Hydroponics for Beginners

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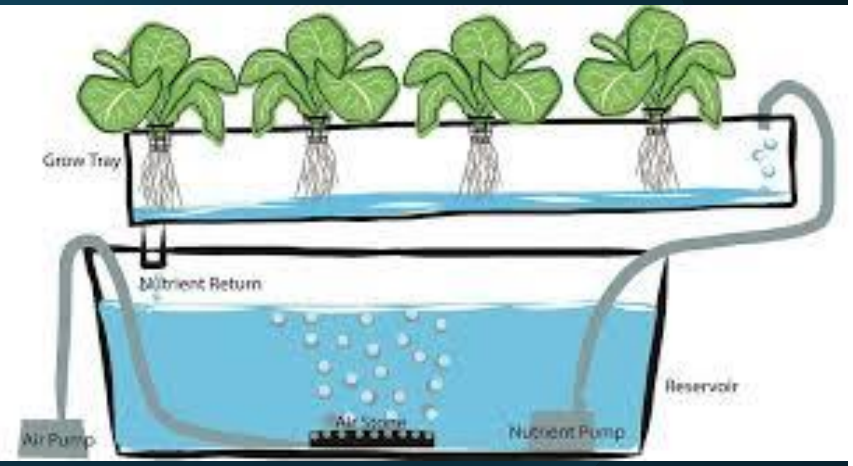
What is hydroponics?



- “HYDROPONICS” is the growing of plants in a liquid nutrient solution
- Variety of commonly used mediums are used to support plant growth
- Hydroponics is a viable method of producing vegetables as well as ornamental crops
- Hydroponic growing and associated practices are all about optimization

Image: https://letpot.com/blogs/hydroponics-system-knowledge-and-tips/letpot-com-blogs-blogs-hydroponics-a-definitive-guide

- Hydroponics relies on the same principles as soil gardening, just delivered more efficiently
- Soil and hydroponic media function to physically support the plant and to help absorb and transport nutrients
- Both soil and hydroponic gardening need water for the system to function
- Both need pH at appropriate levels for nutrient uptake

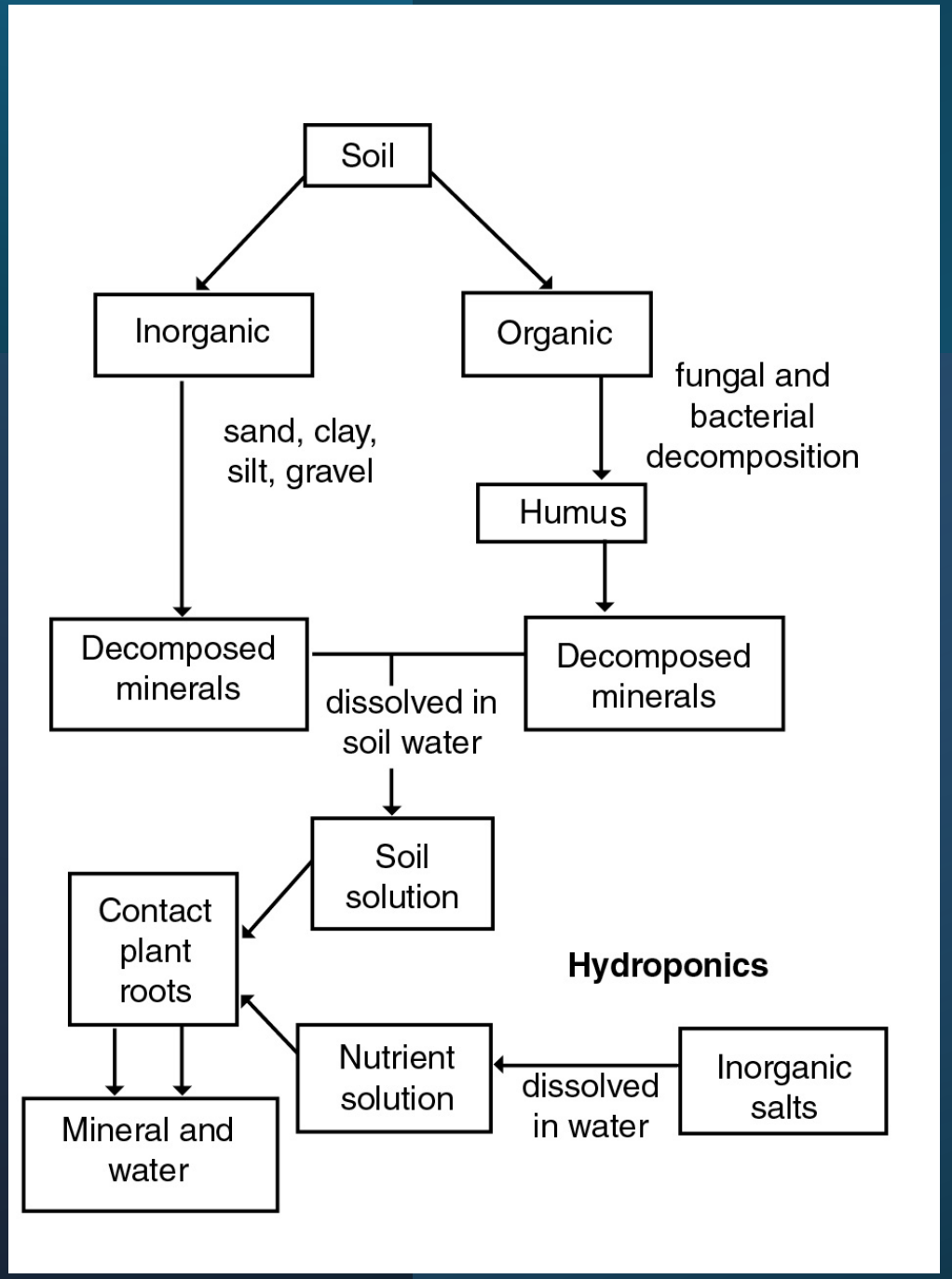


Image: Arjina Shrestha Oklahoma State U 2017

Advantages of Hydroponic Gardening

- It can be used in places where in-ground agriculture or gardening is not possible.
- More complete control of growing environment.
- Lower water and nutrient costs associated with water and nutrient recycling.
- Faster growth due to more available oxygen in root area.
- Elimination or reduction of soil related insects, fungi and bacteria.
- Much higher crop yields.
- No weeding or cultivation required.
- Lower labor costs.
- Crop rotation/fallowing is not necessary.
- Transplant shock is reduced.

Disadvantages of Hydroponic Gardening

- Initial and operational costs are higher than soil culture.
- High initial equipment cost
- Skill and knowledge are needed to operate properly.
- Some diseases like Fusarium and Verticillium can spread quickly through the system. However, many varieties resistant to the above diseases have been bred.

Examples of Hydroponic Growth Media

Deep Water Culture (DWC)

The Water Culture System is the simplest of all active hydroponic systems. A platform floats directly on the nutrient solution. An air pump supplies air to the air stone that bubbles the nutrient solution and supplies oxygen to the roots of the plants

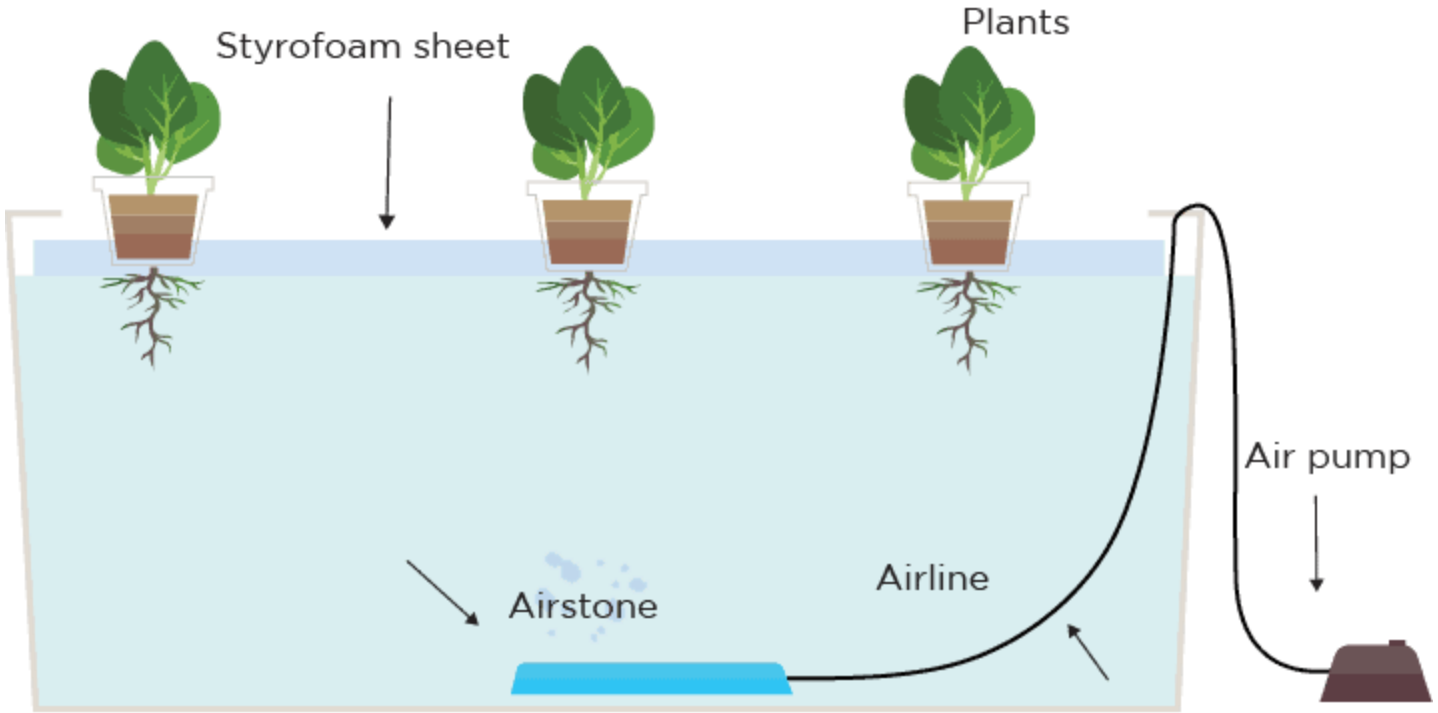


Image: https://www.trees.com/gardening-and-landscaping/deep-water-culture

Example DIY Deep Water Culture System

Source: J. Larsen Arlington, VA

Example DIY DWC System

Source: J. Larsen Arlington, VA

Commercially Available Deep Water Culture Systems

Source: J. Larsen Arlington, VA

Aeroponics

A system wherein roots are continuously or discontinuously kept in an environment saturated with fine drops (a mist or aerosol) of nutrient solution.

The method entails growing plants with their roots suspended in a growth chamber with the roots periodically wetted with a fine mist of nutrients.

Excellent aeration is the main advantage of aeroponics

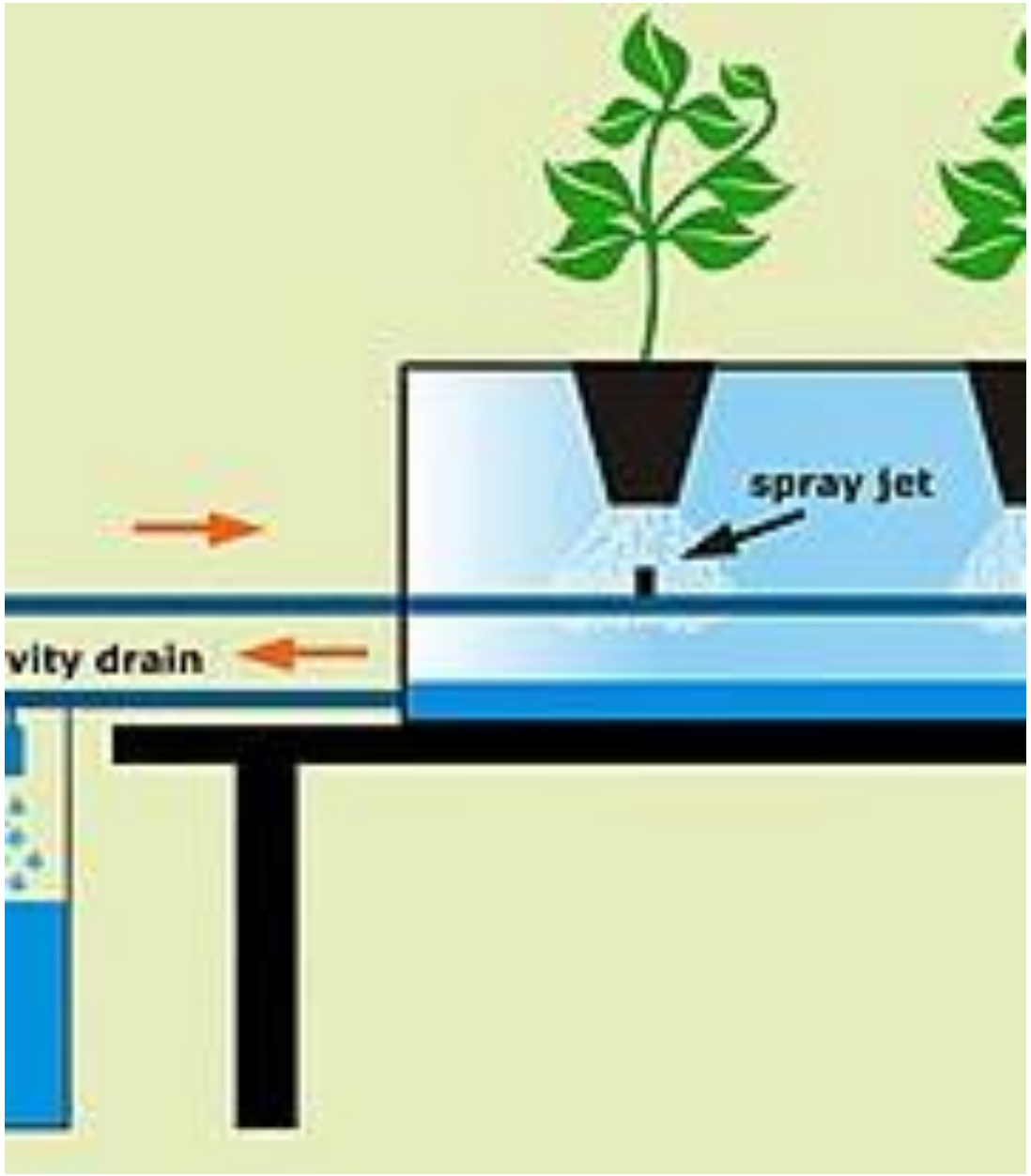


Image: https://en.wikipedia.org/wiki/Hydroponics#

DIY Aeroponics

Source: J. Larsen Arlington, VA

Questions

Source: J. Larsen Arlington, VA

Types of Vegetables you can Grow with Hydroponics

- Herbs
- Lettuce/spinach/greens
- Tomatoes (determinant works best)
- Peppers
- Strawberries
- Peas (dwarf)
- Beans (bush)
- Chard
- Cucumber (parthenocarpic)
- Microgreens

Not Recommended

- Carrots
- Radishes
- Beets
- Onions
- Corn

Equipment to Get started with a DIY Deep Water Culture system

- 5-gallon buckets-black or painted black
- Hydroponic bucket lids with baskets
- Grow light
- Timers
- Fans
- Electric toothbrush-be the bee!
- Aquarium air pump and air stone with tubing
- Nutrients
- Humidifier/Dehumidifier (depending on conditions)
- Siphon (battery powered preferred)
- Growth medium
- pH solutions

Typical Costs for a home hydroponic system

Expense Category	Estimated Cost Range
Growing Medium	$20 to $100
Lighting	$50 to $500
Nutrient Solution	$20 to $50
Water pump and aeration	$50 to $100
pH and EC meters	$20 to $100 each
Temperature and humidity Controller	$50 to $300
Plants and seeds	Variable
Infrastructure	Variable
Total cost (roughly)	Around $200 to $500

https://hgshydro.com/blog-details/is-hydroponics-expensive

Nutrients

- Recommend changing nutrients every 2 weeks
- There are several commercially available sources of hydroponic nutrients
  - These are typically sold in three formulations:
    - Grow or Veg-higher levels of N, promotes growth
    - Bloom: higher levels of P and K, promotes flowers
    - Micro: all necessary micronutrients
    - For most vegetables these are not necessary (below DIY will work just fine)
- DIY solutions can also be made:
  - Plant specific soluble fertilizer
  - Ammonium calcium nitrate
  - Calcium/Magnesium(soluble)
  - This is what I do….

Photoperiod and Distance

- Typical photoperiod is 14-18 hours per day.
- Some plants require a shift in photo period to induce flowering
- Light distance from canopy will be dictated by PPFD (strength of light) but is typically 1.0-2ft.
- Plants not thriving or stretching (move the light closer)
- Plant folding on themselves, tips of leaves burnt (move light further away)

Environmental Conditions

- Need relative humidity of space to be between 40-60%
  - Too low, pollen doesn’t stick to stigma/pistil, also increased transpiration
  - Too moist: pollen won't get released from stamen, also increased risk of fungal disease
- Temperature: 70-90F
- Fans-a must have! Fans recirculating air promote stronger plants and help prevent disease.