Garden PHX

Indoor Vertical Farming

Homer Farms

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What is an indoor vertical farm?

- Multiple tiers
- Artificial lighting
- Air conditioners
- Circulation fans
- Nutrient solution
- Sensors and control units

What plants are best for vertical farming?

- 12” or less in plant height
- Fast growing
- Grow well under low light intensity (~200 $\mu mol \cdot m^{-2} \cdot s^{-1}$)
- Adapt to high planting density (~40 plant/m^2)
- High marketable value if selling and less than 15% root weight
- Quality affected by positive environmental control
- Do not move plants to/from a soil environment.

Leafy Greens	Lettuce (Romaine, Butterhead, Iceberg) Spinach Kale Arugula Swiss Chard Mustard Greens
Herbs	Basil Mint Cilantro Parsley Dill Thyme Chives Oregano
Microgreens	Sunflower Shoots Radish Greens Broccoli Microgreens Pea Shoots Wheatgrass
Specialty Crops	Edible Flowers (Nasturtium, viola) Lavender Stevia

What is provided

- Rack
- Growing tubs and reservoir
- Floating rafts
- Power strip and lights
- Water and air pumps
- pH and EC testers
- pH adjusting acid
- Initial fertilizer for set-up
- Rock wool and seeds for planting

Hydroponic gardening is easy, but does require regular maintenance and monitoring.

What you need

- Air conditioned space <80 degrees F
- Space to move around a 2’ by 5’ rack that is 6’ high
- Electrical outlet - 20amps ($15-18/mo)
- Water, bucket, and measuring cup
- Fan, water strainer, stir stick
- Purchase ongoing seeds, growing medium, pH down, and fertilizer
- Monitor pH, EC, temperature, lighting
- Pruning/ snipping shears
- Distilled water to rinse testers
- Rubber gloves and eye protection
- Several hours per week for maintenance, planting, and harvesting

NOTES TO THE GARDENER

Hydroponic indoor gardening is very rewarding when harvesting your own green leafy vegetables in the heat of a desert summer. Please keep the following in mind.

- The hydroponic system requires regular attention, but is not time consuming.
- Electronic meters are provided. Water at all stages must have a pH (acidity) of 5.5 to 6.5 and EC of 1.5 - 2 mS/cm, which is the same as 1.5 - 2 dS/m or 1500 - 2000 µS/cm. The only exception is the first few days of planting which has no fertilizer.
- Always add chemicals into the water (in a bucket or the system).
- Make changes slowly until you know how much acid or fertilizer to add based on tap water pH and the plant growth load. This is especially important if re-setting your system. Check every few hours when balancing the system and then at least every few days.
- Homer Farms will provide the initial set-up and additional consumables are provided by the Gardener. There are many retailers for quality hydroponic products for rock wool (or substitute), pH acid, fertilizer, and seeds.

Seeding - the fun part!

- Soak the rock wool in pH adjusted water of 5.5-6.5 in your tray with just enough water to keep the bottom wet
- Plant seeds below the surface using tweezers
- Cover with the humidity dome
- At the first spouting (leaves appear) open the dome vents and place the tray of seedlings under light
- After sprouting use < ½ strength fertilized water from the hydro system – always at the correct pH

Transplant seedlings

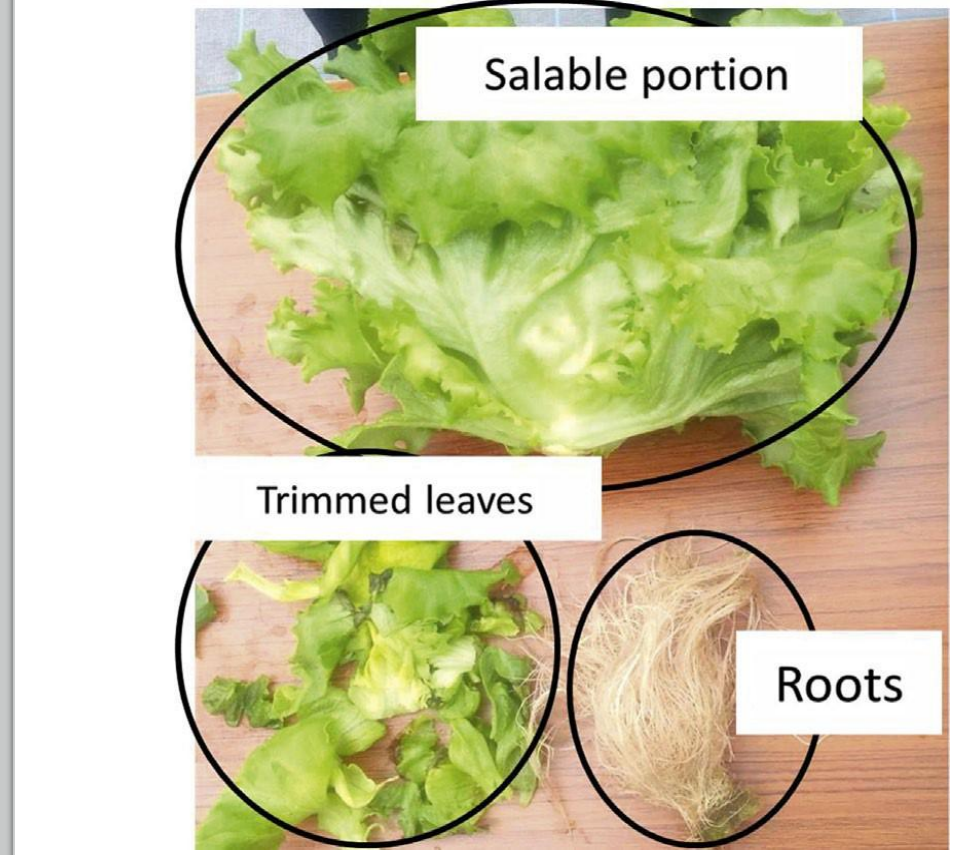
- About two weeks after planting (or when the leaves begin to touch) transfer your seedlings to the raft.
- Break apart each piece of rock wool and place it in a hole in the raft.
- Ensure that the rock wool or roots are touching water on the bottom side.
- Your plants will stay in the raft until harvesting.
- NOT ALL OF YOUR PLANTS WILL SPROUT, TRANSPLANT, OR HARVEST AT THE SAME TIME.

Growth stage

- The water and air pumps should run at all times.
- Plants need 12-18 hours of light each day on your schedule. More light = more growth.
- Maintain the water level above the water pump in the reservoir with pH 5.5-6.5 and EC 1.5-2.0.
- NOT ALL OF YOUR PLANTS WILL SPROUT, TRANSPLANT, OR HARVEST AT THE SAME TIME.

Harvesting

- Depends how aggressively (fertilizer and light) plants grew.
- Typically about six weeks.
- Lettuce is normally harvested entirely while kale and basil can be trimmed many times.
- Simply pull the entire plant out of the raft or cut off the head and push the roots out of the bottom. Clean your reservoir and grow tub of debris!
- NOT ALL OF YOUR PLANTS WILL SPROUT, TRANSPLANT, OR HARVEST AT THE SAME TIME.



Algae control

- **YOU WILL HAVE ALGAE!**
- Unavoidable on the rock wool.
- Similar to weeds in a garden.
- Minimize light penetration into the water by covering open holes in the rafts or algae growth takes nutrients from your plants.
- Wipe wet and submerged surfaces regularly on and in the raft, tubs, and reservoir.
- Chemical treatments are available.

Tipburn

- Affects nearly all plants and common in vertical farms
- Use tipburn resistant cultivars
- Slow down production and growth rate by lessening light and/ or fertilizer.
- Increase airflow
- Lower humidity
- Find the best conditions for the groups of produce you wish to raise and adjust nutrients, fertilizer, and calcium

Harvesting

- Plants may be harvested whenever you like.
- A crop rotation for planting and harvesting is entirely up to you. Lettuce is typically harvested as an entire plant after about six weeks, but can be trimmed from the bottom to keep leaves dry from transpiration and off the growing surface.
- Kale is also harvested from the bottom up leaving some leaves.
- Basil is trimmed from the top down and always leave a pair of branches so the plant can complete photosynthesis. The basil plant produces for many months although older plants may be difficult to remove.
- Your particular crops may be harvested differently.
- BE SURE TO REPORT YOUR HARVESTS AND TIME TO CITY OF PHOENIX.

Cleaning and refilling the system

- Keeping your system clean is essential for proper plant growth and extending the time until a complete cleanout is needed. That is not necessary until your garden smells or the nutrient solution is cloudy.
- Lower the water level with the pump or bailing by hand until empty -OR- undo the swivel fittings, attach a hose, and tip to drain.
- The grow tubs and rafts may be scrubbed with 5% bleach or full strength white vinegar and then rinsed thoroughly.
- Reattach the swivel fittings and fill the bottom reservoir <⅔ and the upper grow tubs just until they begin draining.
- Start the air and water pumps and adjust the pump and tubing valves.
- Slowly begin adding pH reducing acid and fertilizer and allow it to flow through the system. Seeds may be started anytime, but not transplanted until the system is balanced with proper pH of 5.5-6.5 and EC of 1.5 - 2 mS/cm, which is the same as 1.5 - 2 dS/m or 1500 - 2000 µS/cm.

System leaking or overflowing

- Make sure all connections are securely HAND tightened.
- Check the water flow—if it is too strong or weak, slightly adjust the valves at the pump and on the tubing. The valves must not be closed.
- If you find any broken parts contact Homer Farms for assistance.
- Do not fill the reservoir more than ⅔ to allow for grow tub drainage.

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