

Hydroponics 101

From homeowner-friendly to commercial operations with Drew Demler, Director of Horticulture, State Fair of Texas and Head Grower of the Big Tex Urban Farms





What is hydroponics?

- Hydroponics is a method of growing plants without soil using a nutrient-rich, water-based solution.
- There are many different types of hydroponic systems including: deep water culture, nutrient film technique (NFT), vertical systems, Dutch buckets, flood and drain slabs, media beds, and more.
- Most systems require or greatly benefit from a controlled environment, such as a grow room or a greenhouse.

The Systems Used at BTUF

- Deep water culture – 2 types of plumbing set-ups (Venturi and Moleaer oxygen) used for leafy greens and herbs
- NFT – very versatile
- Vertical systems – 1) tower gardens 2) grow racks used for greens
- Dutch buckets – tomatoes and vine crops

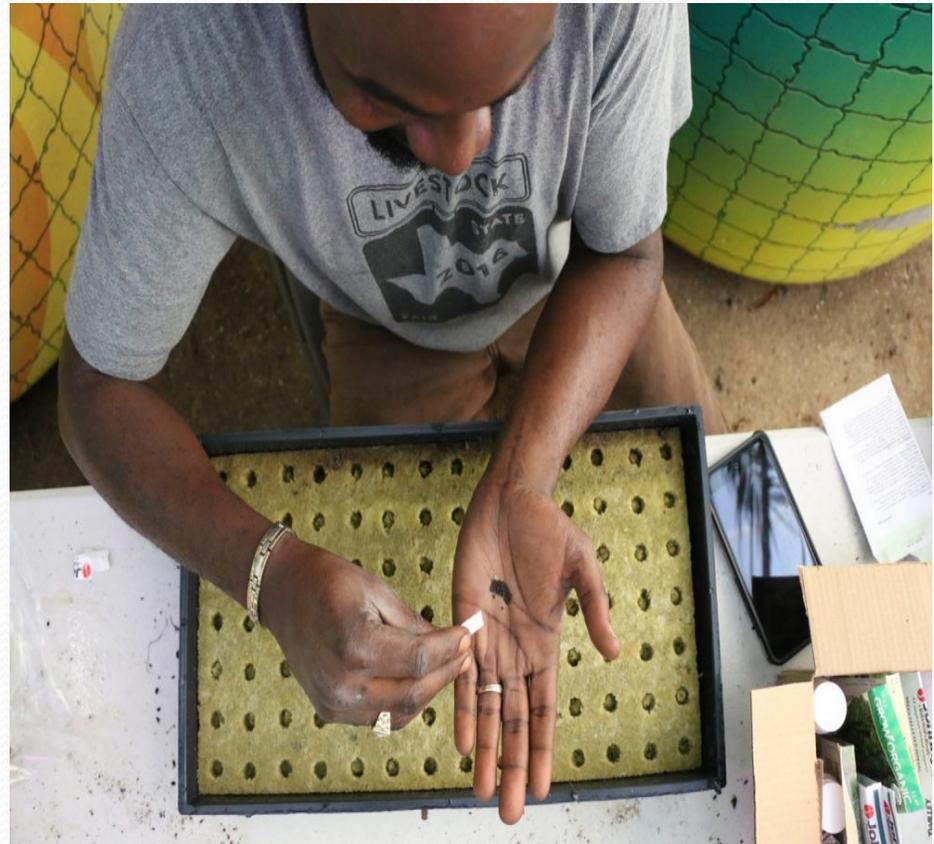




Hydroponics Continued

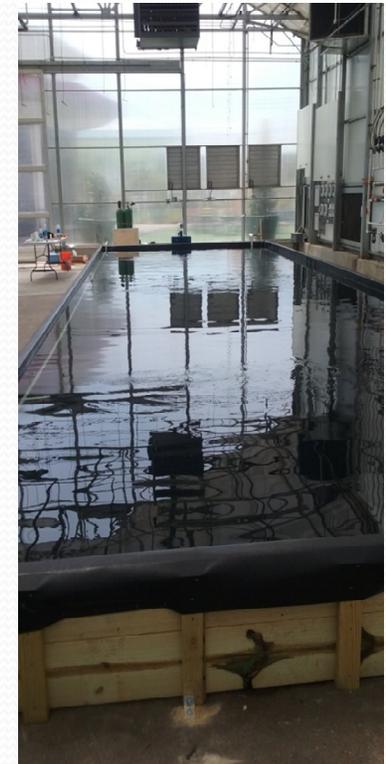
- Plants are started in a soilless substrate, mostly from seed. We use rock wool and coco coir.
- Nutrients are added to the water and pH is usually adjusted.
 - Every system and situation will have a different nutrient requirement -- lots of options.
 - Most people use a base fertilizer and supplement based on the specific requirements of the crop. Some use a one-part fertilizer.
- Hydroponics can be done using traditional or organic methods. We do both.

Rock Wool



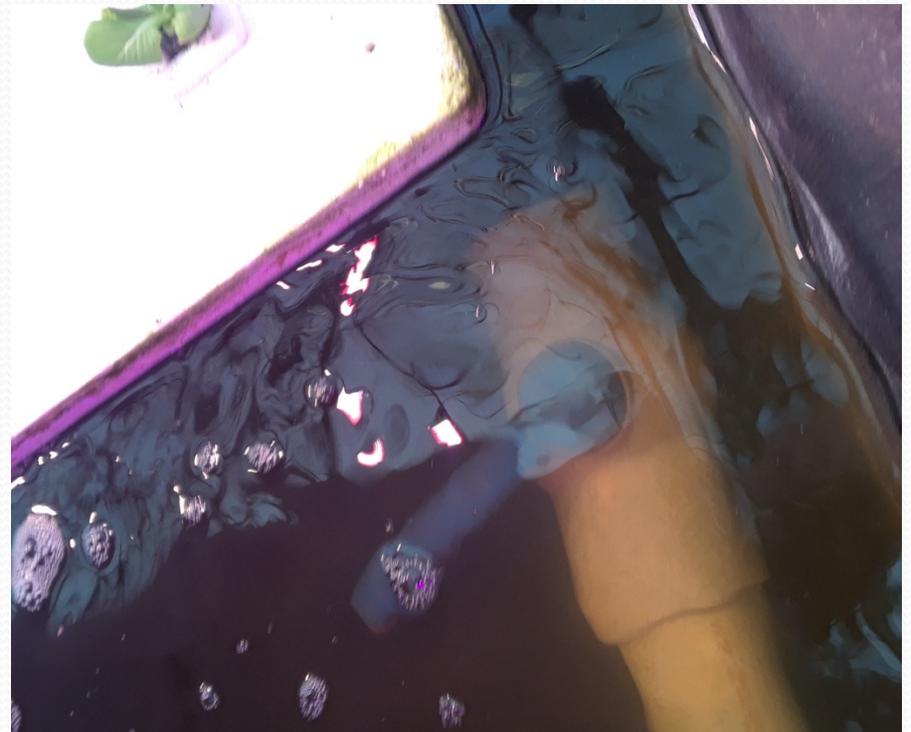
Deep Water Culture

- Ponds made out of dimensional lumber covered with a pond liner.
- Water is added to the desired level.
- Then pH is adjusted and nutrients are added.
- Water is circulated.
- Oxygenation is usually needed.
- We use Venturi and a Moleaer nano boost to oxygenate ours.



Venturi Valve

- Draws in oxygen as water circulates and is distributed to all four corners of pond.

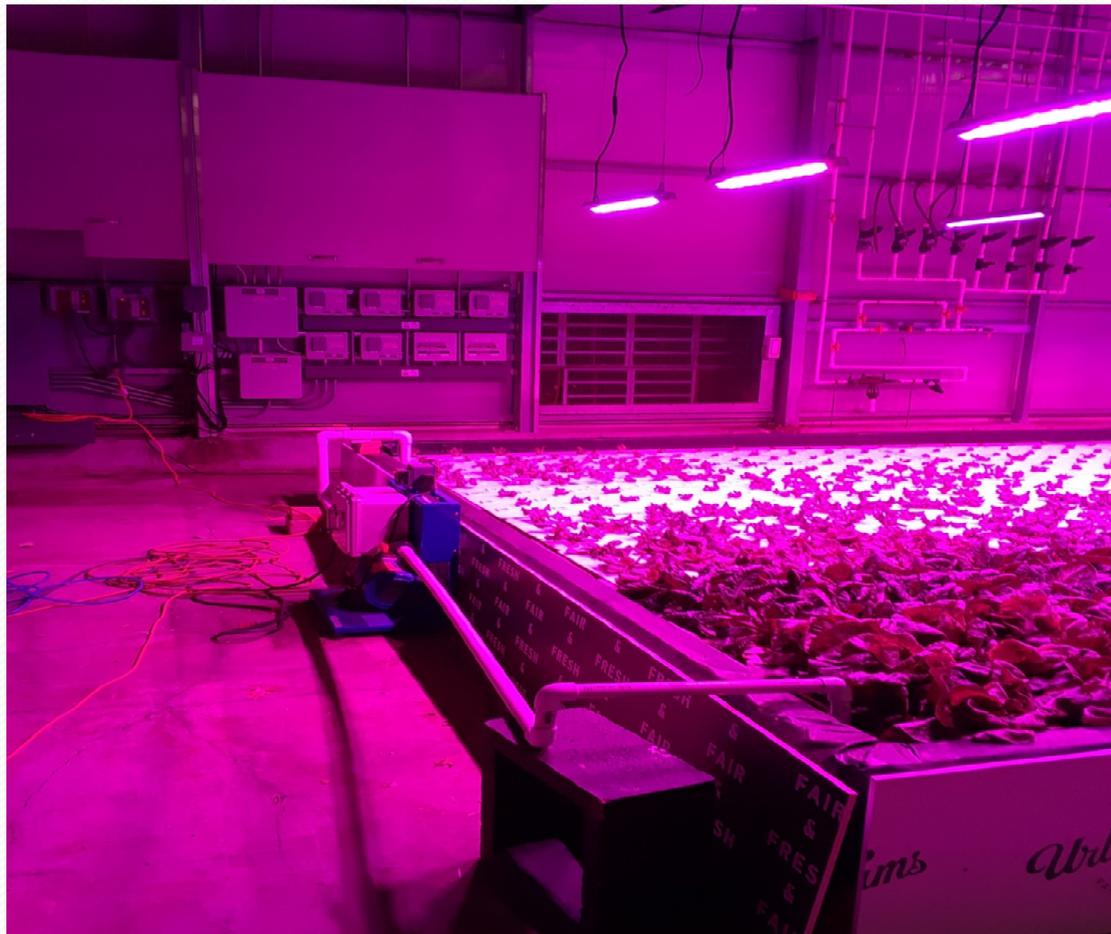




Moleaer Oxygenation

- Uses compressed oxygen tanks to feed oxygen through the plumbing system
- Able to get to around 30 ppm dissolved oxygen where Venturi is around 8 ppm
- Does cost more and needs to be factored in
- Oxygen helps off-set negative effects of heat
- Moleaer.com for more info and videos

Molecular Oxygenation



Moleaer Oxygenation

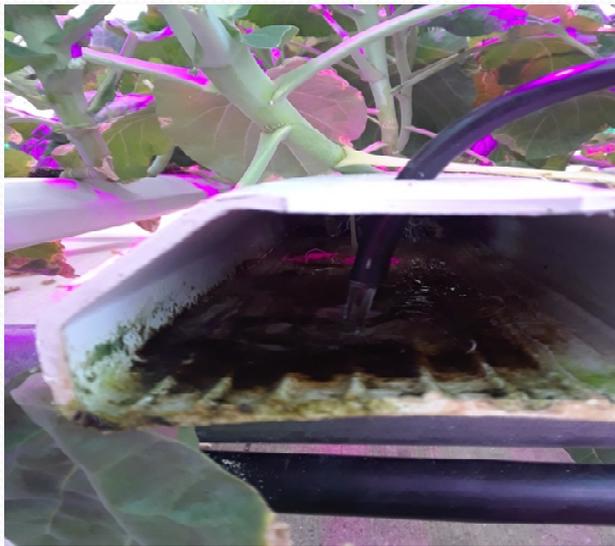




NFT or Nutrient Film Technique

- Plants are grown in channels that look like gutters.
- A very thin layer or film of water runs across the bottom of each channel allowing the plants to wick up water but also breath!
- A reservoir is used and a small pump keeps the water circulating non-stop with a very simple plumbing system (feed line and collector return line).
- Nutrients and pH adjustments are added to the reservoir as needed.
- Very versatile systems .

NFT or Nutrient Film Technique



NFT or Nutrient Film Technique





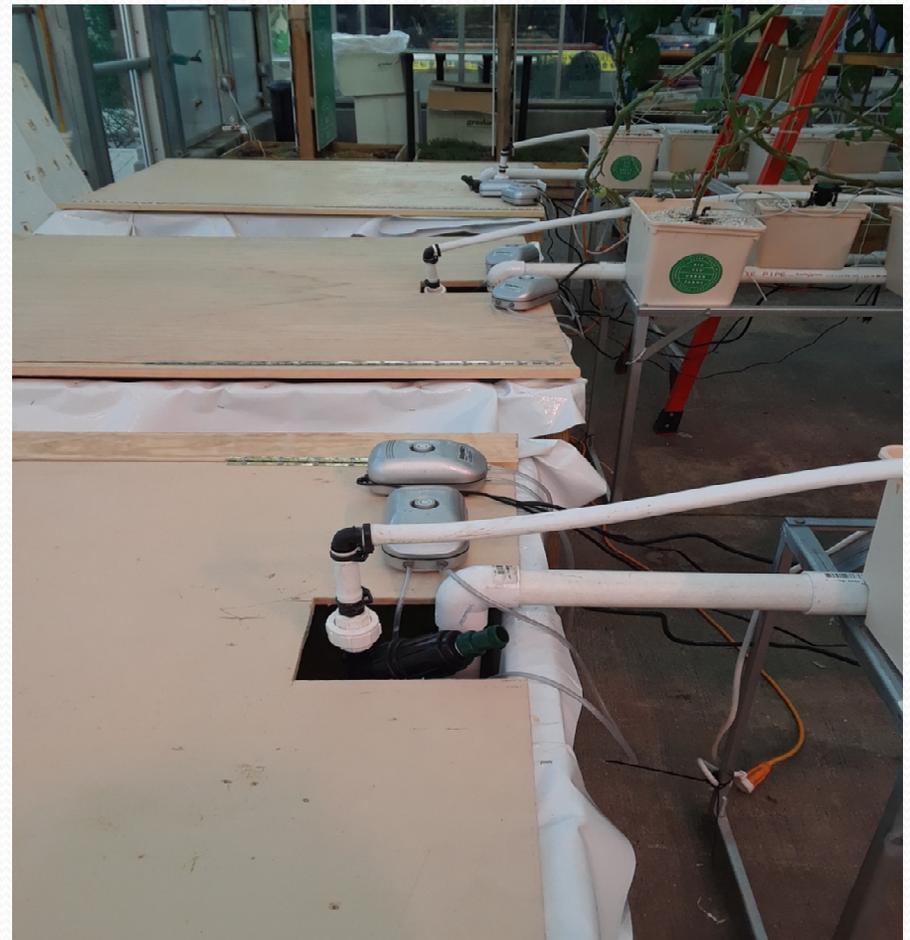
Dutch Buckets

- Buckets filled with media (perlite, coco, clay spheres) and irrigated using a flood and drain method and usually used to grow vine crops. Buckets sit on a stand.
- Can be recirculation or drain to waste
- A reservoir is filled w/ water, nutrients are added and buckets are drip irrigated on a timed cycle
- Peppers, tomatoes and cucumbers are most popular with the lean and lower method but these are versatile systems.

Dutch Buckets



Dutch Buckets





Vertical Systems

- Many types – we use 1) tower gardens 2) grow racks.
- Tower gardens – more for hobbyists and homeowners.
 - Reservoirs need replenishing quite a bit.
 - Grow time slower than other systems.
 - Lighting can be tricky.
 - They are versatile systems and good for an individual to grow several types of plants in one system.
- Grow racks – almost always used for greens but are versatile. Can be used to propagate for other systems, micro greens, baby leaf greens, as well as whole heads.



Grow Racks

- Similar to what is used in vertical farms.
- Stacked shelves that are each irrigated from a single reservoir.
 - Basically a stacked series of flood and drain tables.
 - Each shelf has its own set of LED grow lights.
- These can be used to grow anywhere!
- We have two types from two companies: Hort Americas and Bootstrap Farmer
- One is for propagation only, the other is for finishing crops.

Grow Rack



Grow Rack



Tower Gardens

- Pump circulates water from the reservoir at the base
- Watered on a timer and nutrients are added as needed
- Expensive for the yield they give – more for the hobbyist
- Can grow great herbs and such
- Might be more doable in the future with some tweaks

Tower Gardens



Lighting

- Very effective at increasing rate of growth in all seasons.
 - Very energy efficient
 - Expensive investment
- Blue and Red make it grow!
- White light or full spectrum also an option
- We use two types : fixed spectrum and tunable
- Lights can increase growth rate, affect plant morphology, add color and alter nutrition.

Tunable LED's

- Osram is the manufacturer



Fixed Spectrum





Nutrients

- Most people use a base fertilizer and supplement with calcium nitrate and magnesium sulfate (very common mix).
- We use Hort Americas base fertilizer -- there are many options
- Organic options include Pre-Empt and Kimatec.
 - Both are usually augmented by a biological booster like TerraBella or companion. We use Kimatec for our organic tomatoes.



Suppliers and Information

Hortamericas.com – great supplier. Commercial only.
Great info source, videos , articles and product info.

Bootstrap Farmer .com– supplier and info source.
Commercial, homeowner and hobbyist friendly.
Great videos and podcast.

BWI – commercial supplier



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