reliable
- Includes lifetime warranty
- Has a $50,000 protection policy

The main issues attributed to this timer include:

- Only one schedule is allowed for all outlets
- Doesn't work well with larger hydroponic gardens

Review & buy the APC Surge Protector now

Century Digital Programmable Timer (4.5 ⋆)

This is a feature-rich digital timer that's equipped with two outlets. Keep in mind that outdoor and indoor variations of this product are available to accommodate outdoor and indoor hydroponic gardens. You can set the outlets to have the same schedule or completely different schedules. This seven-day timer comes with eight distinct modes.

The primary benefits of this timer include:

- Different schedules can be set for different days
- Two outlets
- Each outlet can have a different schedule
- Available in outdoor and indoor models

The main issues attributed to this timer include:

- Programming the device can be difficult
- Not all modes are necessary for hydroponics

Review & buy the Century Digital Programmable Timer now

Nearpow Timer (4.5 ⋆)

This is a digital timer with a single outlet that's designed to save energy whenever possible. The timer is outfitted with an LCD screen that's easy to read when you want to set a schedule for your hydroponic garden. Along with daily timing, it's possible to set interval periods.

The primary benefits of this timer include:

- Large LCD screen
- Weekly schedules are allowed
- Different warning tones for schedule changes

The main issues attributed to this timer include:

- Can be difficult to program
- Doesn't have WiFi

Review & buy the Nearpow Timer now

Finding the Right Hydroponic Timer for Your Hydroponic System

If you're searching for the best timer for your hydroponic system, there are many fantastic and reliable options for you to choose from. Hydroponic growing is a great way to obtain higher yields and grow your plants indoors.

While hydroponic systems aren't for everyone, they can help you save time and money. You can reduce the amount of time you spend managing the system with the right timer. It's also possible to keep water quality high by regularly testing your water with pH sensors and conductivity sensors.

Learn About Sensorex and What We Stand For

Our mission

"To create a cleaner, safer world by providing reliable water quality sensors."

For more than 50 years, Sensorex has been solving sensor problems for water professionals around the world.

Clean, safe water is critical to a sustainable future. Water flows through our environment, through our homes, and through our manufacturing facilities and utility networks. At every step, water professionals face unique analysis challenges.

Check Out Our Hydroponics & Agriculture Products

FC75P and FC75C - Polypropylene Flow Cell Kit 3/4" (Tee and Gland Fitting)

Our FC75P Mounting Gland are an easy and economical means for mounting pH sensors for in-line applications. Compatible with all 12mm electrodes, includingS222CD Light-Duty Online Process pH Sensor.

The FC75C includes a 3/4" NPT Tee fitting

Learn More

pH6000 - Process pH Sensor, Light Duty

The durable Ultem® body permits use in the field while conferring chemical compatibility. Double junction reference protection allows use in environments that contain reference fouling contaminants, including heavy metals. The fully integrated cable comes in a 10-foot (3-meter) standard length, with custom cables available by request.

Learn More

TX20 - pH and ORP Controller

This controller allows you to save space in your panel with its small footprint 1/8 DIN case. You can also use the two on/off relay outputs to program process control, including the management of alarms and chemical dosage systems.

- Easy to install 1/8 DIN Case
- Two on/off controls (relay outputs)
- Compatible with sensors that utilize spade lug connectors
- Clear LCDs pH, ORP, and temperature
- 100-240 VAC power supply

Learn More

CX20 - Conductivity Controller

The CX20 conductivity/EC controller is a convenient and cost-effective solution for monitoring and maintaining conductivity. Save space in your panel with the small footprint 1/8 DIN case. Use the two sets of relay outputs to program process control of alarms and chemical dosage systems.

- Easy to install 1/8 DIN Case
- Two sets of programmable relays for conductivity or resistivity
- Clear LCDs conductivity, resistivity, or temperature
- 100-240 VAC power supply

Learn More

CS150 - Graphite Contacting Conductivity Sensor, 12 mm

Used for Laboratory and Light Industrial Applications: Made from graphite to provide good performance for the value. Choose from 2 cell constants: 0.1/cm and 1.0/cm.

- **Lab versions:** with 3 ft (1m) cable, 10K thermistor, and 8-pin connector (for use with Sensorex CM1000 meters).
- **Process versions:** with 10 ft. (3m) cable, PT1000 temperature element, and tinned lead (for use with Sensorex transmitters).

The sensor can be configured to meet your exact needs.

Learn More

S272CD - Process pH Sensor

The S272CD online process pH sensor delivers reliable, online monitoring for in-line or submersion installation configuration. This sensor design extends its lifetime with double-junction technology and a durable Ryton® PPS body. The flat glass measurement surface requires minimal maintenance. It's a versatile sensor for moderate and multi-purpose applications.

Learn More

SSRE - Smart Sensor Remote Electronics

Convert analog sensors into smart sensors with our SSRE. Reduce inventory by stocking analog sensors and wire them to remote electronics to output a digital communication signal (4-20 mA or Modbus). Save on costs by only replacing the sensor; keep remote electronics and cabling in place. Improve environmental impact by eliminating electronics waste after sensor end of life.

Learn More

S8300 - Modular pH Sensors for In-line

In heavily contaminated wastewater or chemical processing applications, an inline pH probe typically wears out fast. We created our modular, quick disconnect S8000 sensor packages for these types of heavy duty industrial applications. The sensor can be replaced in a few seconds with no tools or re-wiring required by swapping the S8000CD Quick Change Replacement Cartridge.

- **One year limited warranty**

Learn More

Shop Our Best Sellers or Get in Touch with us Today!

We are the leading manufacturer of electrochemical sensors and analytical instruments for various industries. We guarantee that our commitment to innovation, quality, and customer service sets us apart from the competition.

Sensorex USA

+1 (714) 895-4344

info@sensorex.com

11751 Markon Drive, Garden Grove, CA 92841 USA

Sensorex Czech

+42 (0) 38960 3703

info@sensorex.com

Okružní, 370 04 Ceske Budejovice, Czech Republic

Shop Best Sellers

Learn More