Fish Trivia

Fishes cannot live in the Dead Sea because the water has too much salt.

The heaviest fish ever caught was an Ocean Sunfish weighing 4,928 lbs. (Not recommended for aquaponics)

The swordtail is the fastest swimmer of all fish. (Not recommended for aquaponics)

The stickleback is one of the few fishes that builds a nest. The male, in his red breeding colors, makes a nest of weeds where the female lays eggs. The male stays by the nest to guard the eggs until they hatch.

Some weird things found inside a shark: a nail, a bottle of wine, a treasure chest, coats, a suit of armor, a drum, and a torpedo.

Aquaponics: Vegetables and fish protein – family size

Advantages:

- Better tasting vegetables (after well established – up to four years)
- No chemicals, pesticides, or fertilizers
- Healthier, fresh vegetables – Vegetables and fruits main objective
- Self sufficient vegetable supply
- Yearly harvest of fish, secondary income source or home consumption
- Minimum effort with no gardening problems when using sealed greenhouse
- Cheap greenhouse, easily expandable
- Low water requirement
- Low power requirement when planned for gravity flow
- Worms, bacteria, hardy fish, duckweed, simple filters create amazing harvests at low cost

Disadvantages:

- Attention more critical for fish care than children or animals
- Water quality control biggest error for beginners – pH, oxygen, nitrates, temperature
- Over feeding and too few plants kill fish
- Failing to properly cycle new system (up to a month in warm temperature, longer when cold) results in poor water quality, fish shock, and dead fish
- Power outages without back-up system will result in high fish mortality (lack of oxygen, too much ammonia)

Spamming on the web is rampant, yet a July Google search for "Aquaponics" produced over 3 million hits. That is an increase of over 500,000 in four months. There must be interest. Few of us have time to research over 3 million hits but some great links and

selected, screened advice are below. This document is a good start.

BEGINNERS: START SMALL with a simple modular system that is easy to expand. If you are considering a commercial venture, plan to start after four or five years of back yard aquaponics learning (experience). And do not go into debt to start.

Layout your plan to scale before cutting pipe. Use gravity to move all water possible, but especially all fish tank water containing solids and nutrients to prolong life of the pumps. For your first module, you can use an air pump similar to the air pump for an aquarium. This will work for an IBC module. There are advantages: low cost to install and to opeate, no water pumps to wear out if gravity used for return, solids pumped to grow bed feed worms, and few, if any filters for one module. Clean water from the grow beds should drain from the end of the grow bed away from where the nutrient water enters. This cleaned water goes to a sump pump or the fish tank by gravity. For a lot of air pump information, Google "Air Lift Pumps Aquaponics." Below, a section on Air Lift Pumps, lists some details on size of pipes.

To layout your system, a FREE 3D CAD program (SketchUp) is free from Google,. Your only cost is time to learn the software.
http://www.softdls.com/c/google-sketch-up?mkwid=KWDa9sVP&pcrid=3051943306&kword=sketchup&match=e

First Module:

If you have access to free stuff, such as old bathtubs, wood, barrels, cattle water tanks, or food grade plastic containers, FREE takes preference for the beginner. A good first fish tank and one grow bed can be made from a food grade IBC container (but it will support two grow beds): Australian Faye Arcaro (Backyard Aquaponics – Perth – latitude of San Diego but down under) converts an IBC container to a fish tank and one grow bed in a good video posted on-line by **www.backyardaquaponic.com**. This one grow bed, plus a second, is a module that can be expanded easily and cheaply. Plan to learn with this module. Do not expand until after two years learning, probably plan to learn for five before a commercial venture. It can be expensive. With fish costing $1 each, the 100 dead fish in the module being replaced, usually because of your mistakes while learning, is expensive. That is why people in a hurry start with cheap goldfish instead of expensive perch or trout. Your main production is the plants grown, not the fish that take up to a year to mature and require the most attention and care.

Also, note the reference on page 23-24 about using flat side IBCs found at soft drink bottlers.

[August 2013 – Rob Bob of western Queensland, Australia posted a video about changing his IBC grow beds. He found a flat sided IBC used by a soft drink bottler instead of the more common ridged sides, top, and bottom IBCs. The ridged IBCs will have low spots and these can develop anaerobic areas that can become acidic and kill plants, fish, and bacteria. Rob Bob suggests finding flat sided IBCs (a good suggestion) and then cut them differently from Faye's video. This discussion starts about four minutes into the following video.

http://www.youtube.com/watch?v=FWYp4BevSrM&list=PLBcWprMIwYYiYYEGOdGmURrE7iJMS4-JN

If you made grow beds from an IBC with ridges (i.e., not flat top, sides, and bottom), be sure to have Red Wiggler or other compost worms in the grow bed.

Bracken – Aquaponics – Step Two

Video: http://www.aquaponicsauthority.com/insider/index_portal.php?fid=96ed55db-61d9-4bd6-9cc7-c65f56e8e8f4#Video

"**Needs** – One of the first steps before getting started with aquaponics is to decide how many people you intend to feed. An aquaponics system with two grow beds (6' x 4' x 12") and 100 gal / (378 liter) fish tank could easily feed a family of 4 if done properly. It is also important to consider your location should your needs increase in the future or should you decide to expand your system. The ratio of plants and fish in an aquaponics system should be kept at one fish for every four vegetables grown. The ratio will be 1:4 to maintain the proper nutrient cycle for your system.

Fish – Before deciding the type of fish for your system you should first consider what you intend to do with them. If you do not wish to harvest your fish to eat and or you are vegetarian you can use non edible fish such as Koi or Goldfish. Most people choose Tilapia because it is known to adapt and flourish in an aquaponic system. But of course, Tilapia isn't the only type of fish you can choose. Bass, trout, catfish, and perch to name a few are also excellent fish choices for your aquaponics system. It is important to note that too many fish in your aquaponics system will result in too much waste being produced so that the plants would not be able to consume it all.

Plants – When it comes to plants, herbs and leafy vegetables are **GREAT** choices, [especially when you start and while your system cycles – up to one year!]. If done properly your aquaponics system can provide you with an endless supply of fresh lettuce, tomatoes, cucumbers and many other fruits and vegetables. [See list of vegetables being grown by Portable Farms – Cole Davis, below.]

Planning Ahead -At some point you may wish to expand your system. Before attempting this I strongly suggest that you first get familiar with what aquaponics is and how it all works before you embark on a larger sized system. With this being said you should take this into consideration before selecting your location, fish, and plants as it will be much easier to maintain a single system vs. multiple ones."

[An argument for multiple, independent modules with the increased difficulty of tasks may be offset by the lower risk of catastrophe when something goes wrong and lower cost to slowly expand a modular system instead of the high investment to build one large commercial greenhouse and very large fish tanks. Since you cannot plan to hire unreliable, untrained illegals, you will have to depend on dedicated family members to be your source of reliable workers. This was the South's solution for the poor who could not afford slaves in the 18th and 19th Centuries.]

“You can design your aquaponics system to fit your needs and can include as few or as many fish and plants if you keep the points above in mind **BEFORE** making your final selections. It is MUCH easier to do careful planning in the beginning versus having to make unexpected changes to your system. Start out small and work out the kinks before you attempt a larger system. This will allow you to achieve success and build your confidence and experience with aquaponics.

If you have ANY questions feel free to contact me.

Bracken
Aquaponics Authority
support@aquaponicsauthority.com”

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IBC Tank – The IBC fish tank should be elevated enough for gravity to drain water to the swirl filter, bio filters, to the grow beds, and into a sump tank. After the nutrient rich water passes through the grow beds, a pump sends the clean water back to the fish tank. Particles in the fish tank water increase wear of pumps, so let gravity handle the nutrient rich water and pump the clean water to a sump tank and to the fish tank. An air pump system and gravity eliminate this requirement.

Water temperature control is easier and cheaper if fish tank is buried in ground. However, flat land loses the advantage of moving water with gravity for part of cycle.

Filters and Start-Up (for one module – a food grade IBC tank and one grow bed can handle the growth cycle of plants and fish without filters). For smaller modules (e.g., apartment balconies; cut a plastic barrel in half, one part for fish and one part for plants. plan for gravity to move fish nutrient rich water to plants and a small pump to move the clean water drained from the plants in a sump tank up to the fish tank. Particles in the nutrient rich water cause unnecessary wear on the pump.

Adding filters is easy, cheap, and good insurance. Also, systems stabilize faster with bio-filters. Some growers consider the bacteria colony the most important part of the symbiotic relationship of fish, plants, and bacteria.

Comments (Sept, 2, 2013):
TCLynx:
“As in Organic gardening, the whole point is to feed the soil life so that the soil life takes care of the rest! It is the same with aquaponics; be sure there is a robust, healthy bacteria colony. They do most of the work, making sure everyone else is healthy.
Think of aquaponics as a triangle and the most important part (the base of the triangle) is the Filtration, both bio and solids. If you remove the base, the other two sides will fall flat.
A bioponic system can run for a time without fish or aquatic animals, and it can also survive a time without plants but neither the plants or animals will survive long without the filtration.
I do hate those basic descriptions of Aquaponics as the "plants" filtering the water for the fish or as just fish and plants.”

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Leo White Bear

“I agree with TC, without the bio-filtration you are looking for trouble. Through my research and experiments with different types of setups, I have come to the conclusion that I am not only an aquaponicist in the sense of the hobby but my **main part is a "culturer of bacteria."**

Fish feed the (bacteria) culture and the plants clean the waste from the water while growing edibles or ornamentals.

The bacteria are the main power function of a healthy aquaponic system regardless of the design used. As long as this is kept in mind your system will remain balanced and will grow healthy fish and plants.”

From Web Site:
http://community.theaquaponicsource.com/group/aquaponicsforbeginners?commentId=4778851%3AComment%3A511497&xg_source=activity

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Swirl Filter

(1) **A swirl filter** uses basic physics to do the work. While stirring a solid powder in a cup of water, you will see the particles concentrate in the center. That is what happens in your swirl filter. A plastic container with a sloping bottom (or water bottle, upside down) helps the particles gather in the center, where the drain is located. Research on the web will find videos (Google: YouTube Aquaponics “swirl filter”) showing the plumbing and slow water flow for this highly effective filter to remove large particles of fish waste, uneaten fish food, and any trash in the nutrient rich water going to plant beds. The filtered waste can be used for worm beds, fertilizer for fruit trees, or other plants in the ground. Design your system so the fish tank, nutrient water flows by gravity to the swirl filter. A paint filter on the pipe delivering the water to the swirl filter will take out the largest particles and should be changed daily. Particles increase wear on pump, so gravity is recommended to carry the water from the fish tank to the grow bed.

(2) Biofilter(s): The larger the system, the more critical are filters after the swirl filter. The two types of bacteria critical for the aquaponics system convert ammonia to nitrites and nitrites to nitrates (fertilizer for the plants). These bacteria form colonies naturally. The speed of system colonization is directly related to temperature and surface area in the total system – **plumbing, bio filters, grow bed media, and fish tank**. The process can be speeded up in a new system by starting the cycle using some water from a fish pond, aquarium, or another aquaponics system. Ammonia must be added daily to the system while pH, oxygen, ammonia, nitrite, and nitrate levels are tested regularly (and recorded in your journal) until your system is ready for fish to be added. If you rush the introduction of fish, use cheap gold fish. Food fish are expensive.

One method to increase surface area is to use simple filters available at low cost. A plastic bucket with the filters and plumbing (after the swirl filter) before pumping the nutrient water to the plant beds will provide extra protection and increase the number of the beneficial bacteria. Check the web for aquaponics filters. Plain sponges, sand, or cheap home or industrial filtering materials can be used.

Filtering the nutrient water to remove particles reduces the waste build up in the grow beds and helps increase availability of oxygen to the plant roots. An additional natural help keeping the grow bed media clean is to put "a handful of red Wiggler worms in a grow bed" (not normal earth worms). Worms thrive on fish waste. Any excessive reproduction of the worms provides more fish food. The web has many examples and videos for worm beds. Red Wigglers cost from $15 (free shipping) - $35, plus $10 shipping. It pays to shop. Worms ship well and reproduce better. (More worm information below.) No waste!

Grow beds:

The 2013 experts on the web prefer the grow bed with media and flood-drain water control using a Bell siphon to drain.. It is cheaper than mist systems and has better temperature control than the plastic pipe system. Murray Hallam, an Australian commercial aquaponics guru, is ripping out his PVC pipe system, replacing with the grow bed, flood and drain system. Note Dr. Nate Story seems to have mastered the use of square PVC pipes in his vertical aquaponics systems. Raft systems are limited to certain plants to be grown. For the beginner, the flat side, IBC tank-grow bed is a good, cheap module to use while learning.

Media of gravel or non-calcium based rock is cheapest; baked clay is light but expensive. Small media size increases surface area for beneficial bacteria growth. Learn the vinegar test for presence of calcium in rocks before using gravel or pumice to avoid pH problems.

Bell Siphon – Bracken posted his DIY Bell Siphon video that does not use the snorkel http://www.aquaponicsauthority.com/insider/index_portal.php?fid=b99ad5fd-df1e-4139-ae44-3f21a023c0f3&tid=72013B#Video

"Bracken Brockston" (http://www.aquaponicsauthority.com)
Sign up for his daily newsletter and request his free 47 page, illustrated Guide to build a Bell Siphon. The guide is excellent, with step-by-step details in text and pictures. Anyone will find it clear and easy to follow. Each step is tested and covers the very important adjustments necessary for success. [A comment:

Two steps need to be added: (1) When sanding to remove burrs after cutting the PVC pipe, be sure the top of the 1" standpipe is (a) level, and (b) the edge is a sharp, 90 degree angle to 'cut the water' that helps break the siphon.

(2) The level should be checked after filling the grow bed with the media mixture and the water. The heavy weight of the water and media will distort the shape of metal, wood, or plastic grow beds, tilting the stand pipe. Your stand pipe will your personal Leaning Tower of Pisa and will not work. Link to Bracken at **support@aquaponicsauthority.com** for a free copy his well illustrated 47 page the Guide. Also, sign up for Bracken's daily newsletter for continuous suggestion. New information occurs daily in the World of Aquaponics.

Grow Bed: Bracken says, "The dry zone is important as it will prevent the plants from rotting and collecting surface algae from the water. Moisture related issues for the plants such as mildew or too much evaporation will be eliminated by having sufficient dry zone." The top two inch

layer of the media is kept dry to prevent weeds from growing, fungus or harmful bacteria from growing that harm plants, and helps save worms from drowning. Worms survive the flooding and draining cycle if the oxygen level of the water is high. Total media depth is: 2 inches at top that stays dry and 10 inches that is flooded and drained by the Bell Siphon. The plastic grow bed shell should extend 2 inches above the media bed with an overflow pipe to return water to the sump tank if stoppage occurs in return plumbing. The total grow bed height is 14".

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Bell Siphon – Brand new Invention about 2,500 years old!

http://en.wikipedia.org/wiki/Pythagorean_cup

I enjoyed this history lesson! –MAH

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Bell Siphon: Install your Bell Siphon at the opposite end of the grow bed from entry of nutrient-rich fish water. When making a Bell Siphon, the distance of the bell top from drain standpipe is critical, about one half to one inch. As mentioned above, for more efficient siphon action, the top of the stand pipe should be level and with well sanded sharp edges. Also, a reduction from top of standpipe to the smaller stand pipe increases efficiency of starting the siphon. As water exits the grow bed, a ninety degree connector and another ninety degree connector about 18 inches away (not glued) increase resistance and efficiency of the siphon. If properly made, a 'snorkel tube' is not necessary.

One inch height differential – stand pipe and bell siphon. This video shows putting water entry and bell siphon close together (He may be doing this for the video, not for a real grow bed): http://frontier-adventures.com/automatic-bell-siphon-aquaponics-tips-tricks/.html

The returned, clean, plant filtered water from the plant bed in a larger system is held in a sump tank for pumping up to fish tank. A swimming pool pump is a proven, long lasting pump used by commercial aquaponics growers. A small system can use aquarium type pumps, family size systems a Walmart boat bilge pump. Size is important.

Another sump tank can hold nutrient rich water from the fish tank to be gravity delivered to the grow beds (to avoid changing the fish tank water level).

Bell Siphon – Meg Stout explains her Bell Siphon design (also without a snorkel).
Two details not discussed are:
1) The Un. of Hawaii research suggests the three pipes diameter follow the "double-double-double" rule (the diameter of each pipe is double that of its inner pipe. E.g. standpipe 1½", Bell Siphon pipe 3", Media Guard pipe 6" for easy access to Bell Siphon for maintenance. The height of the standpipe should be 1-2" below top of the media bed to keep surface dry. The media bed should be about 12" deep. Install an over flow pipe in the side of the grow bed above the media to prevent flooding should a stoppage occur in the return line from the Bell Siphon.

2) Connect a pipe with two 90º angles to bottom of the standpipe (outside, under the grow bed). The extra water flow resistance assists the Bell Siphon to start and cut-off.

Back-Up Electric System: A back-up electric system is a necessity to provide electricity for the water pump and air pump supplying oxygen for the fish. A cheap battery back-up and small solar panel can cut costs in sunny areas. Also, the battery back-up can be charged with a low-cost auto-battery trickle charger (from the grid) if in a heavily clouded area. Power outages may be rare, but they are deadly for aquaponics systems.

For heating, a simple rocket stove is easily made with a few tin cans, and fueled with the lawn bush cuttings (free), scrap wood (free), or wood pellets (cheap) when heat is needed. Some fish require a warm temperature. Preppers or survivalist provide many open source ideas on the web for heating air, food, or water.

For cooling, the almost constant temperature several feet below the ground surface can be utilized to help maintain constant water temperature. During the winter, this constant temperature reduces the heating required, lowering costs. In the summer, it reduces cooling costs.

This information is basic. You need to do a lot of research for information readily available from the web. Some good sources of information, at no cost are:

Video – The IBC of Aquaponics (Australian Faye Arcaro of Backyard Aquaponics demonstrates ease of converting an IBC to a fish tank and one grow bed) This video is used by everyone – probably the best guide. There are others, but this one is basic and easy to follow. (www.backyardaquaponics.com.au)

Part 5 – Plumbing and Water – Heating and cooling:
http://www.urbanaquaponics.com/entry.php?10-Utah-Aquaponics-System-Part-5-Heating-Cooling-Plumbing-Pipes-and-finally-WATER!

Part 7 –Changes to System and Discusses types of Systems:
http://www.urbanaquaponics.com/entry.php?13-Utah-Aquaponics-System-Part-7-Changing-Configuration-wet-dry-dump-siphons-pumps

Part 8 – Permits, Regulations, Fish Suppliers
http://www.urbanaquaponics.com/entry.php?14-Utah-Aquaponics-System-Part-8-%96-Permits-Regulations-Fish-Suppliers

Part 9 – System Cycling – Temperature Regulation – PH
http://www.urbanaquaponics.com/entry.php?127-Utah-Aquaponics-System-Part-9-System-Cycling-Temperature-Regulation-PH

Part 10 – System Cycling, Regulatory Woes, and Plant deficiencies
http://www.urbanaquaponics.com/entry.php?128-Utah-Aquaponics-System-Part-10-System-Cycling-Regulatory-Woes-Plant-Deficiencies

Part 11 – Approvals and Declines
http://www.urbanaquaponics.com/entry.php?129-Utah-Aquaponics-System-Part-11-Approvals-and-Declines-There-be-Whales-Here!

Fans and Pumps

Air Lift Pumps – Cheap, no electricity in water – (For lifting water a small distance

Dig a well or reservoir that is sealed at the bottom. We find 4 to eight feet is great.

It takes 1/2 psi per foot of depth to get the air lift started. After the air is displacing the water, the water is lighter and it takes less air. A 5 psi pump is the strongest we have ever used. 5 psi will inject air into the system at 10 foot depth. We use TWO inputs on heights over 20 foot.

Dig the well to say four foot, pump the water to 8 foot, add another air injector. At the top, you MUST have an air/water separator to get the value of the pump. If a 1/1/4 inch riser (inside a 2 inch well head) we have reducer, two inch to THREE inch. Extend the three inch pipe up to three feet. Have the 1 1/4 inch riser enter the three inch up above the exit point, such that the water falls down in the three inch and exits out the tee fitting. The three inch just allows air to throw the water to the side, such that it does NOT fall back down the 1 1/4 riser.

Cut the top of the 1 1/4 inch riser and insert two-two inches of flat plastic (cut from a five gallon bucket) such that the water sprays to the side and fall down.

I can pump 24 foot high with 300 gallons per hour with two 150 watt air pumps. Most often, I use two 60 watt pumps for a 150 gallon per hour flow. Depends on what you need. Note: I am pumping VERY dirty water that would NEVER clear a mechanical submersible pond pump. And I am using MUCH less electricity. — **Glenn Martinez, Hawaii**
http://www.scoop.it/t/aquaponics-by-charlie-dare/p/4006362380/airlift-pump-systems-for-aquaponics-aquaculture-and-home

From: John Pade, partner of Nelson and Pade, a good source of information
Pictures – Air pumps and plumbing pictures, plus an article.
http://aquaponicsjournal.com/docs/articles/Aquaponic-Equipment-Airlifts.pdf

From Backyard Aquaponics Forum:
"The maximum lift will be half the submerged length of the tube (tube = PVC pipe) less than three inches diameter)."

Diffusers (air stones) more efficient than large bubbles (Contrary to Hawaii reports)
http://www.alabdiffusers.com/Airlift.htm

Video showing very small, simple air pump"
http://www.youtube.com/watch?v=xV8vZqHd0ao

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Greenhouse Evaporative Cooler

The following blog is part of a pdf file to install a solar home evaporative cooler. The builder offers other "off the grid" projects: http://www.livingonsolar.com/rss.xml

"I purchased the electric radiator fan at a local auto parts store. I paid around $80 for it but have seen similar fans on the Internet for $35.

The pump is a 12 volt bilge pump that I purchased at Walmart for around $14. Make sure that you do not use too strong of a pump. [Note: For larger installations needing more powerful pumps, a swimming pool pump is used by many growers.]

At full speed, the fan pulls 5.5amps @ 12 volts. (solar charged, sealed auto batteries or deep discharge batteries)
The bilge pump pulls around 1.5 amps @ 12 volts. (solar charged sealed auto batteries or sealed deep discharge batteries)
A 100 watt solar panel will power the fan and pump nicely.

I am using a Mitsubishi 110 Watt panel that is mounted on a solar tracker that I made. The panel and tracker are mounted on the ground in front of the cooler. In previous years I have placed the panel flat on the roof just above the cooler. That worked fine for most of the day. The tracker extends the time in the afternoon when the summer temperatures are keeping things hot.
[FYI: A solar tracker gets 25% more power. Compare tracker cost and maintenance costs with adding 25% more panels and less maintenance and less risk.]

Rob Bob is another Australian, YouTube activist for aquaponics with good videos.
http://www.youtube.com/user/bnbob01

Cattle panel Greenhouse

Green house: Probably the easiest and cheapest greenhouse to build and easy to expand is the cattle panel, plastic covered greenhouse. A cattle panel four feet, four inches wide by 16 feet long is made of galvanized 4 gauge, steel wire and cost from $15-$25 each. To transport in a pick-up truck, panels are doubled end to end. The ends should be tied to avoid physical harm when unloading.

By placing three panels side-by-side, you have a 12-13 feet wide by 13 feet long greenhouse, sufficient for one IBC module and two grow beds. Width will vary according to height of stem wall around greenhouse (2.5' to 4' high) below the cattle panels. Add another panel and your 13 foot wide greenhouse is now 17 feet long, and etc. Easy expansion!

NEVER FORGET, SMOOTH SIDE OUT FOR CATTLE PANELS AND TIE WIRES TO PROTECT PLASTIC COVERING

Plastic greenhouse covering varies in cost and quality. Top quality diffuses the light, eliminates shadows, and should last four years unless heavy winds are common in your area. Cheap quality plastic probably will have to be replaced every year.

The stem wall allows a wider greenhouse by increasing head room. The stem wall improves ventilation of the greenhouse with more openings for incoming, outdoor, CO2 air for plants. Also, a stem wall eases insect and rodent control and improves insulation in cold weather.

Again, there are many ideas on the web for you to adapt for you site.

One grower's use of cattle panels for the greenhouse

He designed his by raising the level mounting wood (2" x 6" and 2" x 4") four concrete bocks high to increase the head room of the green house (30' x 12') and easy ventilation for incoming air (CO2 in fresh air). Exhausts at top at ends. The whole structure cost $140.
Links: **http://www.youtube.com/watch?v=BdbCcQTUO1o**
http://www.youtube.com/watch?feature=endscreen&v=P0tZPUyKrKs&NR=1

SHOP, SHOP, 16 feet long cattle panels (±$15-$25)

According to information on Dave's garden, a 14' floor width between ends would give a mid-height (MH) of 3.5'; 12' width – 4.83' MH; 10'width -5.63' MH; 8' width – 6.13' MH.

A stem wall four feet high of concrete blocks (or a leveled 2"x6" board with a 2"x4" nailed to wood posts) added to Mid-Height of arched cattle panel results in 8 feet from floor to top of arch for a 13' wide green house. The green house is easily extended in four feet increments by adding cattle panels and more plastic covering.

Cattle panels should be shopped for best price but shipping is expensive., **Source** for $25 cattle panels:
http://www.tractorsupply.com/webapp/wcs/stores/servlet/ProductDisplay?cm_vc=-10005&catalogId=10051&urlRequestType=Base&productId=10997&errorViewName=ProductDisplayErrorView&langId=-1&storeId=10151

pH

pH of established, well cycled, established fish tanks needs to be tested regularly. Some growers say daily test are standard. A pH of around 6.2 – 6.4 is best, though this varies somewhat depending on the species of fish and plants being grown. See optimal pH for plants below. The NASA list may be preferred as their work is with water only. State extension reports are from earth (dirt) tests.

If pH gets too low, it could be a sign that parts of the media bed have developed anaerobic bacteria, which produce acids. If this happens, remove any plants with very large root systems,

as these create pockets where air cannot access. Red Wiggler worms (not deep digging earth worms) help avoid this problem because worms live in the plant root mass improving ventilation.

If the pH is too high, it is generally a sign that the system's biofilters are not keeping up with the fish's production of ammonia. Plant more plants.

Carbonate Hardness

By TheFishVet – Richmond's School of Fish

KH stands for Carbonate Hardness and it's a measure of the buffering capacity of your water against fluctuations in pH which could be stressful for fish. A KH of 3-4 degrees (or 50-70mg/L) is recommended as a minimum. A lower value means you need to add buffers.

Optimal pH for Specific Plants
Three Sources With Slightly Different Test Results
NASA reports are from water cultivation (aquaculture)

Missouri Extension Service

Vegetable Tolerance of Acidic Soil pH

Slightly tolerant (ph 6.8 to 6.0)

Asparagus
Beets
Broccoli
Cauliflower
Chinese Cabbage
Lettuce
Muskmelons
New Zealand Spinach
Okra
Onions
Peanuts
Spinach
Swiss Chard

Moderately tolerant (pH 6.8 to 5.5) Bean

Brussells Sprouts
Carrots
Collards
Corn
Cucumbers
Eggplant
English Peas
Garlic
Kale
Kohlrabi
Lima Bean
Parsley
Peppers
Pumpkins
Radishes
Rutabagas
Soybeans
Squash
Sunflowers
Tomatoes
Turnips

Very tolerant (pH 6.8 to 5.0)

Irish Potatoes
Sweetpotatoes
Watermelons

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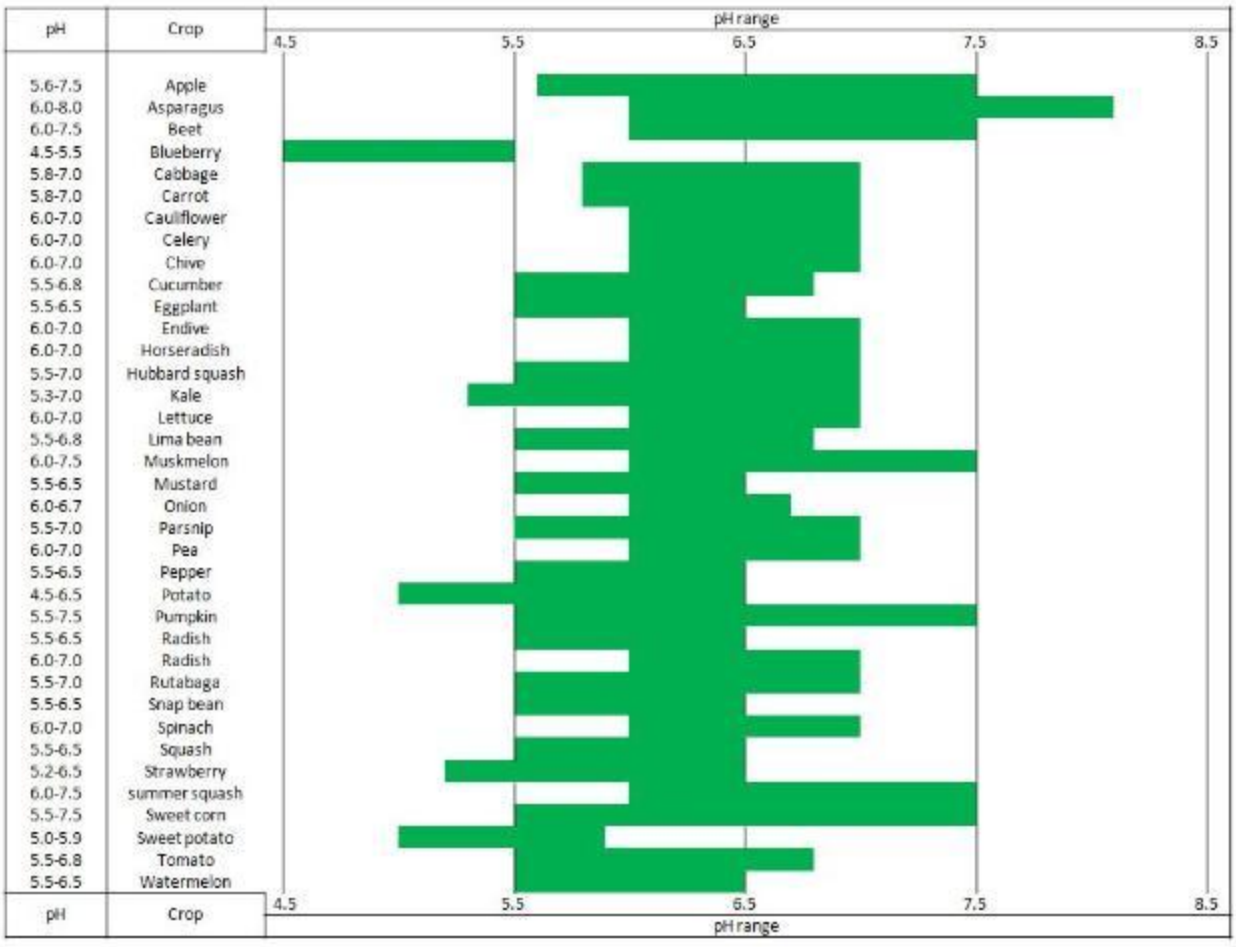
Soil pH range for optimal growth of vegetable crops – 1990 – University of Florida)



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Optimum pH for Vegetable Plants

From: NASA

Vegetable Crops

PLANT TYPE	SOIL pH
Asparagus	6.0-8.0
Beets, table	6.0-7.5
Broccoli	6.0-7.0
Cabbage	6.0-7.5
Carrot	5.5-7.0
Cauliflower	5.5-7.5

Celery	5.8-7.0
Cucumber	5.5-7.0
Lettuce	6.0-7.0
Muskmelon	6.0-7.0
Onion	5.8-7.0
Potato	4.8-6.5
Rhubarb	5.5-7.0
Spinach	6.0-7.5
Tomato	5.5-7.5

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Oxygenation

Aquaponic systems require an air pump for the fish tank. Having the flow of cleaned water from the grow beds falling from a height and splashing into the fish tank will help oxygenate it.

It is very important to keep the aerator pump running at all times. If the oxygen supply to the fish is cut off for only 45 minutes, you probably will have dead fish. For this reason, it is wise to have a backup air pump that will kick in if your pump fails. There can never be too much oxygen in the water; as excess oxygen will bubble to the surface. This necessity increases if you overcrowd the fish for more plant growth in the same grow bed area.

Fish Food Nutrients

Commercial Fish Food

Many commercial fish food contain fish meal and oil (and carry mercury). Australia and the University of Maryland recently announced success with new fish food.

College Park, Maryland – Dr. Allen Place (left) and Dr. Aaron Watson are developers of a vegetarian fish feed. Instead of fish meal, the experimental new feed includes corn, wheat, and soy. Taking the place of fish oil is a combination of lipids (fatty acids) from algae, amino acid supplements, and soybean or canola oil.

The flesh has PCB and mercury levels that are 100-fold lower than those found in fish fed regular pellets containing wild-caught fish. According to co-creator of the feed, Dr. Allen Place, this would allow consumers to eat striped bass twice a week instead of once every two weeks recommended now. (University of Maryland Center for Environmental Science)

Article**:** **http://www.gizmag.com/fishless-fish-feed/28615/?utm_source=Gizmag+Subscribers&utm_campaign=dc36fa4d6d-UA-2235360-4&utm_medium=email&utm_term=0_65b67362bd-dc36fa4d6d-89854674**

http://www.thefishsite.com/fishnews/20963/scientists-develop-sustainable-fish-free-feed-for-marine-aquaculture

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Australia Fish Food Research

The fish-in-the-fish-food problem is being researched to replace the fish content in fish feed with more sustainable ingredients. Traditionally, farmed prawns (or shrimp, depending on where you're from) have been fed pellets that contain some fish meal and fish oil. These are included to help the animals grow large, and to do so quickly. Scientists at Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO) have spent the past 10 years developing a feed additive that does away with fishy ingredients. The result, known as Novacq, was officially announced at the end of July 2013. Novacq contains marine microorganisms that have been bred in captivity that have shown to play a crucial role in prawns' growth process. In a large-scale field test, the product was mixed with an existing commercial feed (taking the place of the usual fish meal and oil) and used in ponds at an Australian prawn farm. CSIRO states the Novacq-consuming black tiger prawns grew an average of 30 percent faster than their regular-food-eating counterparts and were healthier.

Article: **http://www.gizmag.com/fishless-fish-feed/28615/?utm_source=Gizmag+Subscribers&utm_campaign=dc36fa4d6d-UA-2235360-4&utm_medium=email&utm_term=0_65b67362bd-dc36fa4d6d-89854674**

Feedipedia.org – A free source of the lab analysis of the nutrients in over 200 products **including Duckweed and Ramie (China Grass)** has been compiled by a French group and published in English.

Source: http://www.feedipedia.org/
Example Duckweed (green): http://www.feedipedia.org/node/15721

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Most aquaponic systems require calcium, potassium and chelated iron to be added about every two weeks. If you have a wormery, add worm-compost (worm tea) to the water flowing into the gravel beds to provide some missing nutrients. Worms help more than just eating waste.

Assorted information: Several videos, swirl filters, bio-filters, and "How-To" info: http://www.youtube.com/watch?v=G0pTf12wDOQ

http://www.youtube.com/watch?v=k5HjG6yYB1s

The Aquaponic Gardening Community – 997 Videos:
http://community.theaquaponicsource.com/video
(I did not review all of these!)

From Australia (www.backyardaquaponics.com.au)
The IBC of Aquaponics – A FREE, 38 MB e-text instruction manual. The video of the Faye Arcaro cutting and preparing an IBC for the fish tank and one grow bed is included.
http://ibcofaquaponics.com/
http://ibcofaquaponics.com/ibcs-an-introduction/

Here, Faye Arcaro shows the venturi method to add oxygen to the plant cleaned water returning to the fish tank. Cheap, just drill a hole in a reduced size pipe (Bernoulli effect)!
http://www.backyardaquaponics.com/videos/#mc_signup

Home page of the Backyard Aquaponics web site. Good information source. They maintain a free forum used worldwide.
http://www.backyardaquaponics.com/

Which system? Backyard Aquaponics says:

"Through lots of experimenting over the years, and through the trials of members on the online discussion forum, the flood and drain media based system has been found to be the most reliable and the simplest method of aquaponics, especially for beginners. It can be done very simply using a wide range of different containers. The flood and drain media bed system also requires minimal maintenance." [Add worms!]
http://www.backyardaquaponics.com/guide-to-aquaponics/running-of-the-system/

Murray Hallam, an Australian expert that teaches classes as a source of income used to stress the pipe (NFT) methods with his commercial operation. Now he is in the process of replacing his pipes with "flood and drain" because the water temperature gets too high while in the pipes and plants do not grow well. This was an expensive change. So don't. Vertical pipes are different and are suggested for small floor space for increased production. Certain plants do well (e.g. herbs, strawberries, and etc.). Dr. Nate Story of Bright Aquaponics has a commercial system using square vertical PVC pipes.

Fish Stocking:

"Fish Stocking: Every system is different and people's environmental conditions can vary quite a lot, but there has to be a guideline as to what will work well for the majority of people. We recommend stocking around 20-25 fish for every 500 Liters of grow bed media in your system, this is assuming you have grow beds that are around 25-30 cm deep (10–12 inches)".

So, let's say perhaps that you are looking at making a very simple system like the example system we have built in this manual, made from the one IBC cut into two pieces to make the grow bed and fish tank. This grow bed has 250 Liters of media in it, perfect for around 10-12 fish. This is allowing for them to grow from fingerling up to a plate size of around 400-500

grams. If you double the grow bed by adding another one the same, then you can pretty much double the amount of fish you have to 20-25 fish in the system."
http://www.backyardaquaponics.com/guide-to-aquaponics/fish-stocking/

Power Back-Up system
http://www.backyardaquaponics.com/guide-to-aquaponics/backup/

Another source of basic information is Portable Farms in San Diego County, California and Florida. Colle Davis explains their move to Florida: "California is not a business friendly state."
Portable Farms: http://portablefarms.com/articles/

We're growing a variety of organic seeds in each of these categories.

Basil	Green Peppers	Swiss Chard	Cucumbers
Romaine Lettuce	Jalapeno Peppers	Tomatoes	India Mustard
Chinese Cabbage	Green Beans	Zucchini	Bib Lettuce
Basil	Pak Choi (Bak Choy or Joi Choi)		A & C Kale
Leek	Iceberg Lettuce	Green Onion	Eggplant
Green Swiss Chard	Hot Peppers	Yellow Crookneck Squash	

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Tomatoes: From Robbie Alekson's Newsletter

Once set up (well stabilized or cycled), growing tomatoes in an aquaponic system is simple and highly productive.

1. Raise tomato plants to seedlings or purchase tomato seedlings from an organic grower. Avoid using any pesticide or fertilizer in seedlings for your aquaponic system.

2. Use a light weight growing media in your aquaponic growing area. It gives tomato roots better support than free-floating systems.

Insert stakes into growing media. Use ties knotted to the edge of the growing area or lay a metal screen over the media surface to anchor the stakes upright.

Tie stakes to the screen. Alternatively, suspend ropes or nets from a frame (Ex. a cattle panel) to support growing tomatoes.

3. Test the pH of the growing media and the water coming from the fish tank to the grow bed. Aquaponic tomatoes grow best in this system at a **pH of 5.8 to 7.2**.

Adjust the pH with fish-safe aquatic pH stabilizers if necessary.

4. Transplant the tomato seedlings once the pH is stabilized. Cover the root ball with a light layer of the growing media to help prevent the surface roots from drying out, unless you are growing the tomatoes in compost or other heavy media.

Heavy media on top of the root ball will suffocate the top roots and promote disease.

5. Add red earthworms, also called Red Wigglers (Eisenia foetida), to the growing media to reduce anaerobic areas that are unhealthy for tomatoes.

The worms also enrich the growing media with minerals and organic matter that the plants can use for food.

6. Monitor the phosphorus levels in the growing media and the incoming tank water weekly near tomato bloom time (about six weeks after transplant) and throughout fruit set.

Add organic aquatic phosphorus fertilizer at the package recommended rates if phosphorus rates are low.

Now you know how to grow aquaponic tomatoes.

Robbie Alekson
Tamarac, Florida

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Fall Planting for cool weather vegetables – Bracken Newsletter Aug 30, 2013

Fall Planting

Fall is the best time to plant **Cabbage, Cauliflower, Broccoli, Kale** and other cold tolerant plant and vegetable varieties.

Cabbage - Cabbage is great to help lower cholesterol if cooked by steaming. Cabbage has also shown in a recent study to help reduce the risk of cancer if short cooked. Cabbage contains several important vitamins and minerals such as Vitamins K, C and fiber.

Cauliflower - Contains several vitamins and minerals such as riboflavin, folic acid, and omega-3 fatty acids just to name a few. Cauliflower has also shown to help reduce the risk of cardiovascular diseases and cancers.

Broccoli - Is a great source of potassium which helps promote a healthy nervous system and optimal brain function. Broccoli can also help regulate blood pressure. Broccoli has shown to help repair skin damage and has other numerous health benefits.

Kale is a close cousin of broccoli and is perhaps one of the best vegetables you can eat based on its long list of nutritional values and health benefits.

If you haven't yet decided on what to plant or you haven't yet created your aquaponics system the next several weeks is the perfect time to **ACT** before the weather gets too cold. With a little

planning you can secure a healthy crop of fresh vegetables throughout the winter months and save both time and money in the process!

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Marketing Your Produce – The Grocery Bag Direct to Users – Club Method

This ad is the 2013 marketing method by a Connecticut aquaponics grower: Premium price is assured and middlemen or retail stores are by-passed.

The Grocery Bag

Cote's Naturals offers a weekly package that can be delivered to your door.
[Note: His price of $30-$35 is for less than three pounds of produce, a very high price.]

This package includes:

Two 6 oz. packages of Cooking Greens (e.g., Kale, Mustard Greens)
Two 6 oz. packages of Salad Greens (e.g., Baby Romaine, Red Oakleaf)
One package of Herbs, Microgreens, and sometimes, a new product included for you to test and express your feedback.
Recipes and explanations that will allow you to enjoy our produce as much as possible and give you aquaponics knowledge that will wow your dinner guests.

$35.00 – We Deliver
$30.00 – You Pick-Up

To try our service and tasty products, please complete and send the form below. Please note your vegetable preferences and any family allergies in the message area.

For questions or comments, please call Tyler at (860)940-4155 or by send an email to ***Tyler.Cote@cotesnaturals.com***

Web ad: http://www.cotesnaturals.com/products.html

For the beginner or for commercial systems, there is little real world information available of the quantity of aquaponics vegetable production. Dr. Nate Storey, who uses square PVC pipe for a vertical system, offers some data from their operation, perhaps a good goal to try to achieve using other systems. The steady, constant flood and drain (Bell siphon) media grow bed may have different production, but you have Dr. Nate Story's experience for comparison. If nothing

else, it contains good information to help decide which vegetables and varieties to use in limited size, start-up systems.

Click the link to download the nine pages, pdf file, Production Estimates.pdf (2 MB)
http://digioh.com/emd/300437/ew6bq0uksa

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Some Basic Guidelines

MAX fish stocking per minimum grow bed/fish tank volumes
3 kg of fish per 100 liters of flood & drain media filled grow beds with 50-100 liters of fish tank (1 lb of (mature) fish per 5 gallons of flood and drain media filled grow beds with 2.5-5 gallons of fish tank) [Lower fish population reduces risk of losing fish when pH, alkalinity, minerals, oxygen, temperature, and power outages change chemical conditions in fish water.

Ratios
When we talk about ratios it is grow bed to fish tank. A 2:1 ratio means there is twice as much grow bed volume as fish tank. Yes, if you have twice as much grow bed as you have fish tank, you then need a sump tank or some other means to keep from running the fish tank dry.

Pumping
Pump the volume of your fish tank each hour (if pump is running on a timer, pump should move the volume of the fish tank in whatever fraction of an hour it is turned on.)

Aeration
Though flood and drain grow beds provide all the aeration that the plants and bacteria needs, it is good to have supplemental aeration for the fish tanks even if it is not strictly needed to keep the dissolved oxygen up for the fish, the extra circulation provided by the aeration can help keep fish tanks cleaner. Also having a supplemental air pump can make it easy to hook it up for battery backup in case of power failure.

1 cfm (cubic foot per minute) at 2 psi (pounds per square inch) for 400 gallons of fish tank.- approximately 18 liters per minute at 13 kPa for 1000 liters of fish tank

Grow bed Depth
A relatively standard depth for grow beds is 30 cm or 12 inches. This seems to be a good minimum depth that provides plenty of dark space for bacteria and worms, solids filtration, and root depth while still allowing for dry media on top when using siphons and maintains constantly flooded media at the bottom. It is possible to use shallower beds but they have greater challenges. Deeper beds are definitely functional though they provide less planting surface for the same amount of gravel. Deep beds are a good choice for those wishing to place DWC or NFT growing space after the deep grow beds.

Solids removal:

If small (modular) flood and drain media beds are used, solids removal is not needed [especially

with worms in your grow bed media].
However, if trying to grow lots of fish in small fish tanks for the number of plants, then added complexity and labor of solids removal becomes necessary.

Solids Lifting Overflows (SLO)
Commercial grower, Dr. Nate Story shows details of his SLO system and explains the simple method that uses gravity to move the nutrient rich fish tank water to the first filter. This system requires no power (and is not a siphon), while maintaining the water level constant in the fish tank.

Pumping water containing solids causes excessive wear and tear on the pump, while gravity flow does not. Try to plan module layout to use pumps only for clean, filtered water from grow beds.

http://www.youtube.com/watch?v=6YKcmcFyjQE&feature=share&list=UUdNLE33fcMMW3uYINssFKBQ&utm_source=Production+Estimates&utm_campaign=f20635ef9e-Friday_Wrap_Up_August_23_2013&utm_medium=email&utm_term=0_84da0d83ed-f20635ef9e-68774057

Swirl Filter: A simple swirl filter is the first stop of the nutrient rich water from the fish tank. Basic and cheap, a swirl filter uses simple physics of swirling water to cause solids to gather in the center of a container. For a view of the physics of a swirl filter, slowly stir a powder in a cup of water. You will see the particles concentrating in the center of the cup.

BioFilters are next, if used. Both types of filters are unnecessary in small home systems, but are necessary when fish are crowded, insufficient plants for the fish are planted, and worms are not used in the media beds. DO YOUR RESEARCH!

Worms: Worms can extend the time before the media in grow beds need cleaning. One aquaponics grower cleans after 18 months without worms. Others report cleaning grow beds after five years with worms.

Red Worms and Vermiculture

For a great deal of worm information – text and videos – about the benefits and 'how-to' on worms in gardening, check:
http://www.redwormcomposting.com/popular-vermicomposting-topics/#vermicomposting-trenches

You can subscribe at no cost to receive new videos automatically.

One grower recommends a handful of Red Worms should be added to each grow bed.

One report claims the population of Red Worms doubles in 90 days. Also, when the food supply cannot support the population, Red Worms stop reproducing.

Red Worm Composting also sells worms (a bit pricey, but this may be a one time investment).

Shop! Worms seem to ship well, but be careful. Sometimes, the extra money is worth the loss of time and disruption of an aquaponics system cycling caused by the wrong or poor quality worms being put into your grow beds.

Also, it is easy to start your own wormery for your future worm needs.

"How to start vermicomposting for cheap"
From: Red Worm Composting bentley@redwormcomposting.com (Sept 1. 2013)
http://www.redwormcomposting.com/bonus-audios/
http://www.easyvermicomposting.com/easy-vermicomposting-course-membership/

"Any box or tub can be used as your container as long as you keep the worm requirements in mind. Worms do not like light, so do not use a clear container. If you do not happen to have anything at home, I recommend buying a basic Rubbermaid "Roughneck Tote" for your bin.

Most soil worms are NOT well suited for vermicomposting, so do not use common earthworms. Bait shops sometimes have Red Wigglers or African Nightcrawlers , but you cannot be sure what you are getting and you will probably only get a few to save money.

Find someone who is already vermicomposting locally. They may be willing to share some of their worms. Most vermicomposters are kind-hearted folk. Check the map of vermicomposters on **vermicomposters.com** to see if there is anyone close to you.

'I started 13 years ago with worms shared by a co-worker. My total cost was $10. All the food and bedding was free (food scraps, shredded paper, and etc).' –Bentley

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THIS IS AN AD!

I do not post ads, but time and knowledge are important. A vermicomposting site established many years ago offers an online class of 15 lessons for US$27.

http://www.easyvermicomposting.com/easy-vermicomposting-course-membership/

Losing your wormery one time would cost far more than the cost of the course.

A few warnings: Robins love your worms, but robins do not convert food to meat as efficiently as fish.
Moles also enjoy eating your worms, but the market for mole meat is extremely small and they are hard to herd.
Worms provide useable minerals for the plants.
Worm compost tea is a powerful organic fertilizer.
Worms aerate the plants and help avoid having anaerobic masses in grow beds that produce acid (low pH) in fish water.

Check it out. Worms are priced from around $20 to $50 for 1,000. There are warnings of unethical worm dealers out there.
The following are on the Web, but I have no idea which are legitimate. Walmart may charge $50, but you know there is a guarantee.

Red Worms: http://www.redwormcomposting.com/buy-composting-worms/
(U.S.A. orders – US$36)
Walmart – US$42 + US$8.29 shipping
Red Wiggler Worms On SALE **Red worms** are the best composting **Worms**! 1000 $24.99 WORM BINSwww.wormpal.com/
Red Wiggler Worm For Sale$18.95 for 1000 Guaranteed Live Call me I'll answer or call back www.**worms**etc.com/
Uncle Jim's Worm Farm Use Coupon Code UJW10 for 10% Off. Lowest Price Online, Live Guaranteewww.unclejimswormfarm.com/
Red Worms Compost your Kitchen Scraps www.**redearthworms**.com/
Red Wiggler Worms The Leaders in Home and Garden. Great Deals and Fast Shipping!www.gardeners.com/
Live Worms Shipped Comes From Our Farm to Your Home Crickets - **Worms** - Healthy & Freshwww.armstrongcrickets.com/

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Dallas, TX – Bob Jordan calls it magic.

"Aquaponics is fascinating to people because they discover it is a better way to garden. You get it out of the weeds, get it out of the ground. You can grow at twice the speed and four times the density," he says.

He proves the point by holding up a zucchini the size of a small watermelon. The Rolens' current system is housed in a greenhouse measuring 28 feet by 16 feet, so they have vegetables throughout the year. The tank in the center is partially underground to help stabilize water temperature for the fish. The tank measures 20 feet long, 5 feet wide and 5 feet deep.
Rolen grows about 75 percent of the produce needed to feed her family of eight. Soon she expects to harvest her first copper perch for their dinner.

Portable Farms, a California and Florida firm that has classes on aquaponic farming and sells backyard-size systems, says a 10-by-20-foot system can grow 1,100 vegetables and produce 400 pounds of fish a year.

Smaller systems, such as the 55-gallon example Jordan demonstrates, use fish to produce nutrients but the fish are not edible. He recommends that small systems implement inexpensive goldfish or bait fish. Even without edible fish, an aquaponic garden is worth it, Jordan says. His wife gets all the herbs she needs for cooking from the small system by their back door.

Interest in aquaponics has flourished since the 1970s, but the concept is much, much older.

Researchers say similar farms existed in Asia in the sixth century and the Aztecs had floating gardens near today's Mexico City. There are reports aquaponics existed in ancient Egypt.

Aquaponics caveats

Dave Pennington, or Aquaponic Dave as he's known, says getting the system up and running requires some experimentation. Pennington, 51, lives in Richardson, TX and builds and balances systems for clients throughout the state.

Too few fish and there are not enough nutrients in the water for the plants to grow. Too few plants and the water might not be cleaned, killing the fish.

The water's pH factor — alkalinity or acidity — has to be maintained as well to suit both the fish and the plants.

But those things are usually worked out fairly quickly. In addition, fish must be fed daily and pumps checked weekly to assure they stay clean and functioning.

"I'm not saying it's as easy as walking into McDonald's and buying food," says Pennington, "but it's easier than dirt gardening."

Article: http://www.dallasnews.com/lifestyles/home-and-gardening/headlines/20130724-aquaponics-another-way-to-bypass-dallas-areas-difficult-growing-conditions.ece

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For Beginners with limited space for aquaponics (E.g. small apartment balcony)

The barrel system is cheap and a small starter system is best for someone with limited space. There is an important learning curve with aquaponics. Mistakes mean dead fish and dead fish mean money lost, RIP.

http://theurbanfarmingguys.com/wp-content/uploads/2011/07/Barrel-ponics-Manual1.pdf

For minimum floor space, use vertical barrel. Using all the barrel for fish and a plastic bin for plants means more plants from more fish. Place plant grow bed below water outlet from barrel to use gravity to move nutrient water to plant grow bed.

If sufficient floor space, cut barrel in half vertically, one half for fish, one half for plants. If possible, raise fish half barrel higher than plant grow bed for gravity flow of nutrient water to grow bed, Then pump the clean water from grow bed to the fish barrel half. Clean water results in less pump wear and longer pump life.

Stocking density – Based on fish and water

http://verticalfoodblog.com/aquaponics-stocking-density/?utm_source=Homepage+sign+up&utm_campaign=0c327c5778-Friday_Wrap_Up_July_26_2013&utm_medium=email&utm_term=0_243961e928-0c327c5778-63588769

Basically, 1 pound of mature fish for each 8-10 gallons of fish tank water. This video is informative as it explains the science behind the recommendations.

The ratio of 1 pound of fish for each 8-10 gallons of water is for fish security. It eliminate air pumps for extra oxygenation, swirl filters, bio-filters, extra water tanks and all but one water pump, and other equipment needed by larger populated systems and the ratios necessary.

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Aquaponics – No fertilizers, no chemicals, Organic vegetables – Maybe! Organic vegetables using pesticides, but special pesticides

http://community.theaquaponicsource.com/video/pest-controls-for-aquaponics?xg_source=activity

A good source for videos on many phases of aquaponics is from **Dr. Nate Storey**. His approach is scientific and logical. (http://shop.brightagrotech.com/) However, Nate lost fish by not having an SOP (check list). See Tracy Holz's videos below.
http://www.youtube.com/user/brightagrotechLLC

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Affnan, Malaysia (Over the years, he has shared information from experience, including the non-snorkel Bell Siphon.)

Annual Growing Table for Home (i.e., non-commercial) Aquaponics system:
http://www.affnanaquaponics.com/2013/08/growbed-period-and-tilapia-cycle.html

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TRACY HOLZ
One of several good content videos offered to help beginners is Tracy Holz's advice from research, experience, and plain logic. Dr. Storey (see above) lost several hundred fish that could have been avoided had he followed Mr. Holz's SOP method explained in this video.
http://frontier-adventures.com/economic-viability-of-aquaponics/.html#comment-62479
http://www.youtube.com/watch?v=EjyTnhZmJls (Economics - commercial)
"What is aquaponics?" Good tips! http://www.youtube.com/watch?v=f_obO51AJeU
"What is aquaponics?" Part 2 – http://www.youtube.com/watch?v=UzehVjSq7s8
Tracy Holz's videos: http://www.youtube.com/user/MrHolzster/videos
http://www.youtube.com/watch?v=hUs1T1g93bM&list=SPjoERUyiCE1KMCzQxQ_5MnJNs31TwNpNY

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Rob Bob – Australia

A good source for videos for Aquaponics

Here is one. At the end, you have a choice of many more videos.

http://www.youtube.com/watch?v=nJw5OpGCLIw&list=PLBcWprMIwYYh9C2BDFMnIGeLdI6mfDpUe

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A group of slides showing a small, cattle panel greenhouse and aquaponics project.
http://www.youtube.com/watch?v=xzSu7uXvDFE

Good points:

- Simple, cheap
- Smooth side out
- Good use of space
- Insulated fish tank – reduces water temperature shock of fish
- Apparently used good quality plastic covering
- Good exhaust fan
- Good use of stem wall to raise head room for thirteen feet wide floor space

Criticism:

- Plastic tubs probably better than wood, longer lasting grow beds in termite zones
- Lack of ventilation entry points
- Lack of screening of insects and vermin
- No bio-protection
- Few plants to clean water, more needed for healthy fish
- Lacks cloth straps over plastic covering to reduce wind damage

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Aug 2013

Nelson and Pade – A Day in the Life of an Aquaponic Grower - Video

http://www.youtube.com/watch?v=EYrUdWG5hkY

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Diseases: Plant Diseases and Fish Diseases will occur.

Common Aquaponic Tomato Diseases

From: Robbie Alekson, Tamarac, Florida (free newsletter)
robbie@aquaponicsfishsystem.co

Tomatoes grown in greenhouses and aquaponic systems are subject to the same diseases as those planted outdoors. **The frequency of some diseases is increased in outdoor environments.**

Viral Diseases

Tomatoes are vulnerable to a number of viral pathogens, including the tobacco mosaic virus, cucumber mosaic virus, and potato virus Y.

No practical means exist for treating plants infected with a viral disease. Infected tomatoes are often uprooted and destroyed to prevent the outbreak from spreading to neighboring plants.

Symptoms of viral infections include discolored patches or streaks on foliage, wilting of green growth and sudden death of plants.

Controlling infestations of migratory sap-sucking insects, such as aphids and mites, is key to preventing the spread of these viral diseases.

Root Rot

Fungi in the genus Pythium are among several groups of pathogens that cause root rot disease in tomato plants. Pythium is a serious threat to tomatoes cultivated in greenhouse and aquaponic environments because it can survive in soil or water for long periods of time.

Pythium decays the roots and lower stem of its host, causing discolored markings on infected areas. Pythium fungi can infiltrate greenhouses during transplants or through contaminated material, such as non-sterilized water and soil.

Root rots are deadly, so infected plants and their debris should be removed from a aquaponic system as soon as possible.

Preventing root rot from infecting the plant is the best idea of all, so be sure to check the roots often, and cut them back if they start turning grey or brown.

Wilt Diseases

Tomatoes are vulnerable to several wilt diseases that are also caused by soil-borne fungi. A specialized variety of Fusarium oxysporum is a host-specific parasite of tomato plants.

Fusarium wilt damages stems, leaves and fruit of tomatoes, causing discoloration of leaves and wilting of the entire plant, according to Iowa State University. Infected stem tissue turns brown and leaves shrivel before falling from the tree.

This disease causes widespread damage across the entire plant and severely diminishes the

plant's fruit yield.

Another wilt disease, called Verticillium wilt, can also infect tomato plants. Its symptoms are similar to those of Fusarium wilt, but Verticillium does not harm its host as quickly as Fusarium.

Leaf Spot Diseases

Leaf spot diseases are a common ailment of garden plants, trees and shrubs. Tomatoes are subject to several leaf spot ailments, including the fungal Septoria leaf spot disease and bacterial spot caused by the Xanthomonas campestris pathogen.

These two diseases cause brown or yellow spots on the surface of leaves. Infected tissue eventually decays and withers as the spots grow in size.

The spots caused by the Septoria fungus have dark gray centers, while those caused by the bacterial pathogen do not.

8165 N University Dr. #34, Tamarac, FL 33321 — (robbie@aquaponicsfishsystem.com)
Free newsletter.

Hooking Up a Solar Panel Installation to the Battery Pack

http://www.youtube.com/watch?v=cgEvCLJuBkg&feature=em-subs_digest-vrecs

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BackyardAquaponics Forum

After Research – Short Cut Web Search

For quick reference to questions and answers about aquaponics (August 2013):
http://www.backyardaquaponics.com/forum/
http://www.backyardaquaponics.com/forum/viewforum.php?f=11&sid=0212c3d1b3e82115045d52b33822b2fa

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With millions of results for Aquaponics, workable research needs to be filtered.
For videos: Google “YouTube Aquaponics” for thousands of videos.

For all sources: Spam and more spam, pdf files, many subscriptions, general aquaponics information, and videos:

Google users:
Click “Search” and enter “Aquaponics”
Click Gear icon upper right: Then click” Advanced Search”

In choices, click: “anytime” then “Last Update” Past 24 hours”
Click Blue box at bottom “Advanced Search”

You will have over ten pages of new spam and information daily, but you have filtered out over 2.5 million older hits! (But not the spam!)

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For Yahoo users:
Type in “aquaponics” in block above messages. Then, click “Search Web.” After full list appears, click on left side “Past Day” and millions will become fewer. Yahoo does this very poorly and includes posts dating back several months, not just 24 hours.

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A Secondary Benefit of Aquaponics, especially for poor, undeveloped parts of the world with mosquito caused health problems – tropical areas below approximately 3,000 feet (1,000 meters) elevation where malaria is a problem.

“An additional benefit of farming aquaponically (that we noticed after our first system was operational for six months) was that **the mosquitoes on our seven-acre farm had COMPLETELY disappeared**! We live in Hawaii, where there are as many mosquitoes as any other tropical area, even during a drought, when the soil was dusty and dry and there was no standing water visible anywhere, there were still clouds of mosquitoes at dawn and dusk.

When we built our first aquaponics system we introduced a few mosquito fish (gambusia affinis), and neon tetras into our system water. They spread throughout the systems and soon had become a self-sustaining population numbering in the tens of thousands. Six months later, we noticed there were simply no mosquitoes around any longer. We are not certain when the number went to zero, but it was sometime during that six-month period. That was three years ago.

How does this work? We live in the center of a deadly efficient mosquito trap: every female mosquito in the neighborhood can sense the roughly 50,000 gallons of water in our aquaponics systems, and comes to them to lay her eggs. Each egg hatches into a larva, which is then promptly consumed by one of the hundreds of thousands of mosquito fish in our water before it can ever develop sufficiently to hatch into an adult mosquito.

We don’t know what the effective radius of our mosquito eradicator is, but we’ve gone to the corners of our seven-acre property and haven’t found any mosquitoes there; there is a good chance it is significantly reducing mosquito populations on the farms around us. This could make a huge difference in the lives of people worldwide who currently lose family members to malaria and other mosquito-borne diseases.”

From a couple in Hawaii that designed a modified system of their own that is easy to replicate.

They provide training and plans. http://www.friendlyaquaponics.com/

The Greatest Development of the 20th Century — The World Wide Web

Along comes a brand new, 5,000 year old art called Aquaponics, being perfected by wet, green thumbs across continents.

The above document was the result of over four months research – all using the Internet.

Outstanding sites included are located in Australia, Malaysia, the U.S.A., and other countries. Before the days of the home computer, how was research conducted? In 1995, I learned about using the Internet to search and said, "Good-by, libraries."

The amazing factor is the willingness of so many people to share so much information at no charge. And most people benefitting from Open Source information are happy to 'pay forward' later. This document is one example among millions.

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