



aquaponics GLOSSARY

the BASICS

Aquaculture - The cultivation of marine and freshwater animals.

- Requires periodic water changes

Hydroponics - The cultivation of plants in a water-based solution, without soil.

- Requires nutrient rich formula and periodic flushing

Aquaponics - The symbiotic cultivation of aquatic animals and plants in a circulatory system combining aquaculture and hydroponics.

- Fish supply nutrients to the plants, bacteria converts fish waste into fertilizer, plants clean the water for the fish.

key TERMS

Ammonia - The Nitrogen/Hydrogen compound (NH_3) excreted from the gills of fish and the decay of organic matter such as plants, fish waste, and excess fish food. A buildup of ammonia can become toxic for fish if not removed from the water.

Bell Siphon - Used in Ebb & Flow systems to create a cycle of filling and draining based on atmospheric pressure. Water fills the grow bed until it reaches a certain level, activating the bell siphon and draining the grow bed. When the grow bed is drained, the pressure slows and the siphon stops automatically, allowing the grow bed to fill again until the same level is reached. The flood and drain cycle is repeated continuously.

Bio-filter - The filter in an aquaponics system that provides surface area for nitrifying bacteria to colonize.

Chloramine - The combination of ammonia and chlorine that is typically added to tap water as a disinfectant. Chloramines are toxic to marine life and will kill them if left untreated.

Cycling - The process of establishing colonies of two types of nitrifying bacteria necessary for the Nitrogen Cycle to take place within the biofilter in an aquaponics system. The Nitrogen Cycle is the process in which the first set of bacteria convert ammonia into nitrites, then, the second set of bacteria converts nitrites into nitrates, which plants use as fertilizer. Check out our blog for more info. [<LINK>](#)

Ebb and Flow - The process of filling and draining a media grow bed with water.

Float Valve - Opens and closes according to the water level using buoyancy. Allows for consistent, steady water level (most toilets use these).

Grow Trays - Containers used to start seedlings. Grow trays can have clear plastic tops which trap humidity, creating a more favorable environment for seeds to sprout. Plastic cement mixing trays and plastic storage containers of appropriate size can work as grow trays. In extreme weather conditions, it is a good idea to start seedlings in grow trays.

Iron - Iron is a microelement (needed in small doses) that is essential for plant growth. Iron is one of the few elements that is deficient in aquaponics. Iron deficiency can be identified as a yellowing between the veins of the younger leaves. We recommend only using chelated DTPA iron in your system. NOTE: Do not use EDTA iron, it is toxic.

Solid Waste - Larger particles of fish waste need to be removed from the system with the use of a mechanical filter, ideally leaving only liquid waste. If, “solids” build up in a system they will consume oxygen, which will create an anaerobic environment where harmful bacteria can grow. Adding worms to media beds in larger systems can help reduce solids.

Sump Tank - A tank at the lowest part of your system. Typically used when the water flows by gravity and then is returned by a pump. A sump tank is necessary when the volume of your fish tank is less than the total volume of your grow beds. Sump tanks keep the fish tank water level stable and allows up to a 1:3 (fish tank:grow bed) ratio.

pH Levels - Plants, fish, and bacteria all prefer slightly different pH levels. To keep all three organisms alive and happy, the ideal compromise is a pH between 6.5 - 7.4 for aquaponic growing. A pH of 7 is considered neutral. Anything above is considered alkaline, or basic. Any pH below 7 is considered acidic. 7 is a good pH to aim for if you are just starting out with aquaponics.

- **Acidic pH:** Below 7 pH
- **Alkaline pH:** Above 7 pH

Lighting - A light source for your aquaponics system can include the sun, high output fluorescents, metal halide, mercury vapor bulbs, LEDs, or plasma lights.

Mechanical Filter - A filter used to remove solid fish waste from your system. It is important to remove as many solids from your system as possible to prevent problems. Examples of mechanical filters include swirl filters, radial flow filters, Matala® filters, screens, settling tanks, and filters that are filled with various types of media that will catch fish solids. We do not recommend using your grow bed as your only mechanical filter. You will save yourself a lot of time and effort if you insert a mechanical filter before water goes into your grow bed.

Grow Media - A media intended to serve as structure for plant roots to gain support. Examples include expanded clay pebbles, gravel, lava rock, coconut plugs, and perlite (sand is not recommended as it is too fine).

Net Pots - Plastic pots containing grow media which are perforated to allow nutrient-rich water flow to the plant roots.

Nitrite - Nitrite is an ion produced as the second step in the Nitrogen Cycle. Nitrite is toxic to fish and will kill them quickly if levels are high. We recommend testing for Nitrite when initially cycling your system and anytime you have any fish health problems. An ideal level of nitrite in a cycled system is 0 ppm.

Nitrate - Nitrate is an ion produced as the last step in the Nitrogen Cycle and is only toxic to fish at high levels, above 160 ppm. Nitrate is removed from the water and used by plants for growth. We recommend testing for nitrate occasionally to determine how well your plants are taking up the nutrients produced by the fish and to determine feeding rates. An ideal level of nitrate in your system is between 5-80 ppm.

Nitrogen Cycle - The Nitrogen Cycle is the process in which nitrogen moves through an environment, taking different forms and interacting with different organisms. The Nitrogen Cycle takes place in soil and water. In a fish tank, lake, or aquaponics system, the Nitrogen Cycle looks like this:

Ammonia ----> **Ammonia-Oxidizing Bacteria (AOB)** ----> *Nitrite* ----> **Nitrite-Oxidizing Bacteria (NOB)** ----> *Nitrate*

Nitrifying Bacteria - Bacteria that plays a role in the Nitrogen Cycle. The first set of AOB in your system converts ammonia into nitrite. The second set of NOB in your system converts nitrite into nitrate. There are thousands of possible types of nitrifying bacteria in existence making it difficult to know the exact species in your system. Aquaponics systems mature over time and populations of bacteria will die off or be outcompeted by other types. Nitrifying bacteria thrive in environments that are rich in oxygen, with no UV light and warm temperatures.

Pump - The pump moves water throughout the system. To have a healthy, stable system, we recommend choosing a pump that will circulate the entire volume of your system at least once per hour.

Temperature - Maintaining a controlled temperature for fish is important. Different fish species prefer different temperatures. Before choosing your species of fish you should know the temperatures they prefer and make sure the environment around your system will be able to keep the water temperature within that range. In general between 65° - 75°F is a good range for most fish, bacteria, and plants.

Tilapia - Tilapia is the most popular fish used in aquaponics because it has a very fast growth rate and a high feed conversion ratio. Tilapia evolved in very harsh environments, making it one of the hardiest fish and the easiest to take care of. Tilapia require warm water and will become sick or die at temperatures under 55F°. Check out our [Top 5 Fish to Use in Aquaponics Blog](#) for more info on other fish you can use.

Water Heaters - In most places around the world tropical fish will require a submersible water heater. If you use a water heater, make sure you understand the settings of your water heater and have a thermometer in your tank to measure temperature regularly. Keeping the water temperature stable for your fish is more important than having it be exact. Large temperature swings will stress your fish or make them sick and result in a negative affect your plants.

Vermiponics - Another soilless system of growing that uses vermiculture (worms or “worm tea” fertilizer) in addition to aquaculture. Vermiponics can be incorporated into aquaponic systems to help reduce solid fish waste.

Vitamin C - Pure Vitamin C (also called ascorbic acid) can be used to break bonds of chlorine and chloramine to safely prepare water for your aquaponics system. Ascorbic acid can be found in any health food store or online. Make sure to use pure ascorbic acid, without any other additives. The dose is 1/8th of a teaspoon every 20 gallons.

system TYPES

Deep Water Culture (DWC) -

- a. Plants are grown on floating rafts in long tanks of free flowing water, their roots hanging down freely in water to absorb nutrients .
- b. Fish are housed in a separate tank with pipes circulating the water between fish tank and plant grow bed, with a filtration system in between.
- c. Uses large beds, larger volume of water.

- d. Produces a large crop. Must be used with growing cycles. Once the schedule is established (so that harvesting of one crop coincides with sowing of next) the system is simple to maintain.
- e. The extra volume of water in the raft tank makes it less prone to pH, temperature and water quality swings, which cause stress to fish.
- f. Requires more aeration.

Nutrient Film Technique (NFT) -

- a. Each plant sits in its own small perforated container with its roots growing into a system of long narrow channels.
- b. Nutrient rich water flows between channels and the fish tank, in a shallow stream (or film) over the roots of the plants.
- c. Best for leafy greens and other plants with smaller root systems.
- d. A medium size space is needed.
- e. Can be more susceptible to temperature fluctuations within channels.
- f. Our ECO-Cycle Aquaponics Kit is this type of system.

Media Based -

- a. Plants are grown in an inert media and water is pumped from a separate fish tank, over the media.
- b. Most similar to soil gardening. Media can be costly.
- c. Media can act as a mechanical and biological filter: trapping solid waste and providing surface area for decomposing bacteria and worms. If using media beds as your sole mechanical filter maintenance requirements will be higher as the beds will become clogged with waste more quickly.
- d. Flood and drain: Draining water brings more oxygen to roots.
- e. Continuous: Roots can become waterlogged, and areas can become stagnant and anaerobic if waterflow is not fast enough.
- f. Two methods: (1) Flood and drain, with alternating filling and draining and (2) continuous flow with the water from the fish tank filling the grow beds with the height of the water set by a stand pipe leading back to the fish tank.

SWIMMING deeper

Mechanics of a Bell Siphon - Water fills the “bell” of the bell siphon until it gets to the top of the inner chamber. It runs over the top and down the standpipe, eventually blocking air from getting in, creating a vacuum in the top of the chamber. This creates no pressure on the inner chamber but still provides pressure on the outer chamber. The pressure on the water in the outer chamber pushes into the inner chamber and exits down the pipe until the water level is low enough to no longer spill over the top. Air bubbles begin to gurgle in and the vacuum is lost, allowing both chambers to fill back up again.

- https://www.youtube.com/watch?v=CXaruS5z_Xc
- <https://www.youtube.com/watch?v=gFokOynqOqQ>

pH - The measure of the hydrogen ion concentration of a solution. Solutions with a high concentration of hydrogen ions have a low pH and solutions with a low concentrations of H⁺ ions have a high pH. PH is measured on a scale of 1 to 14, 1 being acidic, 14 being alkaline, and 7 being approximately neutral. Tap water and most ground water comes out a bit above neutral.

CHOP system - A CHOP system is designed with water flowing from the fish tank to the grow beds using gravity, then from the grow beds to the sump tank. From the sump tank the water is pumped back to the fish tank. CHOP stands for Constant Height One Pump because the water level in the fish tank stays constant.