Building a Floating Hydroponic Garden[1]

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The Aztecs amazed the Spanish conquistadors with their floating gardens, and now 500 years later you can impress your friends and neighbors with yours. A floating hydroponic garden is easy to build and can provide a tremendous amount of nutritious vegetables for home use—and best of all, hydroponic systems avoid many pest problems commonly associated with the soil. This simple guide will show you how to build your own floating hydroponic garden using material locally available at a cost of about $50.00 (Figure 1).

Figure 1. Lettuce in floating garden system.
Credit: UF/IFAS

Construction Steps

- Build a rectangular frame using 2 by 6 inch or 2 by 8 inch treated lumber. The frame should be 4 feet, 1 inch wide by 8 feet, 1 inch long. This size frame eliminates the need to trim the floating Styrofoam; however, the size can be varied to suit personal needs.
- Line the frame with a 6 mil polyethylene plastic sheet to form a trough to contain the nutrient solution. Be sure the site is level and free of any debris, which could puncture the plastic liner.
- Secure one end and side of the liner to the top edge of the frame with 1 by 2 inch furring strips or lattice using wood screws or small nails.
- Place a 4 by 8 foot sheet of 1 1/2 inch thick Styrofoam insulation in the lined frame. Make sure the edges have sufficient room to allow the garden to move up and down. If necessary, adjust the frame to make it square with the Styrofoam. The Styrofoam sheet will create a floating platform in the wooden frame you have constructed.
- Fill the water garden with approximately 20 gallons of water. The water will form the plastic sheeting to the sides of the frame. Secure the other end and side of the liner to the top edge of the frame.
- Continue filling the water garden with water to a total depth of at least five inches. Keep track of the total gallons of water you add.
- Add water-soluble fertilizer, such as 20-20-20, 24-8-16 or similar analysis, but always with micronutrients, at a rate range of 1-2 level teaspoons of fertilizer for each gallon of water used in the water garden. In addition, add epsom Salts (magnesium sulfate) at a rate range of one-half to one level teaspoon for each gallon of water. Use a soft broom to mix the water and fertilizer in the garden or premix all fertilizer in a bucket before adding to water garden (Figure 2). Note this fertilizer is built for water sources where calcium is abundant in the water supply. Much of Florida's water is high enough to meet the calcium needs of most plants. However, if your water supply is low in calcium, you will need to add a calcium source from a hydroponic supplier or use a standard hydroponic fertilizer with calcium included.
- The pH of the final solution is generally between 5.5 and 6.5, which is fine. If the pH needs adjustment downward, household vinegar can be used.

Figure 2. Nutrients needed for floating garden.
Credit: UF/IFAS

- Light rainfall will have little effect on the water garden; only extensive flooding would require fertilizer adjustment based on the amount of water added by rainfall. In the case of heavy rainfall diluting the solution, you must know how many gallons of rainwater was added, then add only the fertilizer for that number of gallons. Use a rain gauge to know how many inches of rain fell; then you must know how many gallons per inch of depth in your container. The solution in the garden needs to be replaced periodically for optimum production. You can grow two crops of salad greens in the same solution before changing the entire solution and starting with a new batch.
- Commercially available "net pots" (Figure 3) or Styrofoam coffee cups with slits cut in the bottom may be used to hold the young seedlings.
- Use a hole saw or sharp knife to cut holes in the Styrofoam. A 2 1/2-inch hole saw is needed to drill the correct-size holes in 1 1/2-inch-thick Styrofoam when using the 3-inch net Pot or a Styrofoam cup with slits cut in the bottom and trimmed at the top. Using 2-inch net pots will require a 1 3/4-inch hole saw for the 1 1/2-inch Styrofoam (Figure 4). The hole size should allow the bottom of a cup to be level with the underside of the Styrofoam. If a thicker sheet of Styrofoam is used, a larger hole will be needed for a 2-inch net pot. It is very important that once the cups are placed in the holes, they do not extend down lower than 1/16 inch below the bottom of the Styrofoam sheet! This allows the root mass to wick up water without being totally submerged, which might lead to drowning of the root and plant death.

Figure 3. Lettuce transplant in net pot.
Credit: UF/IFAS

Figure 4. Drilling holes in Styrofoam for transplants.
Credit: UF/IFAS

- Optimum plant spacing for most plants would be 6 inches from the sides and 12 inches apart to form 32 holes for planting.
- Transplants used in this system should be grown to be fully rooted in a typical soilless media. Transplants can be grown at home in many root ball shapes in a loose media, rockwool foam cubes, purchased from garden suppliers, or grown in compressed peat pellets.
- Place young starter transplants directly into the cups. Use toothpicks, if desired, to hold the transplant in an upright position. Do not remove the soilless media from around the transplant. Also, do not pack additional media around the plant root ball inside the cup. The transplant root ball sits inside the cup alone and should be surrounded by air.
- The most critical aspect is the depth of placement of the net pot or transplant root ball in the solution. Do not place the pot or transplant too deep in the

solution. A flat bottom transplant cube or disc media will wick up more water than a pointed root ball. If the media seems too wet, tilt the cube so only a portion of the root ball touches the water.

- After placing the young transplant in the net pot or Styrofoam cup, do not add any potting mix or other material around the young transplant as this will keep the roots too wet and inhibit oxygen intake (Figure 5).
- Add extra water and fertilizer as needed to keep the Styrofoam sheet floating on a minimum of 5 inches of solution.

Figure 5. Hydroponic lettuce root system.
Credit: UF/IFAS

Crops

Several leafy salad crops such as lettuce (romaine, Boston, Bibb, and leafy lettuces, Figure 6), mustard greens, mizuna, mint, chives, and kale grow well during the cool season. There are fewer crop options for the warm season; however, basil, Swiss chard, cucumber, watercress, and some cut-flowers, like zinnia and sunflowers, have done well. Growing with floating systems does not override the normal challenges of gardening in the warm season in Florida.

Figure 6. Healthy lettuce being grown in a standard 4x8 ft floating garden.
Credit: UF/IFAS

Not all crops do well in the floating gardens; however, small-rooted, short-season crops generally grow well. Crops that prefer wet rooting conditions grow better than those that prefer dry conditions. For example, watercress grows very well, but spinach and periwinkle do not grow as well in a floating garden.

Container Choices

This publication guides you in the steps to build a 4 by 8 foot floating garden using wood and a plastic liner. Many simple containers can also be used to make a floating garden. Examples include children's or pet pools (kiddie pools), small plastic storage containers, trash cans, and buckets. Many shapes and sizes of containers will work, but they should be able to maintain a 4–6-inch depth of nutrient solution for the best success. Containers with straight up sides are preferred.

New Research

Ongoing research with plants such as tomato in floating systems indicates that larger plants may require more above-water rooting volume (more air space) in order to produce successful yields. To produce more root mass above the water, you may want to test a system that uses two stacked Styrofoam floats with holes drilled in the bottom one and all but a 6-inch edge around the perimeter cut out of the top one. Fill the empty top float with perlite, vermiculite, or other hydroponic media and plant vegetables or flowers into it the same way you would plant a normal garden. Preliminary results show this method to be promising if starter fertilizer is used on the young plants until their roots reach the fertilized hydroponic solution below the floats.

Tomatoes and peppers are also challenging to grow in floating systems due to the high nutrient requirements for calcium. Blossom-end rot is caused by low calcium in the fruit. Supplemental calcium can be supplied in addition to the recipe above. These calcium products are available at most of the same suppliers that sell the net pots. However, for challenging crops like tomato and pepper, greater success will be achieved with standard hydroponic fertilizers where one of the ingredients is calcium nitrate. All crops can be grown with regular hydroponic mixes,

Additional Resources

For more information on hydroponic production, please visit our website at https://smallfarms.ifas.ufl.edu. A video on the floating hydroponic garden is also available to view online on the Virtual Field Day website at https://vfd.ifas.ufl.edu as part of a series of hydroponic video modules.

Hydroponic Suppliers

Pentair Aquatic Eco-systems, Inc.—https://pentairaes.com—1-877-347-4788—net pots, hobby kits, hydroponic supplies.

Verti-Gro, Inc.—https://www.vertigro.com—1-800-955-6757—vertical and other complete hydroponic gardening supplies.

CropKing, Inc.—https://www.cropking.com—1-330-302-4203—hydroponic supplies, hobby greenhouses.

Future Growing LLC—http://www.futuregrowing.com—hydroponic growing systems and supplies.

Growers Supply, Division of Farm Tek—https://www.growerssupply.com—1-800-476-9715—hydroponic systems and greenhouse supplies.

Note: This is a partial list of suppliers of hydroponic materials and supplies. Mention of the above suppliers is not intended to be an endorsement of their product or a preference over other suppliers.

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