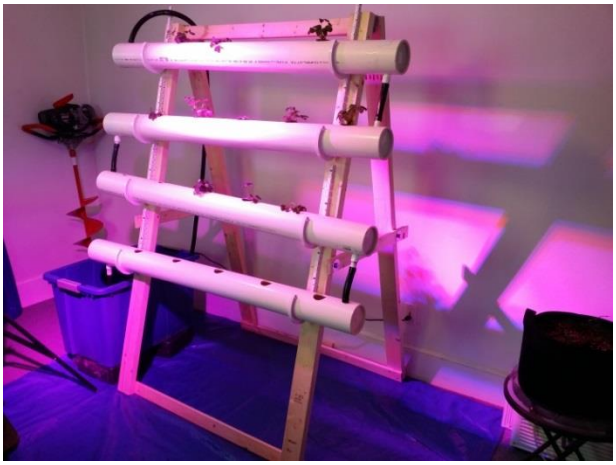
NFT HYDROPONIC SYSTEM INSTRUCTIONS

"It's all about Growing, Making and Eating Green"

These are instructions and plans to build a 6-foot NFT System (Nutrient Film Technique) that will house four, 6'long x 4" PVC pipes which will hold five plants each for a total of 20 plants. The spacing of the plant cups are for larger plants such as strawberries.



This system will also be expandable to twice the size if you decide to add pipes on the back end of the a-frame as well.

Included in the system are detailed instructions on how I built the system, pictures, list of materials, supplies and additional help mates that will get you on your way.

"Congratulations on your decision to purchase this product so you can become more green."

Rene Bastarache, TGG *(The Green Guy)*
http://WhyAmIGreen.com

WHAT IS NFT?

Wikipedia: **Nutrient Film Technique** (NFT) is a hydroponic technique where a very shallow stream of water containing all the dissolved nutrients required for plant growth is re-circulated past the bare roots of plants in watertight channels. In an ideal system, the depth of the recirculating stream should be little more than a film of water, hence the name 'nutrient film'. This ensures that the thick root mat, which develops in the bottom of the channel, has an upper surface, which, although moist, is in the air. Subsequent to this, an abundant supply of oxygen is provided to the roots of the plants.

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EXPANDABLE

This system is designed so if you wish to expand it with four more tubes on the other side it can be easily done by duplicating these instructions. For lettuce, romaine, spinach, or other leafy greens you may put the cups closer together housing up to eight net cups because they take less room.

PORTABILITY

The system is designed to be portable and easy to move. This way you can take it indoors or outdoors depending on your growing needs. The a-frame folds up like a step ladder and the individual tubes can be removed easily without tools with or without the plants still in them.

This is a true “Garden-on-the-go system)

FRAMES

The first step is to build two frames to hold the plant tubes that will be portable and fold up for easy transport such as a stepladder.

You would begin with two, 6 foot 2x4s for the height and screw them together to make a rectangle with two 1 x 3 x 4 pieces of lumber. (Here's a picture Fig.1)

fig.1

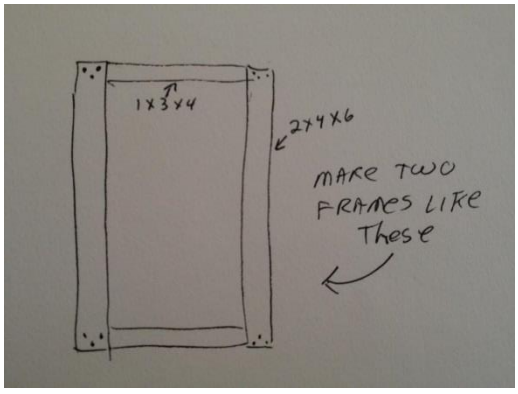

fig.2 Make 2 frames like this

You would then make a second frame the same way he did the first one. On the top of each frame you would connect them with hinges so they can be moved open and closed (see fig.3) the hinges are actually screwed on with the one by three strapping on the inside and the two by fours facing outwards

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fig.3


fig.4

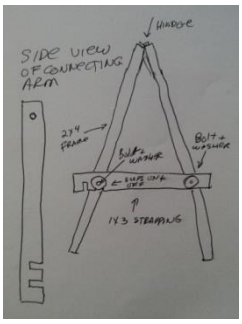

fig.5

On the sides of the frames you would connect a 27” length of 1x3 strapping to make a connector. (See how this is made in fig.4)

You’ll notice that the end of the connector attached to the front part of the frame is the permanent pivot portion of the connector. Notice how there's a large washer between the wood and the bolt to make sure it doesn't fall off.

The back end will have a bolt connected permanently into the 2 x 4 as a way to clamp the board in place when lowered onto it. Before placing the bolt in the back 2 x 4 section. Be sure to attach a large washer so the board will once again hold in place better.

See picture of the slot cut into the back end of this piece of 1 x 3 so it would slide over the bolt and rest (fig. 4). I actually made two of them; one several inches back so if you need to open the a-frame wider it would give you more stability depending on your space. You can make as many of these as you like if you need it even wider depending on your location and possibly windy conditions.

CONNECTING THE J-HOOKS


fig.6


fig.7

fig.8 J-hook

I started connecting the J-hooks (fig.7) at the top having them extends approximately 2 inches above the top however you can start wherever you like depending on your needs and the size of your nutrient bucket. I screwed one side down and the on opposite and I attached the pike but did not screw in the J-hook yet. Instead I placed a level on the pipe to make it slightly tilt downward. You don't want to slant it very much… I just stopped it when the bubble began to move so I knew there was a very slight slope.

You might not want to not tighten your screws all the way at this point because this way you can adjust it even more if you find the water is going to slowly or too quickly once it's complete. Now it's time to screw in the J-hook and attach the one below it.


fig.9

If you look at (fig.8) you'll see that the third J-hook (second pipe down on right) I had the top of the hook touching the bottom of the one above it just to have uniformity through the entire process (see also fig10 below). This gave me the proper spacing that I wanted as well. Screw this J-hook in and once again on the opposite side you would connect your pipe to the J-hook and lower it a bit using the level once again to make sure that it slopes downward in the opposite direction.

So in my picture for instance the top left is high sloping down to the right and then the second pipe is high sloping down to his left and it keeps traveling the opposite all the way down because below the 4" tube will be a small tube attached to both pipes to be able to circulate your water down to the next chamber to create the back-and-forth motion. Continue doing that same process until you've attached all four pipes.

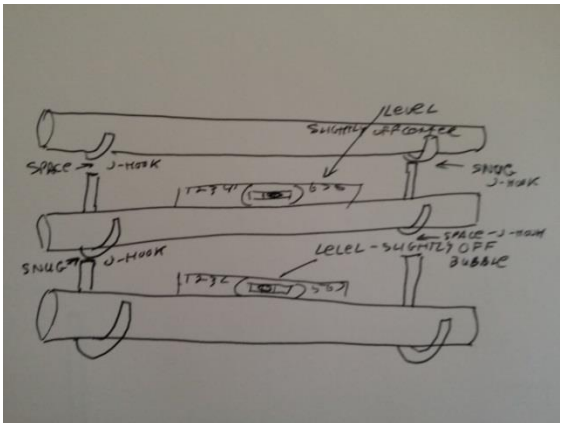

fig.10

There's no need to attach all four if you want it to be smaller; you can make it just three pipes if you like depending on how many plants you wish to grow.

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2 INCH NET CUP HOLES

Now it's time to drill your 2 inch holes in the four-inch PVC pipe. It's important to get them lined up properly so I took the first pipe placed it on my workbench and use a chalk line to snap a straight line on the very top left the right so I can measure my holes and it'll all be in in line with each other on top.

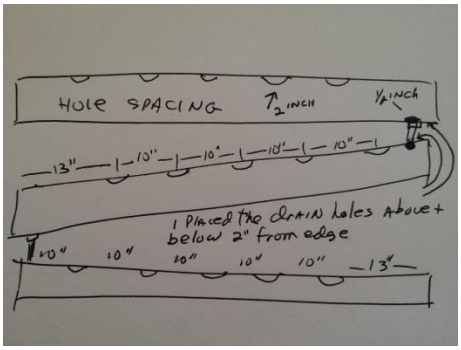

fig.11

If you notice the net cups are not centered. On the down slope of each pipe I set the first net cup 13 inches from center away from the end each net cup from that point forward is only 10 inches on center. The reason for this is so the last plant on the downward slope will have more room to grow its roots without hopefully clogging the drain.

SAFETY ISSUE DRILLING HOLES

I use a 2 inch boring drill to create these holes.


fig.12 - 2" net cups


fig.13 2" boring drill

Note: When using the 2"drill as you would normally the pilot hole will begin and as soon as the outer part of the drill hits the surface of the PVC; I have found it to kick back violently on me. In order to eliminate this problem I use the pilot screw in the middle just long enough to get the hole drilled and stop approximately an eighth of an inch before the 2 inch bore contacts the pipe. At this point I reverse the direction of the drill and continue drilling the remainder of the hole that way. The result will be way less dangerous and a much cleaner looking whole. I also use the same method drilling all my half-inch holes in the PVC pipe as well.

HALF-INCH HOLE DRILLING TIME

Now it's time to drill your half-inch intake hole on the top of the highest pipe which I placed approximately 2 inches from the edge of the pipe.

Next drill your half-inch holes on the bottom of each downslope pipe in the top of each upslope pipe so they can be connected with PVC to create the back-and-forth flow from one pipe to the other. Do this all the way into you get to the bottom pipe which would have a hole on the bottom downward slope to be able to drain into your nutrient solution bucket.

NOTE: Before drilling all these holes decide how you are going to create your connect the pipes. I initially used 1/2 inch threaded PVC connectors to screw into the 4" pipe, then I created a threaded hole with 1/2 threading drill. Keep in mind if you're going to use a half-inch threading drill the hole that you'll have to create on the bottom of each pipe will have to be slightly smaller than a half-inch so the drill will have something to connect to.


fig.14 - ½" threading drill

I then connected a piece of PVC and eight short piece of black hose in the middle connected to another short piece of PVC that slipped into the top hole of the pipe below without gluing it. I did that with each succeeding pipe downward.
The only problem I came up with doing this is that when it was completed the net cups on the top were pointed slightly to the back rather than being where I wanted them right on the center.

…Two ways of handling that problem would be to connect to PVC elbows from the threaded coupling on the top aiming forward and going into the hole below pipe thereby giving it more room to face forward.


fig.15

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…Another way which I did a couple days later was to use one piece of half-inch PVC hype and bend it using a heat gun so it bends forward and then down hopefully creating enough of a bend to have the tops of the net cups aim where I want them and using less PVC pipe connectors. I'm hoping this will also give it a cleaner look as well. It did… see the picture above (fig.15)!

SEVERAL CHOICES FOR TUBE END CAPS

Now were getting ready to connect the end caps to the 4” pipes. Be sure you clean out the pipes first so you don't have PVC debris sitting inside. Once again you have several choices for this
The most inexpensive is to get the four inch insert plastic caps and silicone them closed like I did in (fig.11).

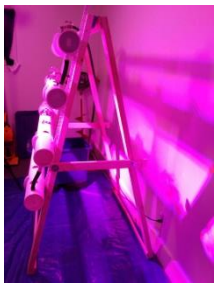
fig.16

fig.17

fig.18

The Second Choice Is to get the 4 inch end cap that slides over the end which will also be glued permanently unless you just put force it tight with pressure so you can open it later to clean it out but this may cause leaking (fig.17).

Another option is to use those red sewer caps I believe they call them compression caps that you can screw in tight or loose by expanding the rubber bushing within (fig.18). Those will give you easy access to the entire pipe however they are a little over seven dollars each when I checked Lowe's which I find to be quite expensive. One of my purposes with this program is to build an inexpensive system that anyone can do.

SYSTEM RESERVOIR

Now it's time to connect a reservoir to the system. I purchased a 29 gallon blue tote from Walmart for this purpose. This way I would have plenty enough liquid it for nutrients and I would feel safe that the pump would be well submerged at all times.

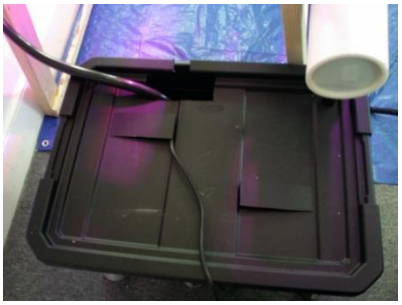
fig.19 Slots work well for indoors but holes would be better outside

I already had a 250 gallons per hour submersible pump from an aquaponics system I built a couple years ago so I used that one. When purchasing a pump be sure to check how high it will pump. My pump said it would pump 5'8" so I figured it would be fine since the entire system is only 6 feet tall and the top pipe is below 5'8". The problem was when I had the pipe go up over the top of the a-frame and into the top pipe so the hose wouldn't buckle giving it enough added inches to make it over 6 feet. The pump wasn't able to pump that high… To remedy this I placed some solid objects underneath my reservoir to elevate it a few inches so it worked fine. I'll still be purchasing a pump that goes over 6 feet just in case this one works too hard.


fig.20

Now from the pump I have a black tube that connects and goes all the way up over the a-frame and into the top tube and just sits there loosely so it can be pulled out. You'll notice at the end of the tube I have a couple inches of half-inch PVC pipe so it slides in and out easily. Since it's a half-inch hole drilled into the four-inch tube, the half-inch PVC pipe fits very snug (fig.20).

TESTING THE SYSTEM FOR LEAKS

From this point I tested the system with a tarp beneath it and let it run for approximately 12 hours to make sure it didn't leak. To my surprise it was watertight and I was very pleased about that.

At this point you can watch the water flow back and forth to make sure it's not too deep, too fast, or too slow. The way you could adjust that is by adjusting the output of the pump to slow down or pick up the

water flow or by moving the levels of your pipes to give you less or more incline depending on what you need.

Once you've decided that your pipes have the proper incline be sure to tighten the screws in the j-hooks so it doesn't fall apart later on. Your drainage pipe from the bottom to going into the reservoir should be cut just short enough that it rests above the water level in your nutrient top. This will give you additional water flow as the water drips out. I'm also going to connect a half-inch T going up the intake pipe connecting to another tube that goes back down into the nutrient top. This way I can adjust the flow of the water and nutrient solution so some of it returns back to the bucket giving it a second waterfall creating more oxygen.

The reason for this is so I don't have to buy an additional air pump and only have one electrical item going into my system.

DRILLING HOLES INTO YOUR NUTRIENT SOLUTION TOP

Once you get your system up and running and everything is where you'd like to have it; now is time to drill permanent holes in your cover to allow your intake and output hoses to fit through the lid. I like to create them as close to the size of your intake and output tubes as possible to eliminate as much possibility of bugs entering the container as I can and also to help keep the tub insulated so it takes longer to overheat in the summer months. Also it decreases the amount of algae forming from so much sunlight or even grow lights if inside hitting the water. It builds up quickly.

INTAKE OF INSULATION

If you're running your system outdoors and you think heat may be a problem you may want to dig a hole to insert your solution tub into the ground which would help to cool it off. Another option would be to create a box around it and line it with Styrofoam on the top and sides to help insulate it from the heat. It's more or less a trial and error process that you'll be going through your first year.

PLANTING

Now it's time to plant your seedlings into the tubes. I initially planted my seedlings leaving just the clear water without solution for a couple days so as to shock the plants as little as possible. A day later I did add some solution at about quarter strength.

I purchased strawberries from Lowe's at a good price. They were three dollars per bucket and each bucket had to strawberry plants. My first step was to remove all the dirt from the root balls and then I soaked them in clean filtered water. I then placed my smaller plants in the four-inch net cups and rather than using any type of media I used grow grips which is a sponge-like product designed to grab the stem of your plant and hold them in the net cups. There is really no need for any other growing medium.

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Update: most of the strawberries done with the grow grips died so I replaced them and used lava rock as a medium to hold them in the net cups. It worked much better for me. Costly mistake but that's how we learn and "grow".

GROW LIGHTS

fig.21

Since it's April 4th and this still snow outdoors I decided to leave my in the house until it gets warm outside which may be another month and a half to two months. Hopefully I'll have strawberries by then. Because of this I purchased for grow lights online (the pictures show to however I purchased two others this evening.) So I can give them all the nutrients and full-spectrum from the sun that they require.

I found them not to be too expensive and I also plan on growing plants right through the winter after the season so I can have fresh, organic fruits and vegetables year-round.

THAT'S ALL…

That pretty much covers everything I did for this system.

If this something that you have difficulty with or don't understand please let me know as it may be something good to add for others to read as well. I'd also like to see pictures of your system if you decide to create one that I can put on my YouTube channel to show others how great you did.

Best of luck in creating your NFT system and remember; *"If you're not growing you're not green."*

NFT MATERIALS LIST

My costs are included to give you an idea of expenses. I purchased most materials from Lowe's, Walmart and Amazon.com

Two 4" PVC pipe -10 foot long for the grow tubes $16.00ea
One ½" PVC pipe -10 foot long $2.50ea

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Two 3" door hinges $2.32ea
Four ½" x 2 ½" Hex bolts for sides to collapse .46ea
Four ½" x 2" large fender washers .22ea
Four, 2 x 4 x 8 studs for a frame $3.05
One 1 x 3 x 8 wood strapping for sides $6.36ea
20 -2 inch net cups $10 – 50 pieces (Amazon)
Half-inch PVC pipe elbows (slip) .46ea
Four threaded PVC extenders (threaded) .70ea
½" ball valve $2.68ea
10-four-inch PVC test caps $2.17ea
20 - 30 gallon tote $20.11
240 + gallon submersible water pump that has a height of at least 6 feet $12. - $20.
Eight - J-hooks pipe hanger DWV .86ea
PVC primer & all-purpose cement $9.98ea
Silicone for end caps $6.00 average
11' Half-inch black oxygen circulate black hose - $5.22 for 11.5 ft. (Amazon)
6 screws for hinges – I used #8 x 1 1/2" stainless screws for the entire system since I have thousands of them left over from a boat building project… You can use whatever works for you…
16 screws for J-hooks
24 screws for A-frame

ADDITIONAL SUPPLIES LIST

Tape measure
Level
Self-tapping bit – for ½ inch pipe
Two different size drills - one the same size as the bolt to slide easily and one to the hole
Saw- miter saw works great
Heat gun to bend PVC pipe
Metal spring to fit into a ½" PVC pipe to bend it
Nutrient solution-I use *(Gen. hydroponics MaxiGro for gardening - 2.2 pounds)* $15.34 on Amazon
2 inch hole drill for net cups

CAN YOU HELP ME GROW?

If you enjoyed these plans and would like to see more information and plans in the future it would really help me if you'd go to my YouTube Channel and subscribe at:
https://www.youtube.com/channel/UC99qA3pCW0u0-J2r49-naNA?sub_confirmation=1

Thank you, I really appreciate your support.
Rene

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