

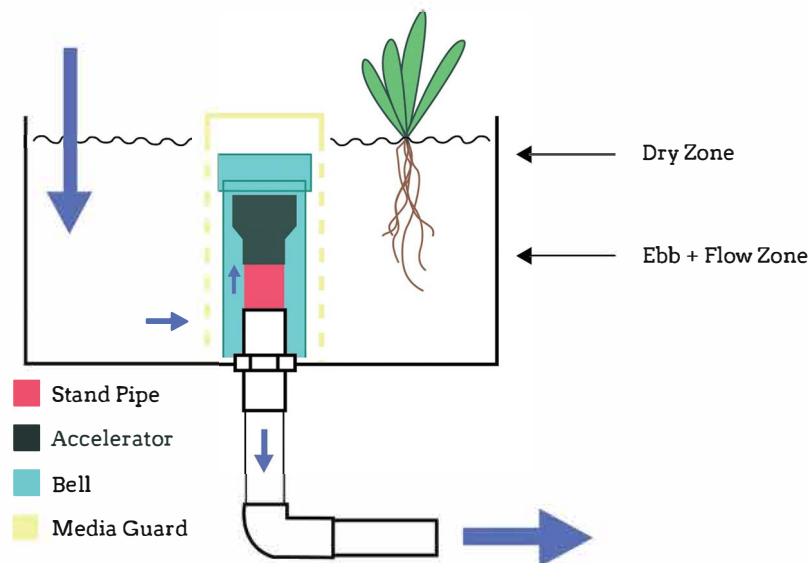
# How To Build An Aquaponics System

Aquaponics systems allow for the cultivation of fish and plants in many environments where it would otherwise be difficult. This type of closed loop system (a system where waste from one organism is used as nutrients by another) can provide high yields of protein, vegetables and herbs using far less water than traditional agriculture. Aquaponics systems can also be modified to fit a variety of spaces, including extending into the vertical.

Aquaponics work by converting waste fish produce into useful nutrients for plants. The removal of waste in this manner maintains clean water for the system without having to use any artificial means. This is how nutrients cycle in nature, and we will be harnessing that system in our aquaponics units. The unsung hero in nature and our built systems are the bacteria, particularly nitrifying bacteria that convert ammonia waste ( $\text{NH}_4$ ) from the fish into nitrite ( $\text{NO}_2$ ) and then nitrate ( $\text{NO}_3^-$ ), which is then used by the plants for growth.

***Make sure all care and feeding procedures and equipment are in place before installing fish! This includes cycling your tank for bacterial growth. More information is available on line.***

## Building a one-pump drain-and-fill aquaponics system



# ***How To Build An Aquaponics System***

## **Materials:**

- Grow tank (ten gallon tank with  $\frac{3}{4}$ " hole in bottom)
- Fish tank ( 15+ gallon tank, no hole)
- Medium guard (12" long 3" diameter pvc pipe with holes)
- Bell dome (10" long 2" diameter pvc pipe with cap)
- Bell siphon (6" long  $\frac{3}{4}$ " diameter pvc pipe with widening adapter on end)
- Drain pipe (2 pieces of 4" long  $\frac{3}{4}$ " pvc pipe connected with 90° elbow)
- Grow Bed connector (1, male, 2 female adapter, 2 #18 o rings)
- Water pump
- 10 feet water tubing to fit water pump
- Stand or sturdy support for holding grow tank elevated over fish tank (can be blocks on desk as long as drain pipe is accommodated)
- Optional: expanded shale, expanded clay, or other grow medium for hydroponics grow medium in the tank outside the guard

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## Procedure:

1. Assemble all pieces as described above, except Grow Bed connector
2. To assemble grow bed connector, place an o-ring over the over the end of each adapter such that it will make a seal when pressed against the bottom of the grow tank. Place the male adapter protruding through inside the tank, and assemble with the female adapter on the outside bottom of the tank. Tighten until just firm (do not overtighten)
3. Place the bell siphon standpipe into the male adapter
4. Place the bell dome over the bell siphon
5. Place medium guard over assembly – optional addition of grow medium in the tank outside the guard.
6. Insert drain pipe into female adapter
7. Arrange tanks so that flow of water from grow tank will drain to fish tank
8. Set up pump in fish tank so that water flows into grow tank.
9. Fill fish tank, and start pump
10. Watch what happens! Do not leave your tanks unattended, at this stage you must make sure that you are with your tanks as long as the pump is running to make sure that the tubing remains flowing into the grow tank

## Observations:

What happens when the grow tank fills to its highest level?

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How far above the fish tank can you put the grow bed? See what happens when you lift the water tubing higher – can the pump always push the water higher?

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