Grow It In Hydroponics

Step 1: BOM - Bill of Materials

Parts and supplies

1.Opaque container that can hold water with lid (I am using an old 18 gallon storage bin)
2. Mesh Pots (how many depends on what you're growing and the size of your container - I am using 6 5.25" pots) ($9.90 for 6 heavy duty)
3. Rockwool Growcube (chopped rockwool) (5.95 for three gallons)
4. Growing Solution (I have used Dyna-Grow brand 7-9-5 with excellent results) ($12.95)
5. Aquarium air Pump (nothing special) (already have/not using)
6. Air Stone(s) and air hose ($3)
7. See the start growing step for additional instruction

Recommended but optional
1. Syringe - for making more precise measurements of growing solution ($2.60 for 60mL)

Construction Tools
1. Razor Knife
2. Pencil
3. A compass would be nice

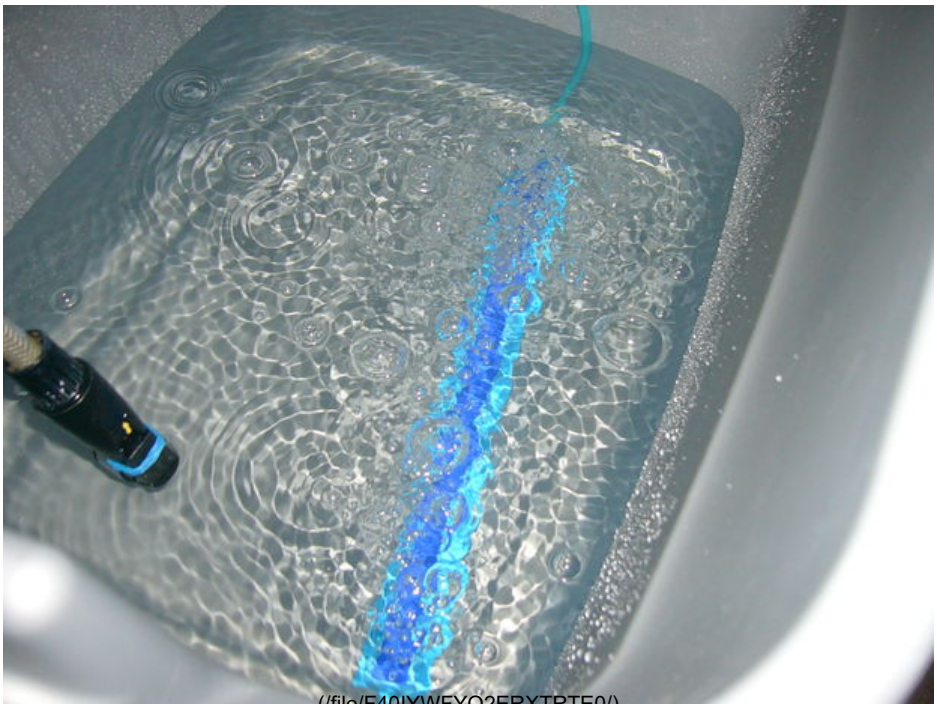
Step 2: Make a Home for Your Pots

Place your pots upside down on the top of your container lid. Now trace around each pot with a pencil making sure that no lines overlap.

Now, if you have a compass, set it to the radius of the BASE of your pot. Eyeball the center of each circle (or measure if you prefer) and trace another circle inside the larger ones.

Next, cut away the SMALL circle and cut perpendicular relief cuts up towards the larger circle (see picture for clarification). The idea is to push the pot down into the hole and the container lid will hold on tight making a better seal.

Step 3: Aeration

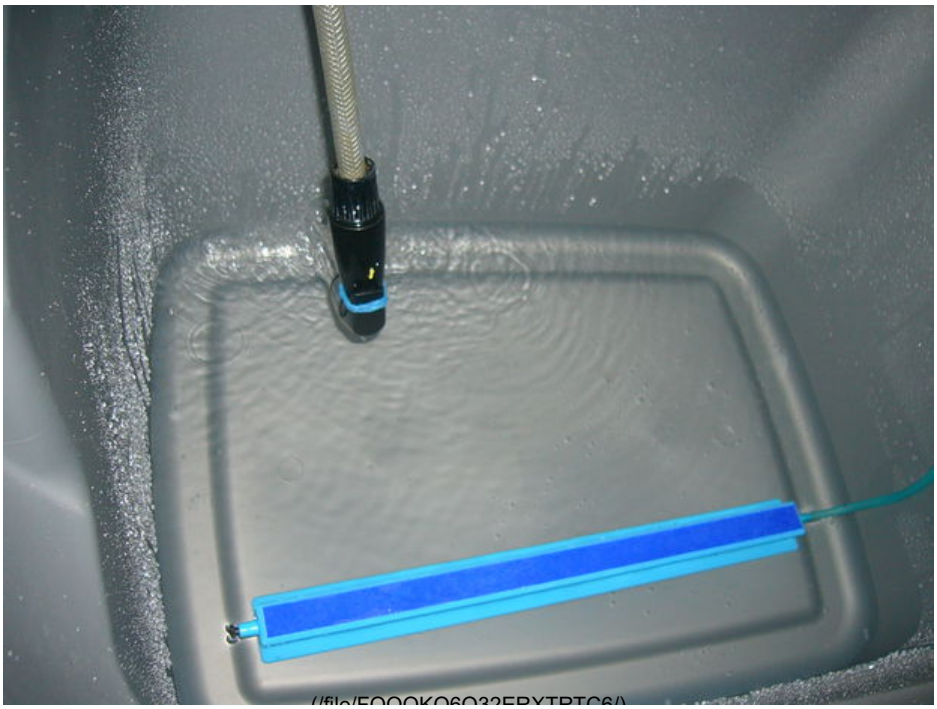


My container has breather holes in the handles, so I plan on running my airline through there. You may wish to cut a hole in the top, side or other location. It is not imperative where the hole is as much as it is functional. Keep in mind that you want to keep sunlight out of the container and keep rainwater OUT.

Prep your air stone(s) as per the instructions on the packaging (typically rinsing and a water soak). Please use new stones to avoid intorducing contaminates.

Connect your air stone(s) to your air line and connect to your aquarium pump.

Step 4: Sterilization



Now, fill your container with water. I am assuming your container is clean and free of debris. Fill to the brim and then ADD 1 TABLESPOON of CHLORINE BLEACH. This is very important as it will kill most intruders you don't want hanging around to cause trouble.

Begin aeration to mix your sterilization solution - put your pots in the container too. After about 20-30 minutes, dump all the water and then allow to air dry completely to get rid of the chlorine.

Once this is done, move on to your initial fill and prepping your medium.

Step 5: Initial Fill

Now, if you've made it this far... you're almost done :D

Follow the directions on your nutrient solution bottle. My directions call for 2-3 teaspoon per gallon for RECIRCULATING systems and 1 teaspoon/gallon for bag systems. The reason is nutrient toxicity (more on that later). I will treat this as a bag system with a little more.

When filled to the proper level, my container will be holding about 15 gallons of water. So that requires 15 teaspoons of concentrate. Converting to CCs (the graduation on my syringe), that's about 73cc. I will be adding 80cc of concentrate solution.

So, fill your container with water - begin aerating and then add the proper MEASURED amount of nutrient concentration. At this point, your garden should be where you want it as water is pretty heavy, this goes double for larger systems.

Step 6: Introducing Plants and Prepping Medium

I will be buying plants that have already started. I want to grow herbs to start off as I love having them fresh for cooking. So obtain your plants. **If you will be starting from seeds, read the next step.**

A special note about Rockwool
Rockwool is made from fiberglass... So precaution must be taken. Wear a dust mask while handling and as instructed, soak the medium in water. Water keeps the fibers bound together which further reduces any inhalation risk. The risks involved are no more than handling fiberglass insulation or accessing an attic with fiberglass insulation - just wear a mask ;)

Using a pot, scoop out pot fulls of growing medium. Rockwool will shrink a little, so add a little more - you do not need this for fired clay. If you have 6 pots, take 6 pot fulls of medium and put it into a large bucket, bowl, etc. Fill this bowl with water and estimate how many gallons you added. Then measure off the appropriate amount of nutrient solution. Completely soak the medium.

While the medium is soaking, wash off all of the dirt from your plants. ALL of it - but take care not to damage the root system. Place a little bit of growing medium in the bottom of a pot, then place the plant in and fill the pot with your medium.

Put the lid on your container, and press the pot into an open hole. Repeat for the rest of your plants.

Step 7: Starting From Seed

If the last step applied to you, you can skip this step -- or read for your information ;)

This requires extra materials - mainly rockwool seed cubes and a method to germinate. But basically, you're going to soak the cubes, drop in a few seeds

and then place in your pots with the main media. Be sure that you can see the top of the seed cube. **NEVER, put a seed into a dry cube as the dry glass could damage your seed(s)**

You're going to need to water by hand to ensure the seed gets the loving it needs. You may want to place a hood over the pot to make the conditions better.

Step 8: Maintenance

Every other week, you need to replace your nutrient solution. Otherwise, the water will become toxic to the plant and it will stunt its growth or cause death. Larger operations don't do this as they have adequate filtering and methods of removing toxins generated by the plants - we don't have this. Besides, the plant is going to soak in those nutrients thus removing it from the water anyway ;)

Monitor your fluid levels in between water changes... If the water gets too low, go ahead and top it off.

When you first start, you want to keep the water level just above the base of the pot. The root system will works its way down into the container (out of the pot) and into the water. When this happens, lower the water level slightly (about an inch below the pots) and make sure to keep aeration going. Aeration prevents the root system from becoming "too wet" and having some of the root system exposed to air helps.

Step 9: Options

So what else can you add on or do?

Well, when you're ready - I recommend adding a water level gauge -- basically just a clear hose that connects at the bottom of the container and goes vertical to show the maximum level. This will tell you when to top off. This will be a future instructable.

Want to grow indoors? You're going to need a grow light -- this adds a considerable amount of cost but it may be the only option for those of you in very cold regions.

A simple valve placed at the bottom of the reservoir can make draining much easier. If you can drain into a bucket, you can use this on other plants in your area.

It is a good idea to monitor pH levels and conductivity of your water solution. I plan on going to my local pool store that does free chemical testing for pH levels. Once I have some information about how the pH of the water changes, I won't need to go as frequently.

Step 10: Pests

This is a whole other instructable which will come shortly. But to give you an idea -- there are plenty of non toxic methods (even non chemical) of dealing with pests that may arrive.

Step 11: Lighting

I do not own a lighting system... I wish I did, but they can be quite expensive as these are very specialized systems. Regurgitating....

What kinds of lighting are used for growing plants?
Most applications use HID (High Intensity Discharge) lights. All HID systems require both a ballast and a bulb in addition to the socket and reflector. You can also use a T5 High output fluorescent bulb which blends the light spectrum. You can use regular T12 fuorescent bulbs for smaller seedlings and cuttings.

T5?
There are two types of T5 bulbs -- one for blooming and one for growing. Compared to their HID counterparts, they use less heat and all of the spectrum output is used by the plant. The ballast works for both types of bulbs.

HID?
There are three main types of HID: Metal Halide(MH), Mercury Vapor, and High Pressure Sodium (HPS). For growing, only MH and HPS are used.

What do I need for HID?
If you're growing leaf/bushy plants (lettuce, greens, herbs) - you want MH all the time. For plants with a vegitative and bloom phase (i.e. tomato, flowering annuals, fruits) - you want to start with a MH and then swtich to HPS while the plant flowers and starts producing fruit. If all you're doing is supplementing natural light - use HPS.

What if I can only afford one light system?
Here are a few options
1. Use a MH system for growth and then an HPS conversion bulb for flowering.
2. Use HPS for flowering and a MH for growth
3.Buy a standard system and upgrade to an enhanced color corrected bulb. Most go for an HPS system because of the higher lumen output per watt compared to its MH counterpart.
4. Buy a switchable system where the ballast can support either type of bulb
5. Use a T5 system with cool spectrum lamps and warm spectrum for flowering.

What is this conversion bulb?
You can only match a bulb to its ballast (ie MH does not work on an HPS ballast). However, special conversion bulbs will work with the opposite type of ballast.

Sizing?
HID System Primary Supplement
100watt||||||||||||||||||||||||1'X1'||||||||||||||||||||||||2'x2'
250watt||||||||||||||||||||||||2'X2'||||||||||||||||||||||||3'X3'
400watt||||||||||||||||||||||||3'X3'||||||||||||||||||||||||4'X4'
600watt||||||||||||||||||||||||5'X5'||||||||||||||||||||||||6'X6'
1000watt||||||||||||||||||||||||6'X6'||||||||||||||||||||||||8'X8'

T5
2 lamp 2 foot||||||||||||||||||||||||1'X2'||||||||||||||||||||||||1'X2'
4 lamp 2 foot||||||||||||||||||||||||1'X2'||||||||||||||||||||||||2'X2'
2 lamp 4 foot||||||||||||||||||||||||1'X4'||||||||||||||||||||||||1'X4'
4 lamp 4 foot||||||||||||||||||||||||1'X4'||||||||||||||||||||||||2'X4'
8 lamp 4 foot||||||||||||||||||||||||2'X4'||||||||||||||||||||||||3'X4'

Reflector shape/size is also going to play a role -- and these are approx.