

Agriculture Academy's

What Is Aquaponics and How Does It Work?

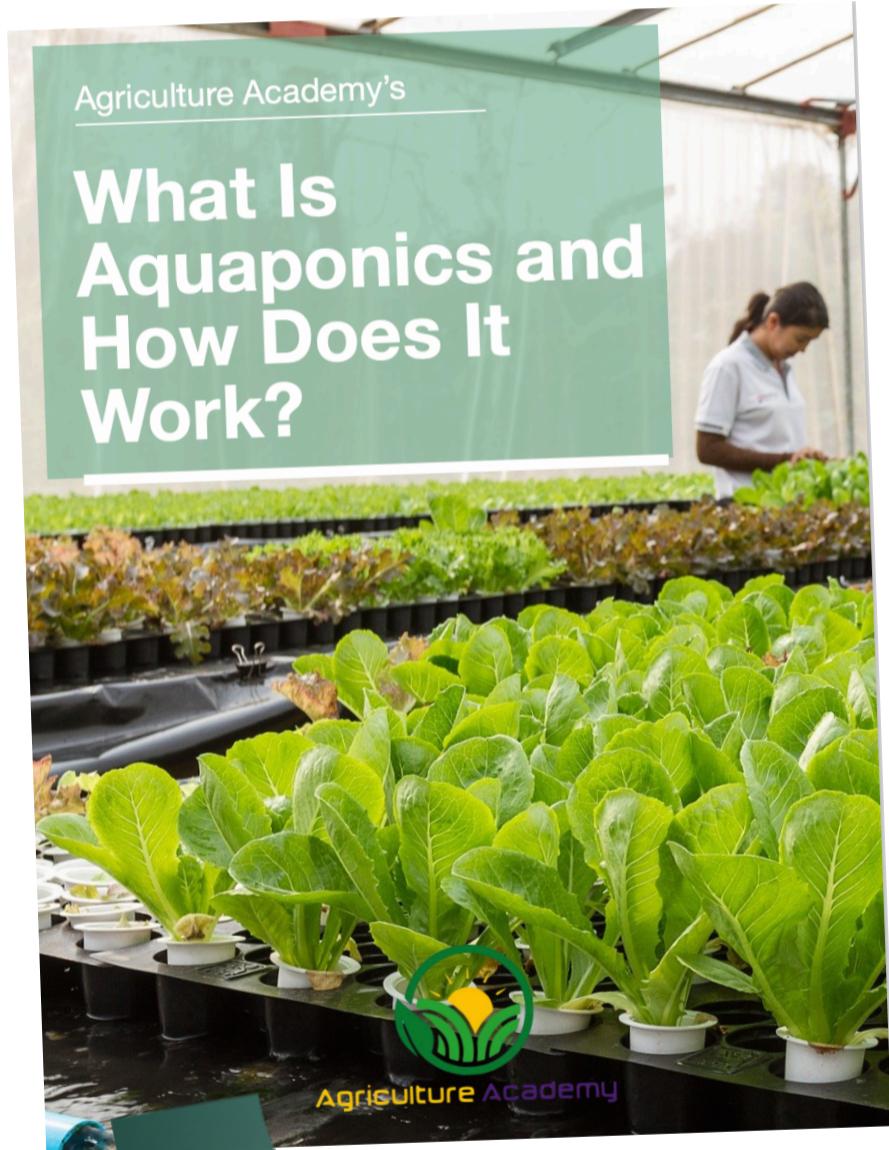


Agriculture Academy

Introduction to Hydroponics

Thank you for downloading this guide!

In this eBook we are going to take a look at aquaponics. What is aquaponics? How does it work? What do you need to get started? All of these questions are going to be answered in this guide.



What is Aquaponics

Now, let's get started by answering the question 'What is aquaponics?'. In a nutshell, the name says it all. 'Aqua' means water and 'Ponics' means to work, or grow. So basically, aquaponics is a method of growing plants in water and using this as a habitat for rearing fish too.

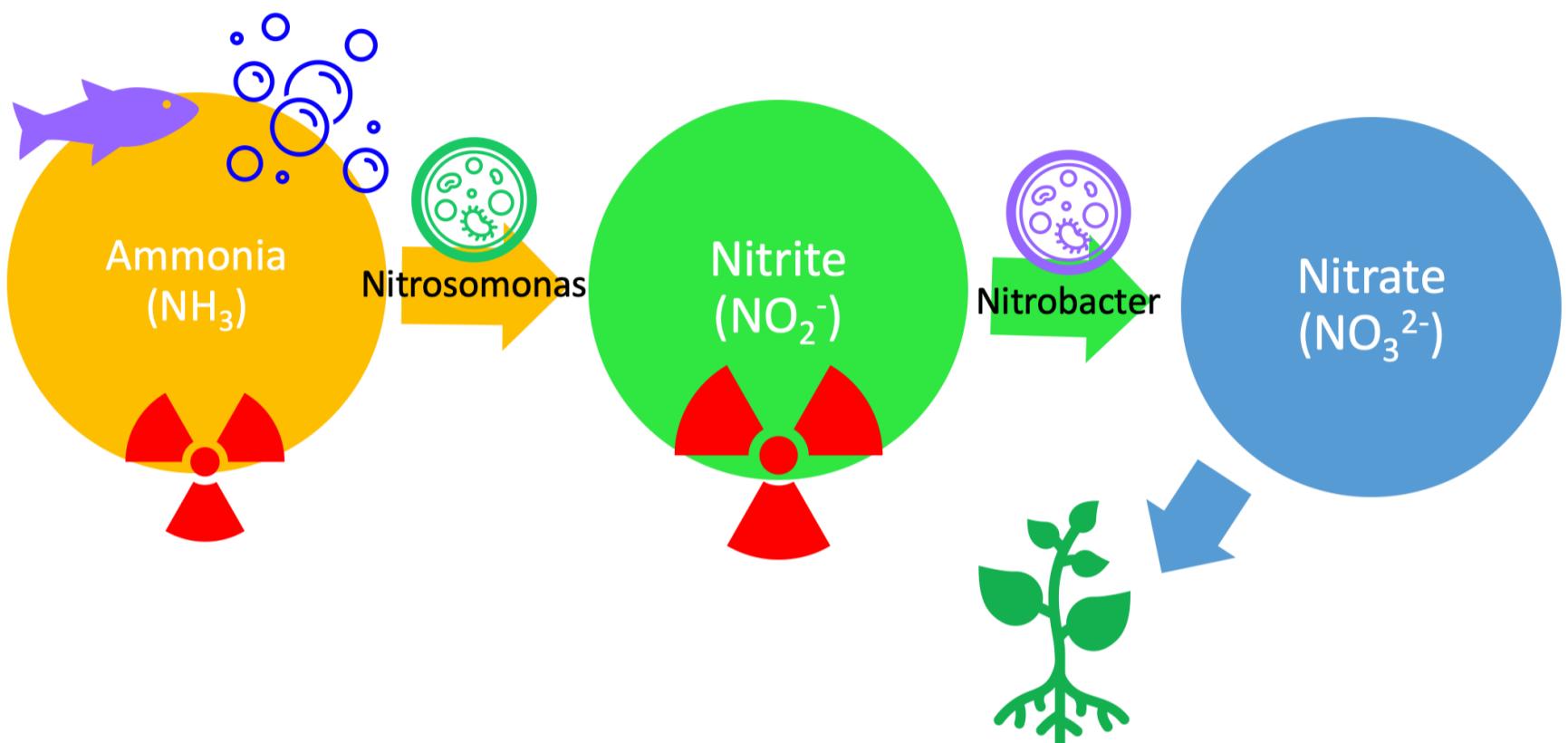
By growing plants and raising fish aquaponically, you take advantage of the best of both hydroponics and aquaculture. In hydroponics, you are merely growing your plants in water which most often gets pumped out the system. In aquaculture, toxic nutrient accumulation from the fish, fish food and fish waste means the water also needs to be constantly siphoned off and replaced with a clean supply. However, both these problems are solved in a mutually beneficial way in aquaponics. Not only is water saved through the continuous cycling from the fish, to the plants, and back to the fish again, but the plants are able to use up the toxic nutrients making the recycled water safe for the fish again.

How Does it Work?

Now that we have defined aquaponics, we need to understand how the process works. There is 1 process at the core of the system upon which everything depends. This process is the nitrogen cycle. If you remember, we mentioned that by placing plants into the system they clean the water and make it safe for the fish again. The nitrogen cycle makes this all possible. It all starts with ammonia. Ammonia is a waste product from the respiratory cycle of the fish, as well as decomposing fish food and fish waste. When ammonia accumulates in high concentrations, it becomes toxic to the fish. On every dark, wet surface in the aquaponics system exist nitrifying bacteria known as Nitrosomonas. These are naturally occurring and extremely beneficial because they convert the ammonia to nitrite. Unfortunately, nitrite is even more toxic to the fish than ammonia. Luckily, there is another class of bacteria called Nitrobacter, which convert the nitrites to nitrates. And this is fantastic because nitrates are a great nutrient source for the plants. So, as

you can see, the nitrogen cycle is an extremely important process that converts toxic waste products into less toxic nutrients that the plants can use.

The Nitrogen Cycle



What Are Biofilters and Why Do I Need Them?

Now that the importance of the nitrogen cycle and the beneficial bacteria have been made clear, we are going to highlight the role of something called a 'biofilter'. **Biofilters** can be made of any inorganic substance, like gravel or a hydroponic substrate for example, and are included in an aquaponics system to provide a place for the beneficial bacteria to live and proliferate. The biofilters provide a large, dark and wet surface area on which the Nitrosomonas and Nitrobacter survive. Water from the fish tanks is pumped through these biofilters, the ammonia gets converted to usable nitrates, the water then goes to the plant tanks, the nitrates are used, and the water is now safe to return to the fish tanks.

Equipment to Get Started

If you are feeling inspired to start your own aquaponic endeavour, then you are going to need some important equipment to get started. We are going to list the most basic products that you can use to build a simple system, perfect if you are a beginner. First of all, you will need a **fish tank**. This can be made from a variety of materials, like stainless steel, lined wood or plastic. The size of the container will depend on how many fish you are wanting to stock. Secondly, you will need some **media beds** which you will use to grow your plants in. Media beds can be made from similar materials to the biofilter, like gravel or a hydroponic substrate. If you are thinking of growing your plants on floating trays, then you will also need some **raft beds**. Whilst your media beds can serve the same purpose as a **biofilter**, you may wish to include a separate system into your design if you have the space and resources to do so. In order to circulate water throughout the system, you will need **water pumps**. In order for these to work, you are going to need to connect them to an **electrical system**. This can come from the grid, or be solar, depending on your preferences. If you live in very hot or cold regions, then you may also want to invest in **water heaters or coolers** to warm the water in the winter and cool it in the summer.

Top Tips for Aquaponic Beginners

Tip #1: Start small. If you have little to no experience in aquaponics, rather start with a small system and expand as your experience and confidence progresses.

Tip #2: Choose your plant and fish wisely. If you are wondering which species is best for you, first take a look at those that grow best in your climate. Trying to rear cool water fish in tropical areas can be quite difficult and increase the costs of cooling the water. It is also important to use complimentary fish and plant species.

Tip #3: Test your water regularly. Fish are extremely sensitive to nutrient and pH fluctuations. It is therefore important to take daily, or at least weekly, water readings. You can purchase simple, cheap kits online or from aquaponic stores.