

## HOW TO BUILD A SMALL LETTUCE RAFT SYSTEM



*This is a lettuce growing machine!* If you start some new seeds every 30 days, and replace each head of lettuce as you harvest with a new baby seedling, you can have a perpetual supply of crisp, healthy salad greens. The setup we provide here can grow six heads of lettuce at a time, and the whole unit costs less than \$50 in early 2009 (not including a lamp and food).

Most of the materials are available from Home Depot or Walmart. A few items must come from a hydroponics supplier (but we give you a good cheap source).

### **SUPPLY LIST:**

- ◆ Shallow reservoir pan (Sterilite 34 qt Latch Box tote works well) this bin is about 23½ X 14½ X 6" deep on the inside [Walmart]
- ◆ Can of cheap flat back spray paint [Walmart]
- ◆ Aquarium air pump, 6 feet of airline tubing, "T" connector & 5" airstone [Walmart]
- ◆ Rigid styrofoam sheet, 1-1/2 to 2" thick; cut a piece to fit inside the reservoir pan. You can buy a 4X8 foot sheet at Home Depot for about \$15. It seems a shame to buy a huge sheet of it for one little piece, but you can always save it for use later when you are ready to build your big 2X4 foot lettuce raft! *An alternative is to cut a slab from an old styrofoam ice chest of the right thickness.*
- ◆ 6- 2" net cups: <http://www.hydroponics-simplified.com/cheap-hydroponics-supplies.html#raft>
- ◆ Small bag of LECA (Hydroton or clay balls), [hydroponics supply or ebay]





Styrofoam building insulation, 2" thick



### **TOOLS NEEDED:**

- ◆ Power drill; 1-3/4" or 1-7/8" hole saw & a 2" hole saw (Borrow a hole saw kit or buy one, you will definitely use it again).
- ◆ Jigsaw, coping saw, or table saw to cut the styrofoam

### **Here's how to build the system:**

**1.** First cut the styrofoam raft to fit inside the reservoir bin; use a jigsaw, cutoff saw, table saw or even a handsaw. The piece needs to be just a tad smaller than the inside of the bin so it will easily ride up and down a couple of inches without binding (when the water level drops). ***This is important for the raft to work right.*** But, you do want it to cover the top of the water as light-tight as possible. In our case, for this Sterilite bin, we cut the styro piece 14-1/4" X 23".

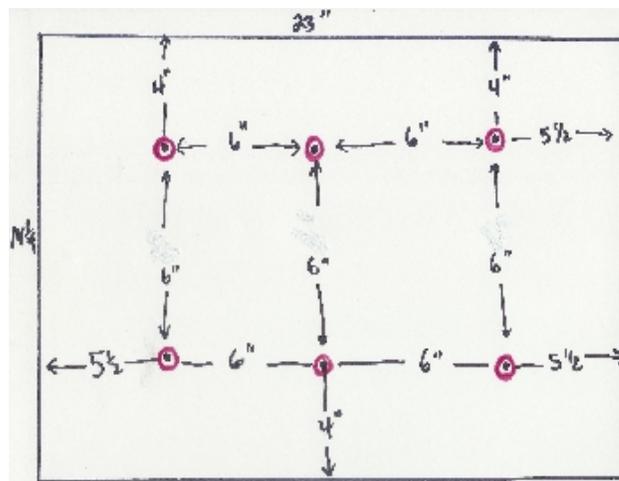
**Warning:** Cut the styrofoam outside in the yard. You can thank me for this tip right now...



**2.** You will likely need to round off the corners so the raft will ride up and down freely in the bin. Take care with your block of styro, treat gently, as it is easy to bust it.



**3.** Mark off the styrofoam block for six holes, evenly spaced, so that there is six inches between each hole, both ways. It doesn't matter if plants ride over the sides a little, just so they don't crowd each other. So for our 14 1/4 X 23" block this is how we centered the holes:



**4.** Now cut the pot holes in the styro block. Start with the 2" hole saw first. From the UP side of the raft, cut a shallow 2" hole, centered over the marked center holes. Cut all 6 holes just to a depth of about 1/4", then switch to the 1 7/8" hole saw to finish up. (Our set did not have 1 7/8" so we used 1 3/4"). Using the center hole as a guide, now cut down as deep as the hole saw will let you go. Do all six from the UP side of the raft. Then use a nail to go down thru the center holes and pierce the back side of each hole. This is so you will know where to drill next from the back side. Then cut with the same size hole saw from the backside of the styro block all the way flush.



**5.** Then carefully pull out the cut plugs and clean up the holes a little. Try out the net pots. You want them to sit in nicely and bottom out at the bottom of the styro, but not fall through.



**6.** Next, spray paint the outside only of the clear reservoir bin, to make it light proof (prevents algae). Spray several coats and use the entire can. *Do not spray the inside of the bin.*



**Just about ready to load this baby up!**



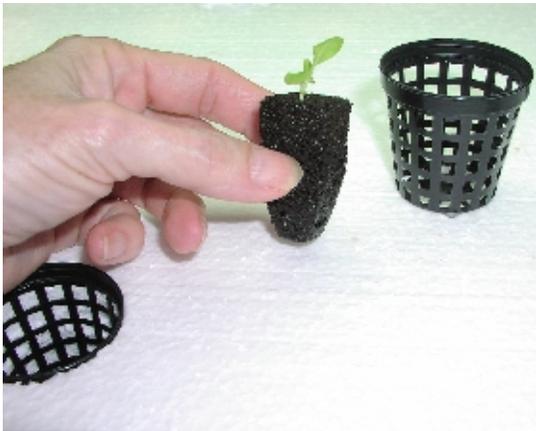
**7.** Set up the tray on a sturdy **level** support, (it's final resting place). Fill with **6 gallons** of water. Place the airstone in the bottom of the tray, connect to the air pump, and plug it in to test it. Important tip: Place the air pump higher than the reservoir to prevent nutrient from backing up into it.



**8.** Next, add your favorite nutrient solution to the vat. If you are using GH Flora Series (recommended), add 6 tsp. each of the Flora Grow, Flora Micro & Flora Bloom, (one at a time, in that order). Adjust the pH with a test kit (more on this and ordering info in the Tips 'N Techniques section below).

**9.** Next, float the styrofoam raft on top of the nutrient solution. You want it to ride at the very top, so add more solution if your bin requires more than the 6 gallons.

**10.** Time to transplant your baby seedlings into the raft. Place the starter plugs into the net pots and carefully pack around them with LECA (clay balls) to help support each plant in its pot. Push the little net pots into the pre-cut holes in the styrofoam raft.



**11.** Plug in the airstone bubbler and watch 'em grow!

**This is about 14 days after transplanting:**



**And this is full grown lettuces 22 days later.**

We had been harvesting the outer and lower leaves of these Romaine lettuces for salads. We went out of town for the weekend, forgot to leave a fan on, and the poor darlings bolted! (Went past their prime 'cause it got too hot). You can see how the leaves are drooping out instead of nice and tight. We harvested the whole raft after we took this picture and had an enormous Caesar salad. Yum!



This is a photo of a different type of lettuce from our large raft. Just wanted you to see what happens to the roots. They grow down into the solution reservoir. Sweet, neat and clean.



***Now continue on for the very important Operating Tips 'N Techniques:***

## **LETTUCE RAFT SYSTEM OPERATING TIPS 'N TECHNIQUES**

### **LIGHTING:**

You can use just the light from a sunny window if all you are growing are herbs. Anything else requires some supplemental lighting. A T5 compact fluorescent "grow light" will do fine for houseplants, herbs, and leafy green veggies like lettuce. This one is available for under \$75, including the 125 watt compact T5 bulb:



You can order this lamp and bulb here: <http://www.hydroponics-simplified.com/cheap-hydroponics-supplies.html#lighting>. You can get off much cheaper by getting a fluorescent "grow stick" at Walmart for about \$25, but you will not get the lush growth a better light setup will produce. Also, for best results, upgrade to the 200 watt bulb listed on our supplies page.

Learn more about hydroponics lighting here: <http://www.hydroponics-simplified.com/hydroponic-lights.html>. One final note: the grow room must be kept cool for lettuce. Use a fan on low in there to cool it down.

### **NUTRIENTS:**

We highly recommend the **Flora Series** nutrient solutions put out by GH (General Hydroponics). This stuff is superior, easy to use, and reasonably priced. It consists of 3 parts (Flora Grow; Flora Micro; and Flora Bloom). If you have hard water, get the Hardwater Flora Micro instead. For this lettuce garden, order a quart of each of the three solutions: <http://www.hydroponics-simplified.com/cheap-hydroponics-supplies.html#nutrients>. Stick with Flora Series, follow the label directions, and you can't go wrong!

The nutrient solution must be kept cool (55-70°). This is especially important for the cool-season crops like lettuce. Learn more about hydroponics nutrient solutions here: <http://www.hydroponics-simplified.com/hydroponic-solution.html>. We also provide a nifty little mixing chart for the Flora nutrients you can print out and save.

As the nutrient level drops in the reservoir bin, you need to periodically add water only (not more nutrient). Keep track of how many gallons you top up with. When you have replaced a total of 3 gallons of water, stop topping up and let the level drop down quite a bit. Then drain the bin and mix up a whole new batch of nutrient solution. Each new 6 gallon batch should last 4-5 weeks, or a whole growing cycle for a crop of lettuce.

**pH-** It is a very good idea for any serious hydroponics project to keep the pH of the water in the proper range, which is 5.5 to 6.5 (6.0 is ideal). If the pH is out of range, some of the nutrients get "locked out" and the plants suffer. GH puts out a simple test kit with pH up & down solutions **cheap**. It will last you through *many* gardens: <http://www.hydroponics-simplified.com/cheap-hydroponics-supplies.html#nutrients>.



## **GROWING MEDIA:**

The growing medium for a lettuce raft is actually the grow sponge or cube the seedlings started in. Then the Hydroton balls are jammed in around the seedlings to help support them in the little net pots. Large pots are not needed because the roots quickly outgrow the pots and extend down into the solution.

This is a handful of Hydroton clay balls:



Here is a cheap source for your hydroponics media: <http://www.hydroponics-simplified.com/cheap-hydroponics-supplies.html#media>.

Hydroton balls must be ordered from a hydroponics supplier. For the tiny bit needed for this small raft, try ebay for a small bag of it. Learn more about hydroponic growing media here: <http://www.hydroponics-simplified.com/hydroponic-growing-medium.html>.



We hope you will try out our plans for a cool little lettuce raft system. You will be amazed at the quantity of produce you can reap from this unit. It provides a great introduction to hydroponics for adults and children alike, and it's just plain FUN.

The lettuce raft makes a classic science fair project. Use a 10 gallon fish tank instead of the black tray we use here. Cover the glass sides of the tank by taping thick paper or cardboard to block out the light (this prevents algae). Then remove the paper covering when you are ready to display the lovely roots for all to see!

Our guess is that once you get a taste of hydro in this way, you will go on to bigger and better things. This field of horticulture is wide open! There are many different methods for you to try, and you'll just get more knowledgeable and skilled at it as time goes on.

You might try growing heirloom tomatoes, medical herbs or even orchids. Or you might just enjoy munching on your own healthy, homegrown salad micro-greens! No matter which way your interests take you, you are sure to enjoy this clean, healthy, prolific, earth-friendly gardening method. We just love hydroponics and know you will too.

Visit our website: <http://www.hydroponics-simplified.com> often for updates on equipment, lighting, nutrition, plants and seeds, pests, grow-closets, and plans for several other different growing systems. We provide simple information, insider secrets, and easy-to-follow instructions to get you up and growing in no time...



*Enjoy!  
Simon & Stella*

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