

DIY MINI-AQUAPONICS - TWO BOTTLE SYSTEM

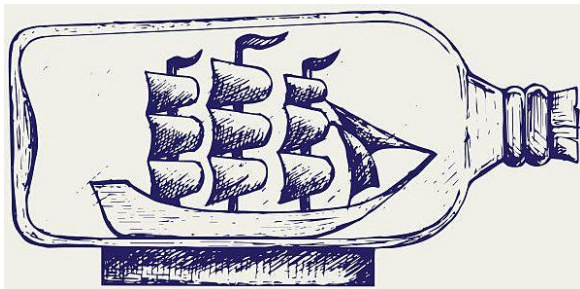
“It’s all about Growing, Making and Eating Green”



This is the third mini-aquaponic systems that I've created. The first was created after watching a video by Vinil Ratnakaran of Bangalore India. Upon creating one similar to his I added a bell-siphon and an automatic timer.

Next, I created a second one, similar system to my first however I made it a vertical system adding two additional growing spaces do it. I added a bell-siphon on the top tier and a flushing system on the second and third tier.

While creating this I let my mind roam and thought it would be nice to create a third system with two bottles. In my mind I imagined a system that would have the bottom or capture bottle resemble a "ship in a bottle" type look.



As a result, I took two bottles and placed them on a rack sideways so I could have the top one containing

DIY MINI-AQUAPONICS - TWO BOTTLE SYSTEM

growing medium, the bell-siphon and plants draining into the bottom one that had fish in it and was decorated with rocks, plants and a sunken ship which is what I decided to create.

Now you have the reasoning and method behind my madness (or at least part of it) so let's move on and begin your project.

NOTE: As you may realize I'm offering these DIY plans for free as a way of sharing this knowledge to help people learn that they can be GEREEN no matter where they live and in virtually any situation.

All I ask is that if you do build a system from these plans that you sent me pictures of your build or a video so I can add it to my site. I will include a link to your site as the builder if you wish which will help to promote both of us. I also ask that you would share my site with others as the opportunity arises.

Thank you in advance.

*Rene Bastarache
(the green guy)*

What is a Mini Aquaponic System?

Aquaponics is a form of hydroponics that requires live fish to be included in the system as a way of using their excretions for fertilizing the crops that you're growing in it rather than adding any type of outside fertilizer or even nutrients to the water.

It's a completely closed system that requires nothing else to grow with the exception of fish food.

- The fish would eat the food and create fertilized water.
- Bacteria breaks down the "fish stuff" to create nitrates.
- The nitrates are then circulated to the top portion of the system.
- It's then distributed to the plants as fertilizer.
- The plants in turn grow happy and create oxygen.
- And this drains back to the fish again to start all over.
- It's a completely symbiotic balance of "man-made" nature.

DIY MINI-AQUAPONICS - TWO BOTTLE SYSTEM

In a commercial aquaponic system farmers will grow their crops and often-time grow types of fish that they can sell at market such as tilapia, freshwater cod or even catfish.

A mini-aquaponic system works in the same manner however is designed on a much smaller scale so you can build one and use it virtually anywhere. I've placed mine on coffee tables and even on the floor in front of the living room window as a way to get more light and spruce up the room.

You'll find them to work great for growing herbs for cooking and other smaller crops due to their size.

Since it's so small, rather than using tilapia or catfish we've chosen to use goldfish as they can live in virtually any type of water, temperature and create lots of excrement or as my wife calls it: "caca".

Isn't this whole concept sounding appetizing now?



DIY MINI-AQUAPONICS - TWO BOTTLE SYSTEM

LIST OF MATERIALS



- Two 5-gallon water bottles with caps (the types they used in water coolers)
- Something to cut them with (I purchased a Dremel tool with accessories, you can also use a jug saw)
- Masking tape - I like to use the wide one approximately 2"
- Pointed tip erasable marker
- Tape measure
- Sandpaper or the drum sander for the Dremel tool
- Spray paint - black matte or semi-gloss finish – I used Rustoleum 2x
- Dimensions of PVC required: (see above picture)
 - $\frac{3}{4}$ " PVC pipe - I purchased two 10' lengths and cut them into the following dimensions:
 - 10 pieces of $\frac{3}{4}$ " pipe cut into $1\frac{1}{2}$ " lengths to connect fittings to each other
 - Four pieces of $\frac{3}{4}$ " - $6\frac{1}{2}$ " pipe
 - Four pieces of $\frac{3}{4}$ " - $9\frac{1}{2}$ " pipe

DIY MINI-AQUAPONICS - TWO BOTTLE SYSTEM

- Four pieces of $\frac{3}{4}$ " -15 $\frac{1}{2}$ " pipe
 - Bell siphon mechanism and "media straining" guard
 - One 8" length of $\frac{1}{2}$ " PVC pipe for the Bell-siphon drain
 - Two $\frac{1}{2}$ " PVC elbows to direct the water below the Bell siphon.
 - 16 $\frac{3}{4}$ " T-fittings
 - Eight $\frac{3}{4}$ " end-caps
- 3/4" Rubber grommet to connect the bell-siphon pipe to the bottom of the top. You'll need to insert a $\frac{1}{2}$ inch PVC pipe through the bottle. Remember the pipe will need a bit larger grommet to fit and the grommet will need a slightly larger drill to fit.



- Hole Drill: I used a 1" hole drill. Try a practice cut in a worthless piece of plastic first as this will be a tight seal. I sanded the edges a bit to give it a little more play. This is to create the hole in the bottle for the bell-siphon pipe
- Hot glue or silicone
- PVC pipe for the bell-siphon and the entire frame of the system
- PVC pipe glue
- PVC pipe cutter or saw
- Submersible water pump
- Less than 2 feet of Black plastic tubing for pump – $\frac{1}{2}$ "



- Half-inch plastic T- fitting to connect to the hose

DIY MINI-AQUAPONICS - TWO BOTTLE SYSTEM



- Nail polish remover
- Electronic timer
- Hydroton pebbles



- Water
- Plants – whatever you want to grow
- Fish
- Aquarium ornaments if you desire
- Aquarium rocks
- Jigsaw or Dremel tool

INSTRUCTIONS

Step One: Cutting the Bottle

Once you have all your materials collected your first step will be to begin cutting the openings in your water bottles.

Here are your choices:

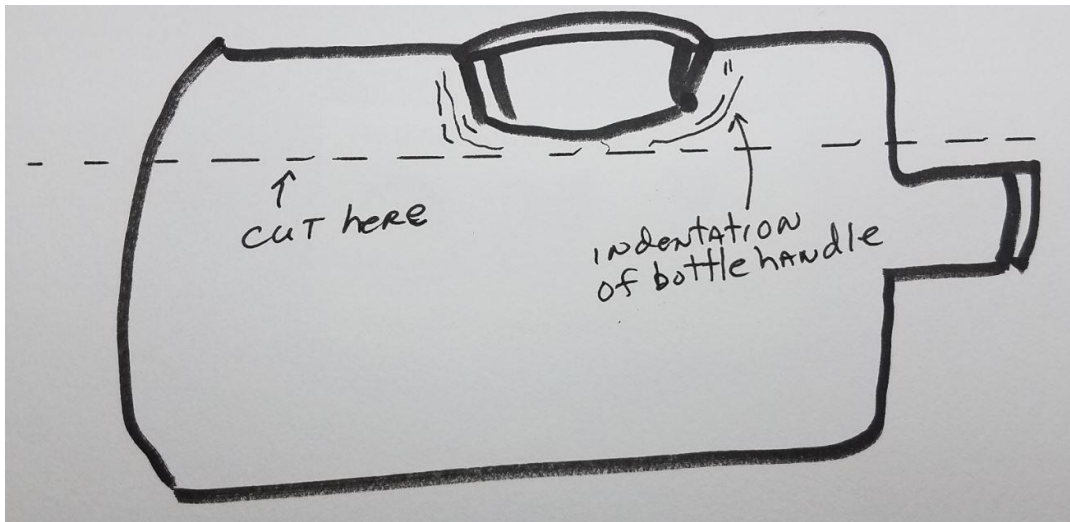
I have decided to cut them the way I did as a way of keeping the holes large enough for me to reach my hands in if needed however small enough to create more difficulty for my cat to have free reign.

DIY MINI-AQUAPONICS - TWO BOTTLE SYSTEM



I cut the top bottle for the plants in a similar manner because I felt it would give the bottle more stability with the weight of the rocks and water inside of it; then later found that it didn't really matter.

In a future build I would probably cut the entire top of the bottle straight across rather the holes I did such as in the drawing below:



I like to keep as much water in the bottle as possible therefore I'd cut the bottle just below where the indentation of the handle is. This gives me more room in the bottle and makes for a straighter cut because there are so many bends in the handle portion of the bottle.

I used a Dremel-tool to make my cut as it was circular in nature however if I were to cut it straight across I would probably use my jig saw instead. I did

DIY MINI-AQUAPONICS - TWO BOTTLE SYSTEM

initially start cutting my first model with the jig saw which worked well however once I had completed the cut I realized that the foot of the saw ended up scratching my bottle approximately 1/4 inch from where I was cutting.

If I were to do this again I would first draw with a marker exactly where I wanted to cut and I would use masking tape to tape the bottle all the way up to that mark so the foot of the jig saw would not scratch the bottle as it's guiding me along the cut. I think this would make a cleaner, quicker and easier cut in the long run. *(If you try it that way let me know your experience)*

I spent many hours searching and making phone calls trying to find free empty bottles or extremely low cost ones to make my projects and finally found that the best place to get them was at Walmart for approximately \$7.00 each. I did find a bottle redemption center that gave me my five initial bottles however they were quite scratched up and several years old.

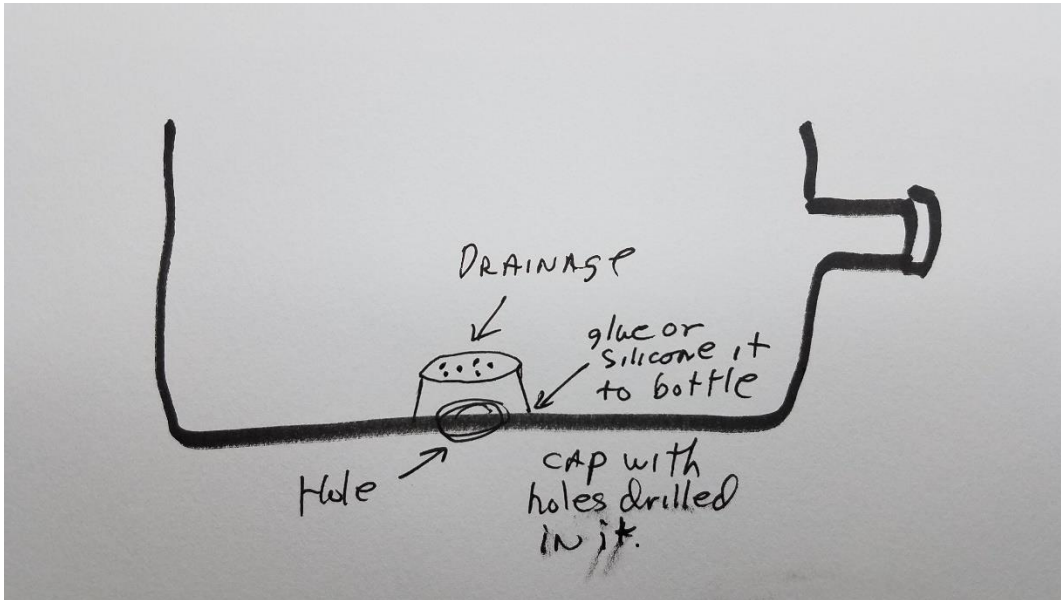
Once I had finished the cutouts on the bottles I then used my drum sander from the Dremel tool to sand down the sharp edges. I finally ended up using a piece of sandpaper to complete the job being careful not to scratch the clear finish of the bottle in the process.

Step Two: Drilling The Hole For The Bell Siphon In The Top Bottle

NOTE: If you don't want to use a bell-siphon in this system, it's not necessary. You can just create a drain to flush the water below however you'll still need to create a strainer so the water drains through.

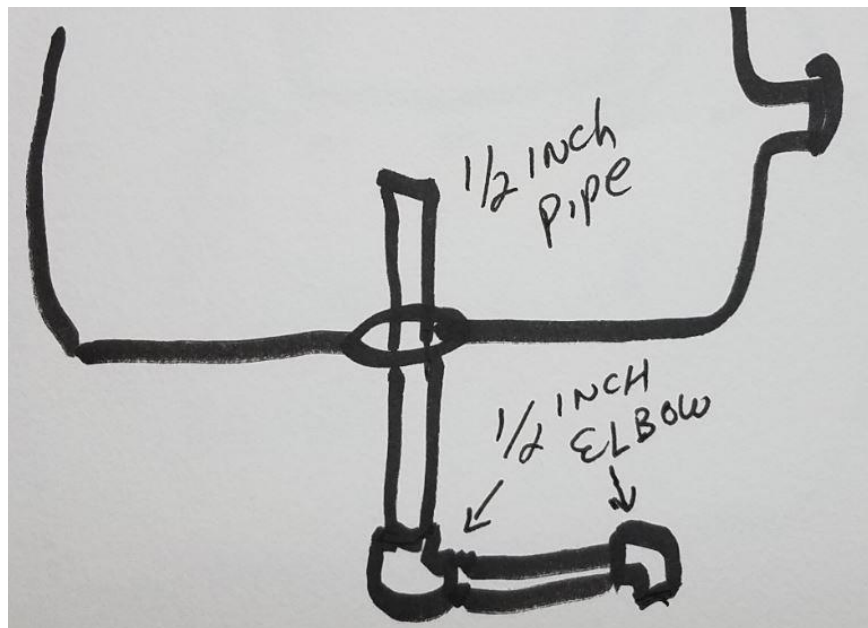
You can take a piece of plastic and drill holes in it or even the top of an aerosol can. Drill holes in it and glue it over the hole using a food safe silicon.

DIY MINI-AQUAPONICS - TWO BOTTLE SYSTEM



The pipe that will go through the bottom of this bottle will be your one half inch pipe. The bottom of the pipe will extend down as you see in the picture below connected to an elbow with another piece of $\frac{1}{2}$ " pipe to a second elbow which will:

- Slow down the descent of the water.
- Create a back draft to help the bill siphon work properly.
- Direct your draining water to the side of the tank so the fish can have a less disturbed swimming area.



DIY MINI-AQUAPONICS - TWO BOTTLE SYSTEM

You'll need to drill a 1" hole that will fit your $\frac{3}{4}$ " rubber gasket to the bottom of your bottle so you can slide your $\frac{1}{2}$ " pipe through it to create the drain via bell-siphon.

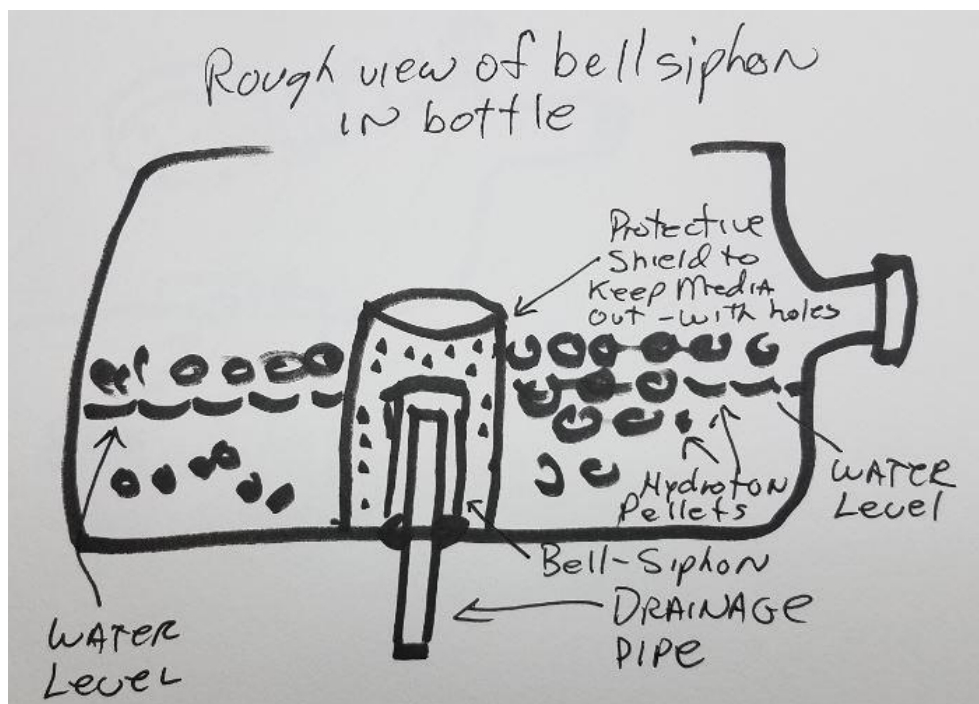
Be very careful putting in the gasket and especially pushing in the pipe through the gasket as if you push too hard you can easily crack the plastic of the bottle.

It's important to sand off any rough edges from where you drilled the circle so it's smooth. Keep in mind before you insert the pipe into the gasket that it will be an extremely tight fit and may seem like a near impossible task to do.

The easiest way to do it is to wet the pipe slightly and the inside of the gasket and also rub some dish liquid soap on both. Doing this you'll find it easier to insert the pipe and slide it to the proper distance.

Once you've inserted the pipe, lower it to the right height inside your bottle so the top is approximately $1\frac{1}{2}$ " below the height of where you expect to have the top of your hydroton or media.

Your bell-siphon will then fit over this pipe approximately a quarter inch higher than the top so the water can siphon through and you'll still want your rocks to be above that as you can see in the following diagram.



DIY MINI-AQUAPONICS - TWO BOTTLE SYSTEM

Your pipe should probably extend approximately 8 inches below the bottom of the bottle at this time. If it is much longer than that you can cut it with your pipe cutter to shorten it later on if needed.

The elbow piece connected to the other half inch pipe and the second elbow can be fitted once you have your frame and bottom bottle assembled so this way you can measure how high or low you wish it to be.

Step Three: Painting The Bottles

Although painting the bottle is not required, if you are planning on having it in a sunny window, outdoors or a very light location there's a strong chance of algae taking over your system. So it's a good idea to paint it black to prevent this.

You can see how I painted mine however there's no requirement of how this should be done.

I feel it is important to paint the majority of the top bottle if not all of it because water will be going through your entire media and be exposed to the light.

As for the bottom bottle it all depends on whether you want to have a clear front so you can view your fish or if you don't care you can paint the entire portion.

One thing I wished I had done as an idea for you is to paint the back of the bottom bottle with a brighter color and maybe even some colorful aquatic plants so when you look through the front it would look pretty and bright. Once you've done that, then you can paint black on top of your creation so the light will not pass through but you can still see brightness looking inside the bottle. Your creation will show from the inside of the bottle and the outside will still be black.

I didn't do that with mine so it's very dark inside the bottle and I must get close to it to be able to see the fish. If you decide to be creative and do something like this please send me a picture.

I did remove the bottle caps before I painted the bottles so when I put them back on it created a crisp color contrast.

DIY MINI-AQUAPONICS - TWO BOTTLE SYSTEM

Step Four: Cleaning or Painting Your System Frame

Before you begin assembling your frame you may want to use the nail polish remover so you can remove all of the black print on the PVC pipe and on the fittings.

You'll find there's quite a bit of it and I had to use about one half of the bottle to remove it all. If you do a good enough job removing it you may not have to paint it. Once you complete that task you can decide whether you want to assemble your frame the way it is or if you'd like to paint it.

I decided to do a good job with the nail polish rather than painting it because it would've created lots of problems painting it without getting white paint on the already black painted bottle.

Step Five: Creating The PVC Stand

By studying the picture below you can actually see how I placed the pieces to create the stand.

Once I had all the pieces cut out in the measurements found in your materials list above, I put the stand together very loosely so I could see how it would work.

You'll find that once the stand has been put together and glued you will not be able to put the bottom bottle into the stand therefore you'll have to build the stand around the bottom bottle. This is why I assembled it initially without glue.

Once you find that you have all the pieces and understand how it goes together you can then start gluing your pieces.

Things to keep in mind while gluing:

1. I decided that I wanted to leave the frame white and not paint it. Because of this I decided not to use the PVC primer which is a purple color and just use a glue instead. I found that the glue will set extremely quickly even without the primer. I imagine the primer is to ensure that you have a good watertight seal however these pipes will not be used to run water through.

DIY MINI-AQUAPONICS - TWO BOTTLE SYSTEM

2. Keep in mind that as soon as you glue these pieces they will set up and become secure in just a few seconds so you'll need to *move quickly*.
3. I began with the cross members of the frame in the back, front, then the sides of the bottom level first.
4. Be sure to have your tape measure handy so that the distance between each opposite side is the exact same.
5. For instance the 15 ½" pipe will stick into the socket on both ends about ¼" – ½" deep. So when you put them in both ends you'll probably have 14 ¼" to 14 ½" showing between the T- joints. If it happens to be 14 ½" be sure that both sides as well as the sides on the top tier on the exact same measurements and keep in mind you'll have to do this quickly because once the glue sets you will not be able to take it apart.

I found this out the hard way... Just in case; it may be a good idea to buy several additional joints so you can have them on hand and not have to run to your local Home Depot to get one because you couldn't undo it.

6. Keep in mind that the longer 15 ½" sides will have to be above the 6 ½" crossmembers in the front and back. The reason for this is that your bottle will rest on top of the longer ones. If you put the shorter ones on top your bottle will have nothing to rest on.



DIY MINI-AQUAPONICS - TWO BOTTLE SYSTEM

7. Unfortunately there was no technique to ensure that you get everything exact because some of the joints are tighter than others and will not allow you to put each pipe in the exact same distance so you'll have to be creative and quick in your gluing process. I purposely did not put the joints all the way in so I'd have some playroom just in case the sides didn't match. I used a rubber mallet to pound the sides in if I needed to get it tighter.
8. I glued and caps on all four bottoms and tops to make it look finished however you may want to find a way to connect wheels to the bottom because I found that the system is quite heavy when it comes to moving it afterwards, especially to do so when it's full.

Now you're ready to begin!

Keep in mind that the reservoir bottle that will be holding the fish needs to be in side the bottom portion of your frame before you glue it together. Also be sure that the black paint from the bottle is dry before you start putting the frame together.



DIY MINI-AQUAPONICS - TWO BOTTLE SYSTEM

Step Six: Assembling the Bell Siphon and Drainage Pipe

Here's the free pdf link I used to create my bell-siphons while it's still available online: www.ctahr.hawaii.edu/oc/freepubs/pdf/BIO-10.pdf

You can also find many additional webpages, free information and videos on building your own bell siphon in the internet.



Almost looks like explosives but they “are” bell-siphons!!! 😊



The bell siphon goes over the out-take pipe and sits freely on the rubber gasket. The strainer pipe then goes over that. Be sure to hold it down when

DIY MINI-AQUAPONICS - TWO BOTTLE SYSTEM

filling the system with media so you don't get any inside the pipe or underneath it.

Be sure to practice and make sure it works well before adding your media.



Step Seven: Washing Everything and Testing Your System

Now it's time to wash everything really well, strain all the dust out of your Media and add your submersible water pump.

Make sure you buy a pump that has enough height to be able to pump the water over your top bottle wall. 2" of Head would do it for this system.



DIY MINI-AQUAPONICS - TWO BOTTLE SYSTEM

I purchased the 80GPH Submersible Water Pump Aquarium Fish Tank Powerhead Fountain Hydroponic – I got a two-for-one deal on Ebay for \$11.76

- Max Head: 2.2 ft
- Tank Capacity: 5 gal.

Use the larger of the two fittings as you see connected to the pump in the picture, connect it to your ½” tubing.

The pump goes into the bottom of your water reservoir and the top goes into the top so it pours onto the media. You’ll need to find a way to secure the top of the pipe so it’s doesn’t move when the water goes through it and you have a flooded home. You can use zip-ties or an elbow of some sort to hook it to the side of the bottle. I heated the tube until it bent into a hook shape and connected it to a T-fitting.

Step Eight: Connecting a Timer



I used the “Timer Outlet, Nearpow Multifunctional Infinite Cycle Programmable Plug-in Digital Timer Switch With 3-prong Outlet for Appliances”

DIY MINI-AQUAPONICS - TWO BOTTLE SYSTEM

It's \$13.99 on Amazon at the creation of these plans. Do a search and you'll find it.

You can use any type of timer you want and how often to cycle it will be a matter of trial and error for you. Each system is different depending on the amount of media, filling time, type of pump and how much moisture your plants need. Mine cycles on for 1.50 minutes every 45 minutes round the clock but I have another that goes every hour.

Each timer will have instructions to set them up with the unit and you can always find YouTube videos online to help.

Step Nine: The Finishing Touches

Now it's time to add fish, decorations, plants and an aerator if you need one...

I added the fish first for a week or so to build up the nitrates and give the plants a head-start. Although it takes about 2 months to get the nitrates effective; I'm always too impatient to wait that long...

Be sure to wash any decorations and if the rocks are not aquarium safe to make sure there's nothing in them that could hurt your fish like lime, salt or harsh minerals.

Step Ten: Take Pictures or a Video and Send Them to Me

1. I'd love to see how your set-up turned out. Drop me a line with your progress and end product at:
e-mail at: renebatarache@yahoo.com
2. Help me to grow by sharing my site with all your friends.
3. If you haven't done so please give me a thumbs up and leave a comment on my page so I know you're interested in building the system.

I do this for free so the thumbs up and comments really help me grow... Thanks!

DIY MINI-AQUAPONICS - TWO BOTTLE SYSTEM

Rough Cost of Materials:

I kept receipts for most of my materials and I'll guesstimate for the rest of them. This is cost of materials to build and not the tools you may already have to build like saws and tape measures...

• Two 5-gallon water - \$7.00 each Walmart	\$14.00
• Masking Tape	\$3.00
• Spray paint-black matte or semi-gloss finish	\$3.75
• Two ¾" PVC pipe, 10' lengths	\$11.00
• One ½" PVC pipe - cheaper to get a full length	\$2.50
• 16 T- fittings	\$9.44
• Eight ¾" end-caps	\$5.00
• Two ½" PVC elbows	\$1.00
• ¾" rubber seal / grommet	\$.75
• PVC pipe glue	\$6.00
• PVC pipe cutter or saw - Home Depot	\$14.00
• Submersible water pump	\$6.00
• Black plastic tubing for pump-half-inch	\$2.00
• One ½" plastic T-fitting to connect to hose	\$.75
• Nail polish remover	\$1.00
• Electronic timer	\$13.00
• Hydroton - \$32 for large bag for all 3 systems	\$11.00
• Water free unless you buy it...	0
• Plants - \$3.00 each	\$6.00
• Fish	\$10.00
• Aquarium ornaments if you desire	\$19.00
• Aquarium rocks	<u>\$5.98</u>
Total:	\$155.17

This system may seem expensive at first glance however keep in mind that this price also reflects the cost of:

- The fish,
- Plants,

DIY MINI-AQUAPONICS - TWO BOTTLE SYSTEM

- Aquarium rocks
 - Electronic timer
 - Hydroton
1. You may already have some of these on hand or have alternatives that you can use for each.
 2. Some people will take fish from their own aquariums or other systems.
 3. You may be growing your own plants and will save cost there.
 4. You may want to use river rocks or some other media you have on hand.
 5. You can also use river rocks rather than aquarium rocks for the bottom tank as well.
 6. If you don't use a bell-siphon you'll have no need for an electronic timer.
 7. You may already have a PVC pipe cutter or you can just use any saw that you may have which reduces another \$14

These items alone costs approximately: \$59.98

That covers more than half the cost of the previously mentioned expenses leaving the cost of the entire system at:

Only \$95.

Congratulations!!! [You Just Created Your Very Own Mini-Aquaponics System!](#)

Best of Success,

Rene Bastarache, CI

<https://WhyAmIGreen.com>