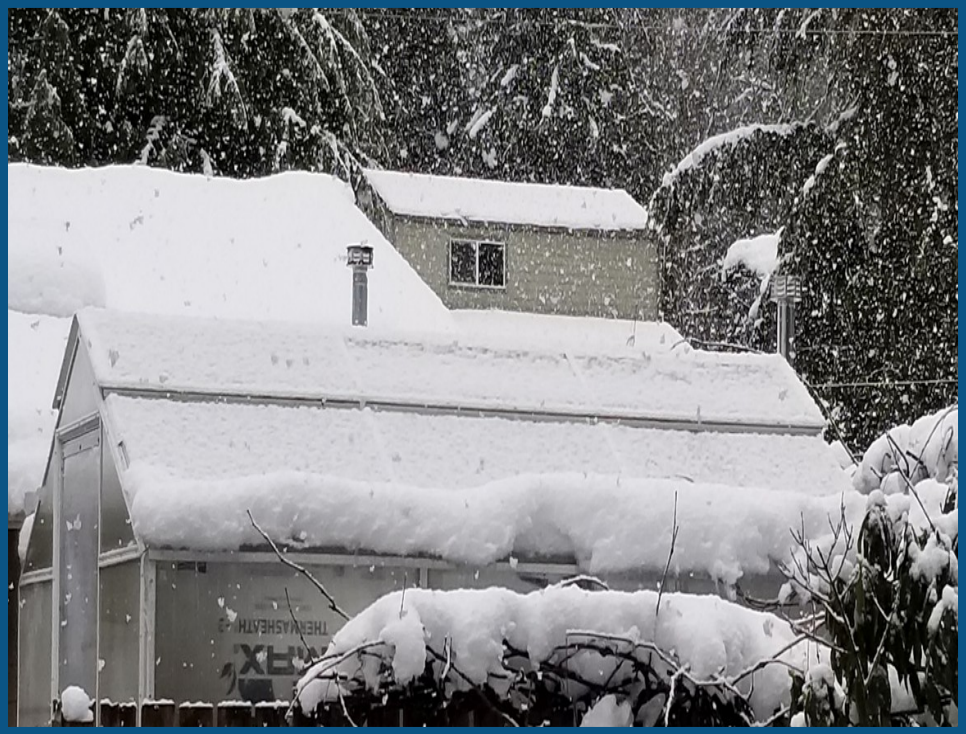
Backyard Build

Overview – Suggestions – Results

(Build Perspectives from an Amateur Aquaponics Enthusiast)



Many decisions are involved to have a successful aquaponics system. This presentation contains a handful of those decisions while describing the journey. It is not an exhaustive set of directions nor will all of the decisions apply to your system nor are all decisions the best.

My intent is to help those wanting to setup a system, showing it can be done, and hopefully providing those building options to consider.

Here's wishing you an enjoyable journey!

Ed Favilla

Sept, 2019

Outline for Today

- Who am I
- Snapshot of the Build
- Safety Considerations
- Goal for the System
- The Build - Obtaining Materials, Plumbing, Deep Water Beds, Support Frame, Environmental Systems, Lighting, Water Quality, Fish, DWC Rafts, Aeration, Products
- Summary
- Questions

Snapshot of the Build

- ✓ 10 ft x 12 ft Greenhouse
- ✓ 250 Gallon Fish Tank
- ✓ 8 ft^2 Seed Starting Area
- ✓ 6 ft^2 of Microgreen Area
- ✓ 135 ft^2 of Deep Water Culture
- ✓ Heated Water and Grow Space
- ✓ 850 Gallons of Water in System
- ✓ Artificial Lighting via 70, 4 ft LED Fixtures
- ✓ Growing 6 varieties of Lettuce, 3 Types of Basils
- ✓ Currently Producing 55 Units a Week **(Unit = 1 head of lettuce or 1 Large Basil Bunch)**

Safety

Systems may Utilize Water, Electricity, Natural Gas, Propane, Compressed Air, Mechanical Devices, Microcontrollers and/or other High Energy Components that can Cause Injury

- ✓ Understand and follow Electrical and Local Codes, if you aren’t sure, consult an expert
- ✓ Ensure all Build Materials are “Food Safe” in your System

Contemplate your Goal

(Helps decisions along the way)

Possible elements to consider:

- ✓ Personal Production, Commercial production, Community Grow
- ✓ Types of Products – *Leafy Greens*, *Fruiting*, *etc.*
- ✓ Expected Budget
- ✓ Seasonal or year-round
- ✓ What to do with Fish – Consume, Sell, Ornamental
- ✓ Building Codes, Local Regulations for Live Fish

Goals for My Build

- ✓ Cost Effectively Personally Evaluate Costs, Markets and System to Produce Aquaponically
- ✓ Personal Production with a desire to go Commercial
- ✓ Leafy Greens and Microgreens – Lettuce, Basil, Herbs
- ✓ No Wood or Other Organic Construction Materials
- ✓ Year-round Production
- ✓ Indoor Production, Artificial Lighting
- ✓ Donate Product to Food Banks
- ✓ Safe Build and Operation
- ✓ Use Koi – Fish to be used in Personal Pond

Obtaining Materials

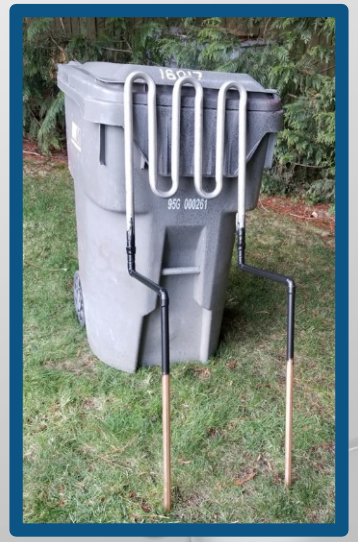
- ✓ To reduce costs, explore Newspaper Ads, Craigslist and Offerup and/or Other Venues Advertising Used and New Product at Lower Prices

Racking Material $200

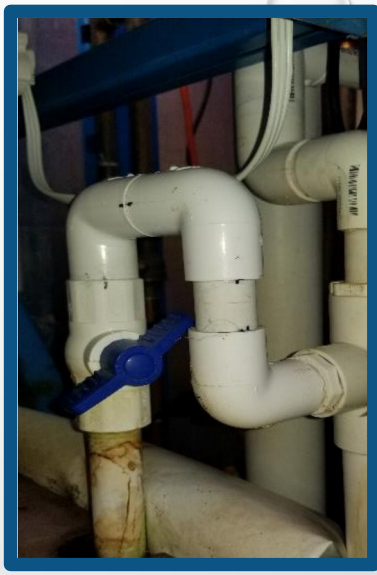
Greenhouse -$300

Regenerative Pump -$30

Heat Exchanger - $25



Plumbing



- ✓ Use Pipe/Hose with Smooth Internal Surface
- ✓ Oversize the Pipe as Organic Material will Buildup Internally
- ✓ Glue Pressure Lines – Slip Fit Other Lines if Fully Supported
- ✓ Consider Valving to Isolate Sections if/as Needed
- ✓ Each Fitting and Length of Pipe Add to the Total Head Require to Operate the System

- ✓ Eliminate gravity up flow (Creates Settling Point)
- ✓ Deburr ID of PVC Pipe

Other Plumbing Considerations

- ✓ Pump Once, Gravity Flow Back to Pump
- ✓ Include Energy Consumption When Considering the Pump to Buy, Not Just Purchase Price
- ✓ Oversize Pump 15 to 20% as System Characteristics Degrade Over Time
- ✓ Each Pump Type has Correlating Head and Volume Characteristics
- ✓ Consider Buying a Backup Pump

Deep Water Beds

- ✓ Utilized Pallet Rack Mesh
- ✓ ¾ inch Tube Forms Upper Edge
- ✓ 6 inch Deep Beds
  - (Depth Appears to Work Ok for Products I Grow)

- ✓ Bulkhead Fitting Connection for Drain
- ✓ Plastic Sheeting Formed to Interior to Protect Internal Liner
- ✓ Dura-Skrim Liner

Support Frame

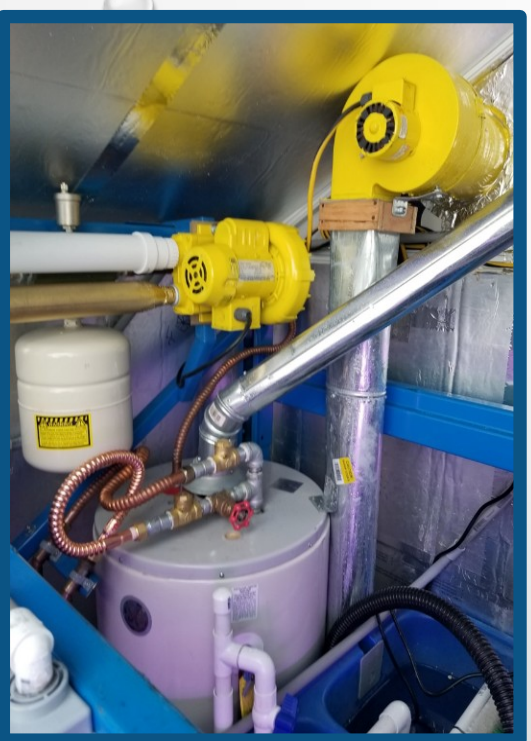
- ✓ Pallet Rack Framework
- ✓ Four Shelves for DWC Beds
- ✓ Adjustable – Allows Flexibility

- ✓ Fairly Easy to Modify
- ✓ Excellent to Prevent Algae and Microbe Growth

Support Structure in Place

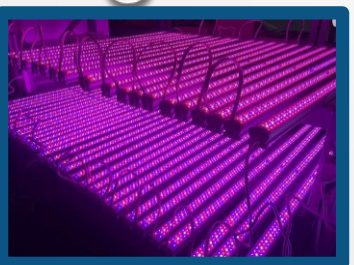
- ✓ 4 Layers per Side
- ✓ 2 Sides
- ✓ Supports Fish Tank

Environmental System

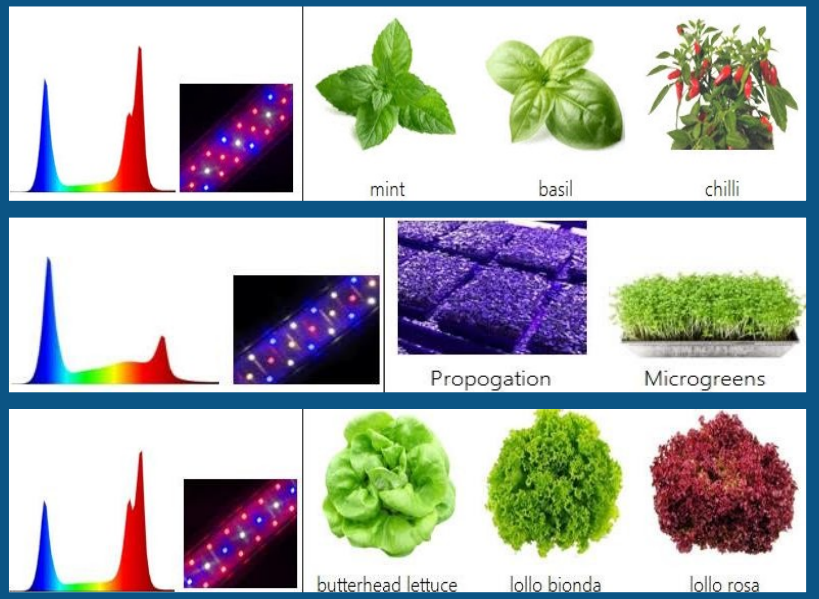


- ✓ Natural Gas H_2O Tank
  - System/Room Heat
- ✓ Inkbird Humidity Controller
- ✓ Inkbird Temperature Controllers
- ✓ 12 Volt Fans Above Plants to Provide Air Circulation
- ✓ Heat Exchanger for System Water
- ✓ Separate Fan to Cool Space
- ✓ Positive Internal Air Pressure

Lighting



- ✓ 4 Spectrums Selected
- ✓ LED, Low Energy
- ✓ LED, Low Heat
- ✓ 70, 4 Foot Fixtures

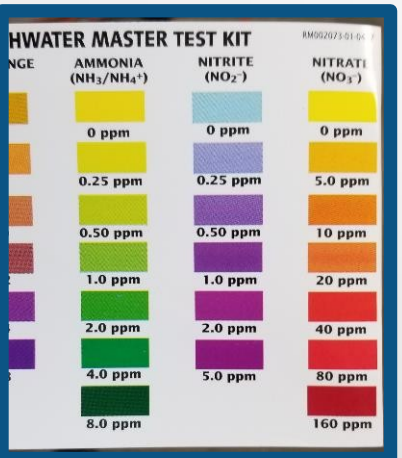


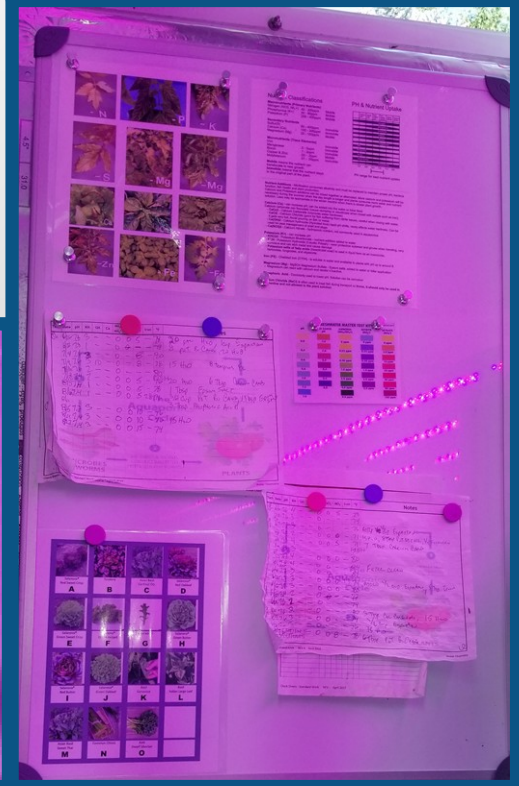
Water Quality

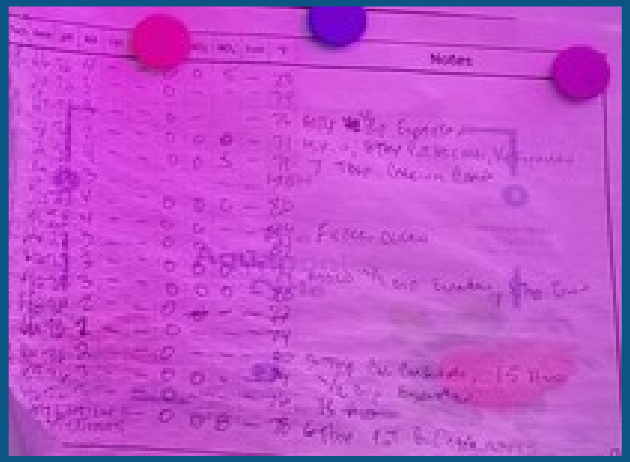
- ✓ Regular Water Testing Imperative
- ✓ Key Facets to Measure at Beginning

  Ammonia, Nitrite, Nitrate, PH, Carbonate

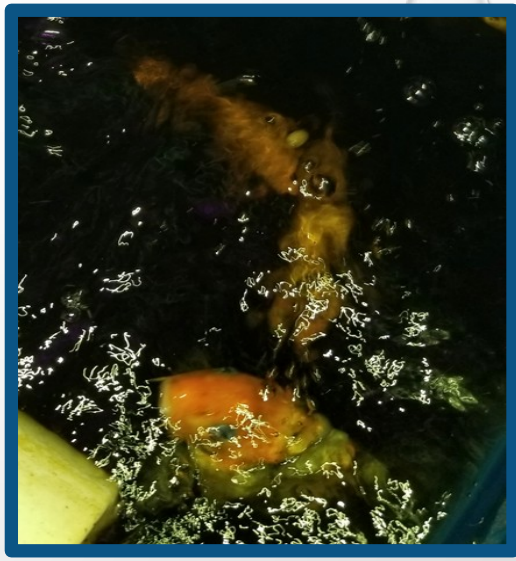
  Hardness, Temp
- ✓ Treat Incoming Water
- ✓ No Sudden Significant Changes to Any Water Characteristic Desirable
- ✓ Keep Records !



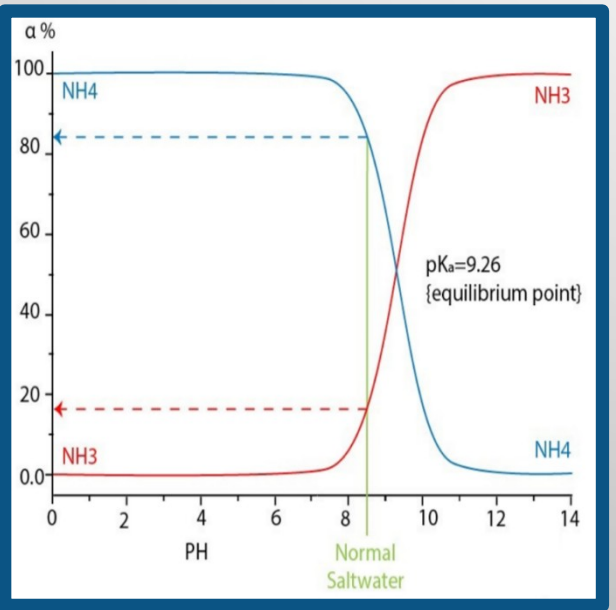




Fish



- ✓ Select Variety to fit Your Environment/Needs
- ✓ Quantity Commensurate with System Size
- ✓ Feed 2, 3, 4 times a time.
  - *Never more then they can consume in 5 mins*
- ✓ Introduce High Quality Disease/Parasite Free Fish
- ✓ Fishless Cycle System, Building Strong Bacteria Colonies



- ✓ Acclimate New Fish to Water Temp by Floating Bag
  - Do not Open it until you are ready to net fish and introduce into system CO2 change will cause PH change creating Lethal Ammonia Levels
- ✓ Be Sure to Cover the Tank – *New Fish Will Jump*
  - Use a Nonsolid Cover to Allow a Gas Exchange

DWC Rafts

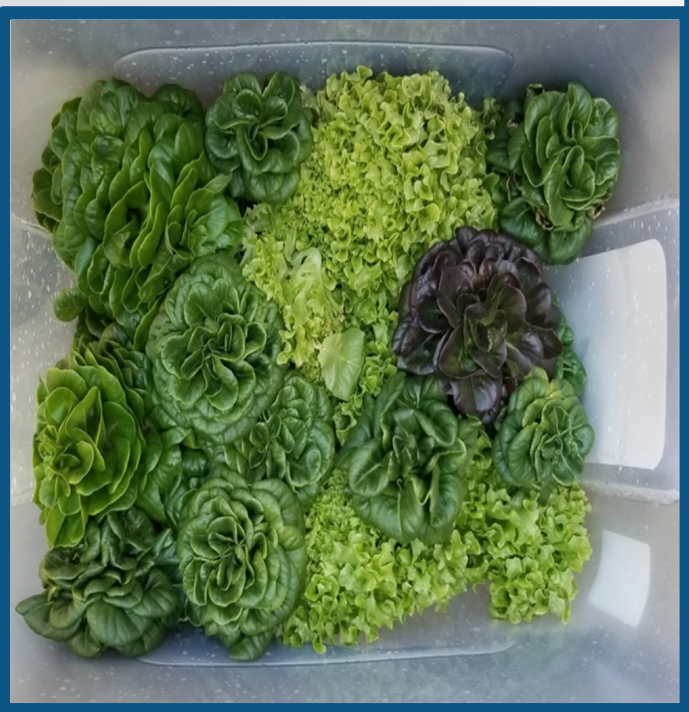
- ✓ 18, 28 and 72 Cell Rafts Tested
- ✓ Cover Entire Surface – Reduces Algae Growth
- ✓ Beaver Plastic Rafts
- ✓ Resized to Cover Entire Surface

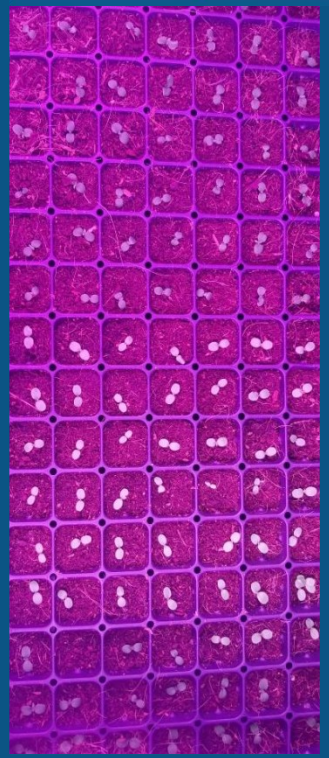
Aeration

- ✓ Regenerative Air Pump
- ✓ Air Stone Every 4 Feet in DWC Bed
- ✓ Air Stones in Fish Tank
- ✓ Air Pumped into Bio Ball Section
- ✓Air Stone in Sump Tank
- ✓ Consider Having a Backup Air Pump

Products

- ✓ Lettuces and Basils
- ✓ Currently Donating Majority of Products
- ✓ Local Neighbors Interested
- ✓ Several Restaurants Interested
- ✓ Rapidly Depleted Nutrients and needed to Supplement





Summary

- ✓ Many Decisions Required to Build and Operate an Aquaponics System
- ✓ Best to Learn Prior to Building System
- ✓ Courses/Classes Available are an Excellent Source. I Recommend Learning from others Prior to Building a System:
  - I have read several Books on the subject
  - I Attended the "Aquaponics Immersion Course" from the **Aquaponics Source Denver"**
  - I have heard rave reviews for **Murray Hallam's** "Aquaponic Design Course"
  - **Upstart University** is also an excellent source of information
  - *Many other sources to learn exist* – Ask a colleague at the convention or *Google away* …
- ✓ Great to Attend Aquaponics Convention to Learn from Others as well as Make Contacts for Future Questions
- ✓ It's Doable and Rewarding to Build and Operate a System


Questions?

Thank you