How to Make a Aquaponics System

Materials

- (2x) ¾ plywood
- Air pump (12v 6hz ¾ output house)
- Bolts
- Breadboard
- Bubbler
- Caulking
- Caulking gun
- Complete water care kit
- Drill gun
- Fish (goldfish)
- Fish food
- Fish tank
- Floating charcoal filter (optional)
- Jig saw
- Outlets
- Ph test and adjuster kit
- Shelf (Muscle Rack-5-shelves) or any heavy-duty shelf with the same dimension
- Screw gun
- Seed starter kit
- Seeds of plants you prefer
- Skill saw
- Staple gun
- Staples
- Tubing
- Window box liner

Electronic Materials

- 3d printer (for automatic fish feeder) *optional
- Humidity and temperature sensor (dht11)
- Light bulbs (fluorescents)
- Outlets
- Raspberry pi
- Wires

Steps

- Assemble the shelf together, to your own liking, we only put one divider. The middle shelf is holds the plants, a rectangular hole is cut to fit the window planter so it can be seated within. bottom shelf is reinforced with two shelves so to support the weight of the fish tank with water. We only filled it up to 90 % which weighed about 150 lbs.

- Measure the shelf to get the right dimensions in order to cover the shelf with plywood. Our side panels came out to be 5'20" and back panel was 5'36 ¼".

- Once you got the dimensions mark the plywood and make your cuts with the skill saw.

- With the plywood cut, place it at the side it belongs. Once it is positioned where you want it, use a drill gun to drill holes from the outside of the wood through to the railing of the shelf.

- The more holes you make to attach the wood to the shelf the sturdier it will be but four is enough.

- After the holes are made use a screw with a large head or a regular screw with small washers to attach the plywood to the shelf .

- Do the same for the other side panel, after the two side panels have been attached to the shelf, place the back panel between both side panels and drill from then outward face of the side panel into the side of the back panel on both sides. Again use woods screws to attach. (the back panel is not directly attached to the shelf only to the side panels for neat and easy removal).

- Once the plywood is where you want it t add mylar sheeting to the wood with either a staple gun or caulking. The mylar sheeting traps the light which adds heat, that is beneficial to the plants.

- We didn't make a front cover for the shelf like we planned, but we did place another sheet of mylar to the front to hold the heat in for the plants. (it is recommended to front opening doors for the plants.

- The shelfing should be done, now to wire the electronics. Starting with the outlets(GFCI). It is best to place them where it is easy accessible to an external power.

- With the sockets mounted to the side panels , wire your Raspberry Pi to the humidity and temperature sensor (DHT11). The code for the the temperature sensor is provided in the Git-hub under “simpleserialanswerer”

- Rinse out and scrub the fish tank with only warm water. Fill the tank up with the cleanest water at your disposal. We used tap water then later added dechlorinating tablets to make the water fish safe.

- When the water is added you have to check the Ph level to make sure it's suitable for the fishes to survive. If high or low, add Ph up or down depending on your fish needs. Ph level is a major component on the life of your fish monitor often as possible.

- For extra measure,place the water care tablets in the tank to make sure it's fine.

- When the Ph is fine is at a good safe point add the water pump into the tank.

- If you want or have a filter place it in the fish tank. We did not have one and had to manually clean the tank as needed.

- Now add a bubbler into the tank for the fish to get oxygen. (it is recommended to let the bubbler sink in a separate bowl of water while on the get rid of debris and other possible hazards).

- After the water is at room temperature, gently place the fish whilst still in temporary container in the fish tank and let it float on the surface to slowly adjust them to the tanks water temperature.

- Choose the plants you would like to grow. We chose to grow spinach, sweet basil, and chard. As they were the fastest too mature in the amount of time needed for the time frame. Research diligently on your plants. Look for what plants need a reasonable amount of sun, plants that work together rather than hurt one another, and that can tolerate constant water flow.

- Plants your chosen seeds in the seed starter kit to give them a good start. They should start sprouting in a couple of days.
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- Our window planter had perforated at the bottom as a drain hole. We re-purposed it as a drainage spout for the water. A ¾ vinyl tube was pushed to create a tight water proof fit. Fit some type mesh of the tubing to avoid any debris from entering the tube. The tube should come up from the bottom of the window planter about 3 inches. The level of the tube will control the water level in the planter(this is up to you and the need of the plants to adjust).

- With the window box liner snug in the shelf and the tube adjusted to the desirable height and a thin layer of clay rocks as a base layer.

- When your plants are big enough (about 3-4 inches) move them into the grow pots and add clay pebbles to the pot and fill the rest of the plants to keep the pots stable.

- With the plants being set into the window box liner run a hose from the water pump into your "garden". The placement of the hose depends on how much planters you installed. We ran ours up from the tank, through a small gap in the shelf and to the planter while holding it down with a tie-down.

- Depending on your preference you can place a hose on the the bottom of the box liner that extends to all the way to a few inched above the fish tank water to reduce sounds and any splashing.

- The water pump will push the water from the fish tank into the the window box liner where your plants are ,then fill the planter to the appointed water level and drain out to the tank. The cycle will repeat until the pump is turned off.

- Watch for your plants and make sure they are healthy, if not then you should make adjustments to your system as needed.

- Keep monitoring your aquaponics system and eventually your plants should healthy and big. water