

Agriculture Academy's

# Intro to Hydroponics



Agriculture Academy



# Introduction to Hydroponics

**Thank you for downloading this guide!**

In this eBook, we are going to discuss hydroponics. The basic principles on which hydroponics is based, the different variations thereof as well as some advantages and disadvantages are all going to be covered in this guide!





# What is Hydroponics?

Plants grown hydroponically are not planted in conventional soil, unlike so many other agricultural crops. Instead, the roots are submerged in an inorganic growing medium. Nutrient-rich water is then applied to the roots of the plant. This is the basis for any hydroponic set up.

You might be thinking how a plant can survive, and even thrive, without soil? To understand how hydroponically-grown plants grow and mature, you need to understand the purpose that soil serves in supporting the life of a plant. One of the most important functions of soil is its ability to retain water and nutrients and supply these to the roots of the plant. In hydroponics, this need is overcome by placing the plant in an inorganic growing medium, like vermiculite, perlite, rockwool or an expanded clay substrate. Alternatively, the plants can also be placed in a simple container without any substrate or float on the water itself. The nutrient demands of the plants are then met through regular applications of nutrient-enriched water to the rootzone of the plant.



Nutrient-enriched water being placed into the system

# Types of Hydroponic Set-Ups

A beginner can get easily confused and overwhelmed with all the variations of the hydroponic method. So, let's take a look at the different hydroponic applications that you can try out.

1. **The Nutrient Film technique (NFT).** In this set up, plants are placed in sloping hollow pipes or channels. Nutrient water is continuously pumped through the channels over the root system. There is no need for additional growing medium like vermiculite or rockwool. The NFT is a closed system that recirculates water throughout the channels by pumping it first to the upper or higher ends of the channels that then flows down the slope.

2. **Wick Systems.** This is one of the simplest hydroponic set ups and is perfect for beginners. A reservoir of nutrient-enriched water is placed underneath the plants. There is a wick that extends from the growing medium downwards into the reservoir. The water moves through capillary action from the reservoir into the growing medium and keeps the roots nourished and moist. Little specialist equipment is needed for this design and it is very easy to DIY with some buckets, rope and a drill.

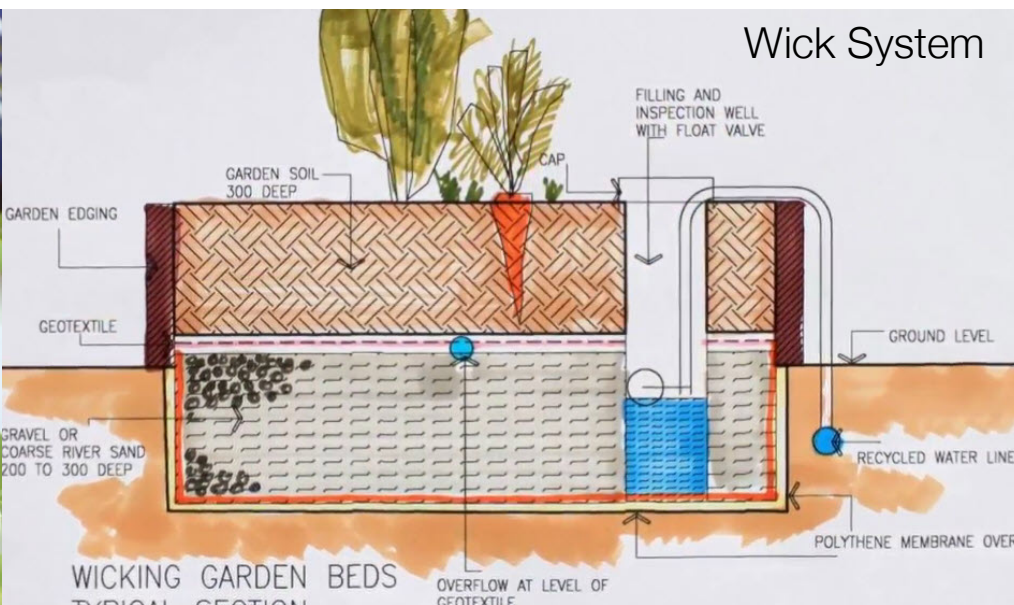
3. **Ebb and Flow.** Also known as the flood and drain system, plants embedded in a growing medium are placed over a reservoir filled with nutrient water. A pump periodically forces the water up into the section housing the plants. The pump is then turned off and the water gradually flows back into the reservoir. This is another simple technique and apart from the pump and piping, little expert equipment is required for success.

4. **Deep water culture (DWC).** Here, plants are placed in pots with growing media or lightweight covers that float on the water's surface. The plants' roots then grow into the water. A pump oxygenates the water to keep the roots healthy, but apart from that, no other mechanization is required. This makes the Deep Water Culture system great for beginners or DIY projects.

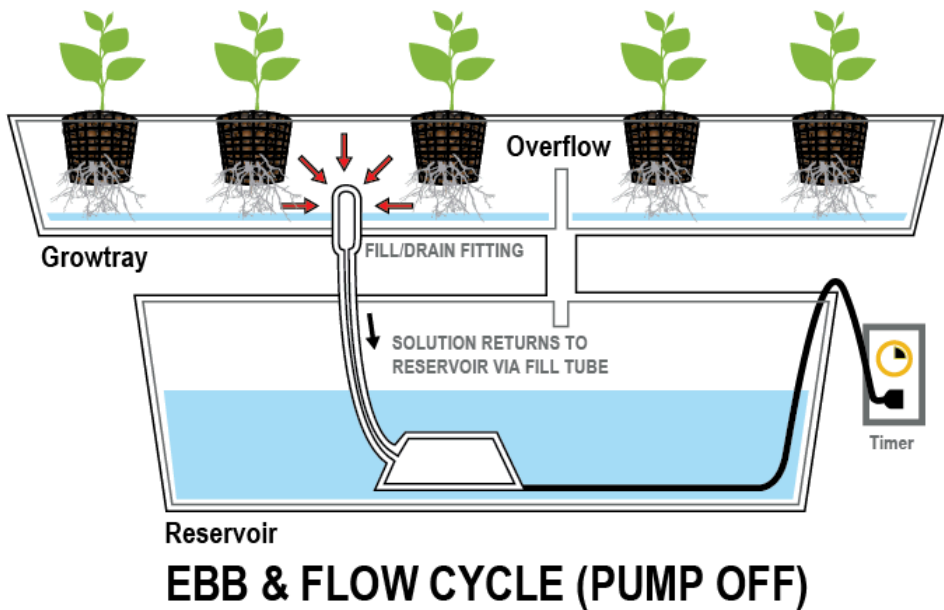
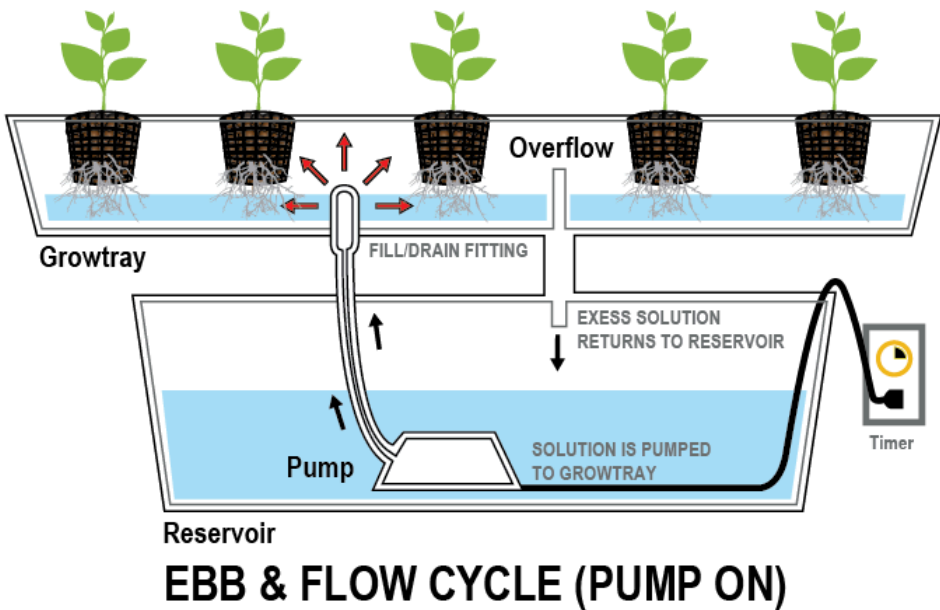


**5. Drip Systems.** This technique makes use of drip lines and a pump that transports water from an underlying reservoir into the growing media encasing the plants above. Usually, a dripper will be allocated to each plant which allows for the fine-tuning of nutrient concentrations and watering intensity. The water can be recycled, which saves time and money, or it can be siphoned out the system, which maintains the optimal nutrient concentrations in the reservoir.

**6. Aeroponics.** Here, plants are suspended in the air vertically or horizontally. A pump then delivers a misting of nutrient media to the roots of the plants at scheduled intervals or on a continuous basis, depending on the needs of the plant. This is a more advanced system requiring pumps, misters and timers, among other equipment and should only be considered by expert growers to make the investment worthwhile.



Ebb and Flow





Deep Water Culture (DWC)



Drip System



Aeroponics





# Advantages of Hydroponics

No matter the type of hydroponics system you decide on, you will always have to consider the advantages and disadvantages before you start your production. Let's start with the positives of growing plants hydroponically:

Firstly, you can set up a hydroponic operation, big or small, almost anywhere. Because no soil is needed, you can grow a considerable number of plants indoors even. You can maximize your yield because the roots of hydroponically grown plants are kept compact. This is possible because when they are provided with the perfect amount of water and nutrients, roots do not need to grow in search of more. You will also be free from the constraints of poor soil conditions and environmental pollutants, allowing you to grow almost any herb or leafy vegetable anywhere.

The money saved on water and nutrient inputs is another advantage offered to hydroponic

growers. In conventional agriculture, most of the water and nutrients applied to the plants is lost through drainage, runoff, and evaporation. In hydroponics, this problem is overcome by applying only the exact amount of water and nutrients needed by the plants. The savings are further improved in circulatory hydroponics systems, as the same water source is pumped through the system over and over again.

Hydroponic systems also allow you to overcome the constraints imposed by a change of season. Climate-controlled systems allow the grower to fine tune the temperature and lighting to suit the needs of their plants. This can open up the possibility of producing crops in their off-season, which can ensure you receive a premium for your harvest and limit the need for expensive and polluting international airfreight. The climate control also means that plants grow faster. Because you can alter the environmental conditions as needed, the plants can always be provided with the optimal conditions for growth.

The lack of soil will also eliminate any soil-borne diseases or weed infestations. If this problem is solved, then the money spent on the usual control methods will no longer be required. The labour and time spent mitigating pest and weed problems will also be removed. These savings can either be reinvested into expanding production, or it will result in improved profit margins. Furthermore, the plants will be less susceptible to soil-borne pathogens and will not need to compete with weeds for water or nutrients.

Lastly, you will be able to change crops or cultivars easily and quickly if market demand fluctuates away from or towards certain products. You will therefore be able to keep up to date with consumer trends and meet demands as they arise.

## **Disadvantages of Hydroponics**

It is easy to see why hydroponics is a favourite among commercial growers and hobbyists alike. However, there are some obstacles that every grower needs to consider before they start.

While a small, backyard set up may not be too costly, the startup costs of a commercial hydroponics operation will be expensive. You will therefore need to make sure that you have a solid business plan and contingencies in case of unforeseen obstacles. This may be a barrier for small-scale farmers who cannot afford the initial investment or be approved for the necessary loans.

Relating to the expenses of setting up a hydroponic production, you will need the expertise and experience required to make a commercial set up a success. You do not want to waste money on mistakes and mishaps that could have been easily prevented with the correct experience. This is less of an issue for hobbyists, as making mistakes and learning from them is all a part of the hydroponics experience.



Lastly, and this is especially so for large, electric-powered systems, the risk posed by power and water outages is a big one. Because the roots of the plants are not anchored in water-retaining soil, prolonged periods without water or nutrient applications will be devastating and result in large scale losses. It is therefore wise to invest in generators and boreholes if you are a commercial grower.

## Our Take Home Message

In conclusion, there are so many benefits of growing your plants hydroponically. If you are interested in starting a backyard, small-scale operation then do not hesitate. However, if you are looking to go big or expand your production, more time and thought will be needed in developing a business strategy, a budget and contingency plan before you take that leap.



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