

Aquaponics Basics

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Before we dive into Aquaponics...

- First, what is Hydroponics?
 - Growing plants without soil and instead with the use of water and added minerals given to the plants, which are living in non-soil growing medium (no nutrients given off by media- must add).
 - Typical growing media include:
 - **Rockwool/stonewool** (think of cotton candy, but rock) (we sell)
 - With or without baskets
 - **Clay pellets** (made from recycled clay pots) (we can sell)
 - **Coconut coir** (we can sell)
 - **Vermiculite** (mica) (we sell)
 - **Perlite** (the white stuff you see in your potting soil) (we sell)
 - **Peat moss** (we sell)
 - **Sand/gravel/sawdust**
 - These growing mediums can also be used in aquaponics.
 - There are multiple ways to grow via hydroponics, which can also be used in aquaponics (which we will talk about soon...)
 - Farmers can grow a small hobby-sized scale or a commercial-sized scale, depending on the system setup and the amount of veggies wanted to achieve.
 - Typically, hydroponics is performed in an indoor, year-round greenhouse.
- Next, what is aquaculture?
 - Sometimes referred to as “Aquafarming.”
 - The cultivation of fish, crustaceans, mollusks, aquatic plants, algae, and other organisms.
 - Freshwater and Marine systems
 - Fish stocking density and fish feed ratio must be determined for system size
 - Controlled environment agriculture allows the farmer to contrast commercial farming, which is harvesting wild fish by improving fishing techniques.
 - Like hydroponics, farmers can grow a small hobby-sized scale or a commercial-sized scale, depending on the system setup and the amount of fish wanted to achieve.
 - Can be done indoor/outdoor, depending on location, species raised, and form of aquaculture being applied.
 - Different forms of aquaculture include:
 - **Pond Culture** – netting in ponds, moved around to reduce dead zones.
 - **Cage Culture** – Cages in open water
 - **Raceway Culture** – Shallow flow-through artificial channel systems (think river fish)

- **Recirculating System** – Limited water exchange and biofiltration used to reduce ammonia toxicity and create a suitable habitat for the fish.
 - **Canal Culture** – Irrigation canals

- Finally, what is Aquaponics?
 - **Aquaponics = Hydroponics + Aquaculture**
 - Fish feed input sends nutrient-rich water from fish tanks to the plants
 - Plant roots essentially “clean” the water before it is sent back to the fish tank
 - Common misconception: Fish and plants are in the same tank
 - Fish would eat plant roots
 - Nutrients need to be converted first before being sent to plants (beneficial bacteria)
 - The third species being grown in an aquaponic system is beneficial nitrifying bacteria – very important!!! Two types:
 - **Nitrosomonas**: Convert ammonia to nitrite.
 - **Nitrobacter**: Convert nitrite to nitrate (= plant fertilizer)
 - Aquaponics has been modernized in recent decades, and the term “Aquaponics” was coined in the 1970’s
 - Its roots are ancient:
 - as early as lowland Mayans
 - Aztecs who raised plants on rafts (called chinampas) on the surface of a lake in approximately 1,000 A.D.
 - South China and Southeast Asia – Rice cultivated in paddy fields with carp
 - Freshwater systems ONLY – Too much salt would kill the plants!
 - Typically, aquaponics is done via recirculating aquaculture systems (RAS).
 - Large variety of fish can be raised aquaponically (depending on location and natural water temperature)
 - Many different plant species can be grown aquaponically
 - Disease and Pest Management should be done organically (sticky traps for insect identification, beneficial insects to kill off unwanted insects)
 - Parts of an aquaponics system include:
 - **Rearing tank** (for raising fish – air stones needed for fish to breathe)
 - **Settling basin (Clarifier)** (for catching uneaten food and biofilms, and settling out dissolved solids (nutrient-rich water for the plants)
 - **Biofilter (Mineralization tank)** (a place for nitrifying bacteria to grow and convert ammonia to nitrate, which is used by the plants. Air stone needed for bacteria.)
 - **Hydroponics subsystem** (where plants are grown by absorbing excess nutrients in the water
 - **Sump** (the lowest part in the system where water is gravity fed through the system and is then fed back to the rearing tank via a pump.)
 - There are various ways to grow plants via aquaponics that are similar to the ways to grow hydroponically, such as:

- **Deep Water Culture (DWC)** – Also called deep water raft (Styrofoam rafts floating on water with holes in raft where plants grow from)
 - **Nutrient Film Technique (NFT)**
 - **Wicking**
 - **Ebb and flow** (flood and drain, media bed)
 - **Aeroponics** (misting)
 - **Drip Systems**
 - Farmers can grow a small hobby-sized scale or a commercial-sized scale, depending on the system setup and the amount of fish wanted to achieve.
 - Example of hobby-sized system:
 - Backyard aquaponics system used to self-sustain or sustain a small family with fresh veggies
 - Example of commercial-sized system:
 - Superior Fresh in Hixton, WI
- Sustainability & Healthfulness
 - Aquaponics (and hydroponics) uses about 95% less water than traditional irrigation systems in industrialized field agriculture.
 - The waste generated is being recycled, reused, and is growing fresh produce for you!
 - Can be economically viable option when compared to aquaculture farming (reusing fish waste to provide nutrients to plants)
 - Reducing commercialized fishing & preserving our streams, lakes, rivers and oceans.
 - Since the environment the fish live in is being controlled, they are being well cared for, living in pristine water conditions and fed a nutritious, balanced diet that you can trust when consuming.
 - Cannot use many pesticides/herbicides in aquaponics – it would kill the fish!
 - Very natural - close to being organic (can be organic depending on the fish feed.)
 - Fish feed should ideally be your only input into the systems, unless water parameters/water quality (such as pH) is not where it should be. Very rarely does anything need to be added, and if it does, it must be safe for the WHOLE system and YOU.
 - Systems produce food very quickly – 40 days or less from seed to harvest!
 - In my experience, the produce tastes AMAZING and are very long-lasting after picking!
- There are Pros and Cons to every system and setup – find what works for YOU!
- Things to consider:
 - Price, size
 - Plants, fish
 - Waste
- Examples of what grows well in an aquaponics system of any size (keep in mind that top heavy plants will grow best in a media bed, while lighter plants will do better in other types of systems)
 - Herbs
 - Mint

- Basil
- Sage
- Chives
- Parsley
- Dill
- Rosemary
- Other veggies
 - Lettuce
 - Kale
 - Swiss chard
 - Pac choy/bok choy
 - Tomatoes
 - Cucumbers
 - Zucchini/Squash/Summer squash
 - Eggplant
 - Peppers
 - Spinach
 - Strawberries
 - Peas
 - Beans
 - Microgreens
 - Flowers
 - AND MORE!!! 😊