



TECHNICALHELP4U

How 2 Hydroponics

Hydroponics 101

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How to Series: Hydroponics 101

These plans and instructions can save you considerable amounts of money with your hydroponics system.

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What is Hydroponics?

Hydroponics or Working Water is the art of growing with water and nutrients, in a soil free medium has been around since the dawn of mankind. This method of growing provides you with fast growing, hardy crops.

With total control over the growing environment you have a great deal of control over the outcome. The goal with a hydroponics system is to provide an environment which is as ideally suited to plant growth as possible.

By creating the ideal growing environment, you can have a plant which is as healthy as genetically possible.

The ideal growing environment consists of:

- Giving the plant what it needs, when it needs it, in the ratios it needs with respect to nutrients, temp and light.

Your grow area should be well ventilated, lit and safe.

Benefits:

1. Controlled Environment, results in 2-3 crops grown in the time 1 may grow in soil.
2. Low water usage in long run.
3. Flowers, Fruit and Vegetables are of much better quality grown hydroponically.
4. No soil borne diseases. (slugs, beetles etc)

Caution:

1. Watch your nutrient strength and PH closely.
2. Do not let the reservoir run dry.
3. Flush the system often with clean water.
4. Use quality nutrients.
5. Keep surface temperatures of plant low.

Lighting Basics:

Sunlight and artificial light are measured in foot-candles (f.c.) and the light emitted is rated in lumens. A clear summer day is around 10,000 f.c. and a winter day is low as 500 f.c. The full moon measures less than 1 f.c. Supplementary artificial light, from cool white, high output fluorescent or high intensity discharge sodium vapor or Metal halide lamps is beneficial to plants when sunlight is unavailable but is not a complete substitution.

Intensity of supplementary lighting should be about 800-1000 foot-candles at the plant surface.

The portion of the light band most responsible for photosynthesis measures 400-700 nm. This band is Photosynthetically Active Radiation. Intensity and light period are very critical

Certain bulbs have a peak in this wavelength and this is very useful for optimal vegetative growth.

When using artificial lighting keep an eye on the surface temperature of your plants to keep them from getting too hot.

Keep these points in mind when selecting lighting:

- Fluorescent, Incandescent and halogen lighting are virtually useless to promote chlorophyll production.
- Metal Halide (MH) lighting promotes tight compact growth, with close internodal spacing.
- High Pressure Sodium (HPS) lighting promotes flowering and budding significantly more than the others.

It is beneficial for some crops to use MH for vegetative growth, and switch to HPS for flowering.

Nutrient Basics:

All of the systems presented here consist of a reservoir which holds the water solution, A pump for this solution, a drip tube which connects to the pump and drips the solution on top of the grow media. Drip systems are run continuously for some crops and for a few minutes an hour otherwise. For most of our crops we run for 15 minutes every day. Your goal here is to maintain the proper level of moisture for your plants without letting the roots dry out. Use of our recommended medium helps give you insurance against dry out.

Nutrient solution is water in which are dissolved all the soluble elements a plant needs for growth. The "mix" will depend on the type of plants being grown, their stage of development and climatic conditions. Most nutrient solutions are: Nitrogen, Phosphorous, Potassium, Calcium, Magnesium and Sulphur plus minor elements of Fe, Boron, Mg, Zn, Cu and Molybdenum. These elements are exactly the same as the plant would seek - but might not find - in the soil and the method by which the plant takes up these nutrients through its roots is also similar. However, hydroponically grown plants usually have far less extensive root systems, thus saving time and energy in their growth as they do not have to search for what they need.

The composition of the solution does not need to be exactly correct provided it is not so strong as to be toxic, nor so weak as to offer inadequate nourishment to the plants. If the strength of the nutrient is approximately correct the plants will automatically take up what elements they need in the right proportion. Liquid concentrated nutrient solution must always be kept in two separate containers as the calcium and the

phosphates, if left together, will precipitate into an insoluble form which becomes unavailable to the plants. Nutrient solutions must never be exposed to the light in order to avoid green algae being formed which is unsightly and can upset the chemical formula of the solution.

Most plants grown hydroponically will need these different nutrients added at different stages. This is why we prefer an easy to use kit such as this. We add various combinations of the Basis and Growth during the vegetative stage, then during flowering and fruit production we use the Bloom combined with Basis.

This type of system is very easy to use and almost foolproof which is why we use it!

Some final points regarding your nutrient solution:

- Flush your planters every 4-6 weeks with clean, room temperature water. This is very important so as to remove any built up toxins, salts or nutrients present in the media. A minimum of 1 gallon per planter should be used to flush the system, pour each gallon directly into the planters. Remove all the flush and dispose of properly - not down the drain.
- If your plant species is PH sensitive (many are) then monitor your PH on a weekly basis.

Medium Basics:

The purpose of your medium is to anchor the roots and to allow air to circulate freely through the medium and around the root system. With Cocopeat and Grorox the medium also holds a small percentage of water as reserve. This is important if you pump malfunctions or the electricity shuts off.

Though there are many mediums we only use these two since their blend of properties is best for our uses.

Coconut Fiber is naturally rich in rooting aids as well as in disease preventing compounds. It holds about 8 times its weight in water while providing excellent aeration. It is ecofriendly, degradable and renewable.

Grow Rocks are made from a variety of materials from ceramics to shale. These can be reused many times and are a favorite with commercial growers.

As you learn more about hydroponics, you may encounter a grow medium called Rockwool.

As an environmentally conscious company we do not recommend use of this material due to its inability to break down in the environment and safety concerns.

Material Sources:

Buckets & Large Tubs: Available at any home improvement store

Tubing and connectors: Available at any home improvement store

Dripper Stakes: 'Mister Landscaper' low volume mist irrigation
adjustable 0 - 10 GPH drippers: www.mrlandscaper.com

Water pump: Use small water fountain pumps. We get ours from
www.wishingwellpottery.com

Grow Media & Nutrients: www.futuregarden.com
www.hydroponics.com

Air pump & tubing: Any pet supply store. We use the 10 gal model.

Deep Earth planter

This type of hydroponics planter provides for very deep roots, yielding a tall, lush plant. A deep reservoir combined with the large area for media results in a simple to maintain planter.

This system needs only a small space to operate; a 4' x 4' area would work fine. Each system needs a minimum of 250 W of high intensity lighting (HID).



Parts List:

- 1 ea 5 gallon bucket
- 1 ea 3.5 gallon bucket
- 1 ea 16" long PVC pipe
- @2' 3/8" OD, 1/4" ID PET tubing
- 1 ea 1/2" barbed/screw T "tee"
- 1 ea 1/2" barbed L "elbow"
- 1 water pump (Rio 400 type)
- ~ 4' of 1/2" dia tubing

Drill small holes as shown in the small 3.5 gallon bucket. A star pattern with a hole every 1 inch or so is best.

More holes provide faster drainage. Most plants prefer fast drainage to prevent water logging.



Drill your drain hole in the 5 gal bucket, use the type of drill bit shown for best results. Make certain your drill bit is the right size for the grommet.

Smooth the edges and insert your grommet.



Insert your tube onto the 'L' elbow and carefully slip the elbow into the grommet.

Secure the tube at the top with a tie. Use this to view the fill level of solution as well as to drain or to connect the farms together as one unit.

By adding another elbow, you can connect many farms together in a daisy chain and run as one unit.

Draining view.

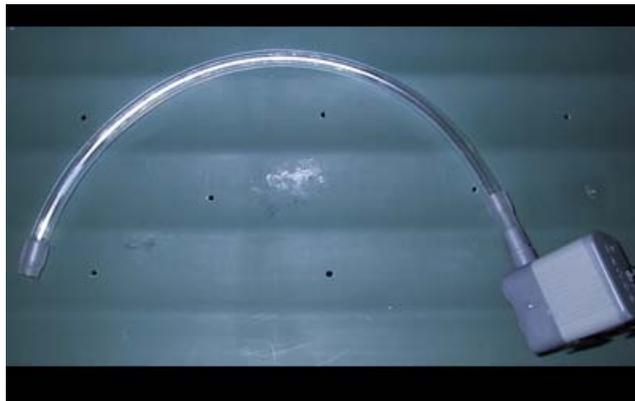
If this area leaks, simply use a waterproof silicone sealant.

If using the H2O farms in the mega design planter. Stop at this point, no drip ring is needed since you get the nutrient pumped from the maggie mae



Start to assemble your Drip Ring. This will be above the hydroponics media and drip solution down. I use the screw tight T for irrigation, you can use barbed T's.

Cut your tube to about 2' and make a circle as shown. Use a small 2" piece on the leg which our pump tube connects into.



Cut your tubing to reach from your pump to 1" above the PVC. It is important to use a water pump which can lift the solution up to 2' (rated as max head). We recommend using the Rio 400 if using just one farm.

If interconnecting the farms, then a much larger unit is needed since you will need to pump solution from one farm to the others.

You may need to use various fittings to get a tight fit, this is ok - it is low pressure.



Drill a hole about 7/8" in the 3.5 gal bucket as shown. Your PVC pipe will slide in here.

Cut the PVC pipe to 18" at a 45 deg angle as shown. This will slide over the water pump output tube to contain and protect the tube during operation..





Place the pump in the 5 gal bucket, run the cord carefully out the top.

Place the 3.5 gal bucket in, running the pump water hose up through the hole. Slide the PVC tube over this. Plug the Drip ring in the top and fill with a gallon or two to test for any leaks. If Ok, turn on and if water is coming through the ring your done!

We recommend filling this with either cocopeat or GroRox. These are both available along with the recommended nutrients at many places on the web. Read more about growing media in our How to section.

Run the pump as often as needed for your crop. Usually 5~15 minutes per day maximum. Use of a timer is recommended for consistent watering.

These systems are very versatile and can support even more than one plant by carefully tying your plants over and careful clipping.

Be creative and connect them together and use one pump for many units. This can be done by eliminating the drip ring steps and using the drip system featured in the Maggie mae to feed each H2O Farm.

Maggie Mae Grow Farm

This planter design is the most versatile and yet still yields multiple large plants. An added benefit of a large reservoir is a key feature as is the ability to use multiple types of planters.

A long reflector 400 watt HPS is the minimum required, with a larger unit recommended. You can really grow 4-6 large tomato plants on this unit!



Parts List:

- 1 ea Large Rubbermaid type Tub
- Lid must be deep and sturdy
- 3 - 5 Drip emitters & tubing
- @5' 3/8" OD, 1/4" ID PET tubing
- 1 ea 1/2" barbed/screw T "tee"
- 1 water pump (Rio 600 type)
- ~ 5' of 1/2 " dia pump tubing
- 1 air pump & airstone (optional)
- Various pots/containers

I like to use the Rubbermaid 31 gal RoughTote brand container. The lid fits very nicely and holds over 200 lbs like this.



Invert lid and drill holes at 1 - 2" intervals. Be careful not to cut any ribs as shown:





Drill 1 hole large enough for your pump tube and then in a near corner another hole the same size for additional drainage. Assemble your water pump and cut a length of tube long enough to reach from the bottom of the tub to 1" above the hole.

Use a Rio 600 pump for larger tubs up to 50 gallons. This ensures all your planters get the needed nutrient solution.

Assemble your feed system by using the layout shown. A ring of the larger tubing with the dripper stakes attached as shown.

Add as many as needed for your plants.
The Rio 600 pumps handle 3 - 6 easily.

These also feed the Deep earth satellites for the Mega Planter





Place the pump in the bottom of the tub, connect tubing and run to hole in top. Connect there to feed tubing. Place assortment of pots with drain holes, most any will do. We find the long 'window box' type planters the most useful.

Fill these with cocopeat or with GroRox.

Run the drip emitters to the pots, fill & grow!!!



If you want to add the air pump, which we recommend in these systems do so now. Simply connect air stone to the tubing and pump and place in water reservoir. Loop the airline with a drip loop when setting it up. This infuses the solution with additional oxygen and further stimulates rapid growth.

The use of a continually running airpump is recommended by us for almost all crops.

The 'Mega' Grow Farm

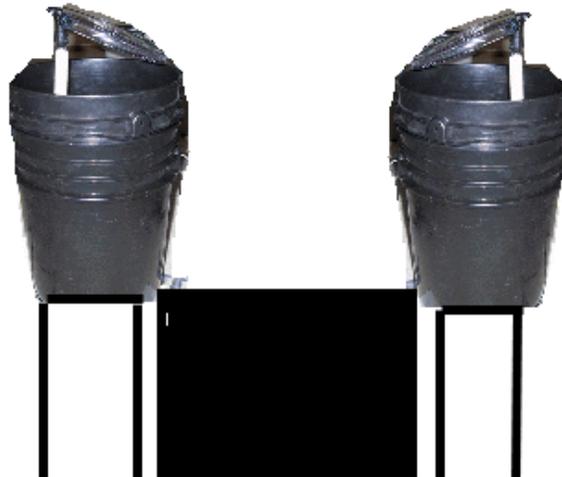
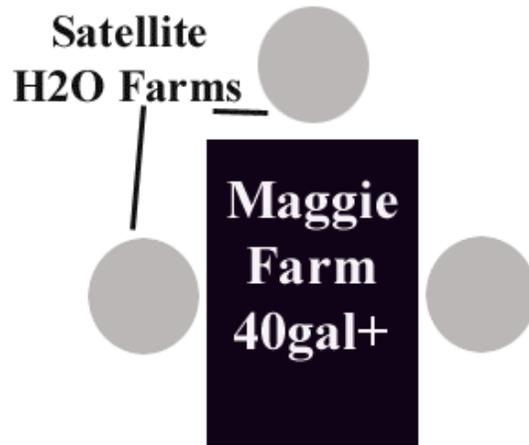
This system is a combination of the prior two systems. By using modular design concepts, you are able to take advantage of all available space to maximize growth.

Before building such a large system, which could support over 6 large plants and many more medium size ones, take into account your available space. New growers underestimate the amount of space mature plants of many species require. Interior grow areas need to be at least 10' x 10' for the larger configurations with a 30 - 40 gallon maggie in the center surrounded by two Deep Earth's on each long side, one on each end for a total of six additional grow containers of one central large maggie. Lighting requirements are very high (two 1000 HPS or 3 430 HPS) are needed, ensure adequate light distribution and heat removal in confined areas.

The heart of the system is a Maggie mae Farm. Around this are the satellites which consist of H2O farms.

With these large systems remember:

- 1: Larger reservoir Maggie Mae systems support more 'satellite' nodes.
- 2: More satellite nodes require more or higher capacity pumps.
- 3: The Deep earth's drain into the Maggie Mae.
- 4: The Maggie reservoir should be at least 30 - 40 gal



Depending on how elaborate a system you decide upon, you have some options as to the setup. The higher the H2O/Deep Earth farms are, the drier they tend to get. Always keep the drain higher than the water level. This setup here has the H2O farms on stands around the Maggie Mae. The use of the plastic modular shelving is good for this purpose. The drain on the H2O farms is turned down into the Maggie Mae top reservoir.

Since the feeding solution comes from the Maggie Mae, no feed tube or drip ring set up is required for the H2O farms. Simply connect an extra mister or drip tube to the Maggie mae feeder ring. Route this to the H2O farm. If the pressure drops too much and you cannot get solution to the H2O farms, try lowering the farms or getting another water pump to supplement.

This setup has been used in a multi light setup, by having the satellites on one side of a light blocking curtain, you can have various lighting schedules and run one reservoir.

Be creative and use it to fill your available area.

Happy Growing!

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