

# UC Master Gardeners of Orange County

The Presentation Will Begin Shortly



Photo credit: Erin Nelson



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# UC Master Gardeners of Orange County

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CC email registration



Photo credit: Erin Nelson



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# We Are UC ANR

UC Agriculture and Natural Resources is network of UC scientists and educators who cooperate with local counties to bring practical, trusted and research-based answers to Californians

- UC ANR is an equal opportunity provider and employer



Photo Credit: Kathleen Dyke



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# UC Master Gardeners— Orange County



Home Horticulture



Integrated Pest Management



Sustainable Landscaping



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# Hydroponics for the Home Gardener

Presented by Alvin Lam and Sally Richards  
UC Master Gardeners of Orange County



April 11, 2026



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## Today's Speaker: Alvin Lam



- Former Sales Engineer
- CA native & in HB for over 20 years
- 3rd year Master Gardener
- Hydroponics team co-lead
- Composting
- Houseplants
- Fruit trees and bushes



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## Today's Speaker: Sally Richards



- Started gardening at age 8 in Michigan
- Joined OC Master Gardeners in 2016
- DJ at KUCI 88.9 FM on the weekly Thursday morning show: In The Garden
- Lives in San Clemente
- Grows veggies hydroponically in a hoop house



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## History

- 600-500 BC - Hanging Gardens of Babylon
- 300 BC - Egyptian hieroglyphs showed plants in water culture
- 1200 – Marco Polo described “floating gardens” in China
- 1300’s – Aztecs created artificial islands called “Chinampas” to grow food
- 1627 – Francis Bacon book outlines growing plants in water, not soil
- 1937 - Dr. W.F. Gericke coined the term hydroponics
  - Greek: hydros - water & ponos – work
- 2004 – Dr. B.A. Kratky research paper published
- Today – NASA’s on-going program to establish food production on Mars



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## What is Hydroponics?



Photo credit: Sheree Wiener

- Growing plants in nutrient-rich water
- No soil or garden plot needed
- May use growing media
- Flexible locations
  - Small spaces
    - Condos, apartments
    - Balconies, decks, patios
  - Indoors
  - Outdoors
  - Greenhouses



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## Why Grow Using Hydroponics?

### PROS

**Minimal gardening space needed**  
**Vertical gardening**  
**Reduced water use**  
**Less fertilizer needed**  
**Up to 30% more growth & yield**  
**No soil-borne diseases**  
**No crop rotation**  
**Weed-free**  
**Re-purpose used materials**  
**Grow out-of-season vegetables\***  
**Far less pest issues\***

### CONS

**Possible up-front costs**  
**Some assembly required**  
**Disease & pests can spread faster\***  
**Electricity needed for lighting\***



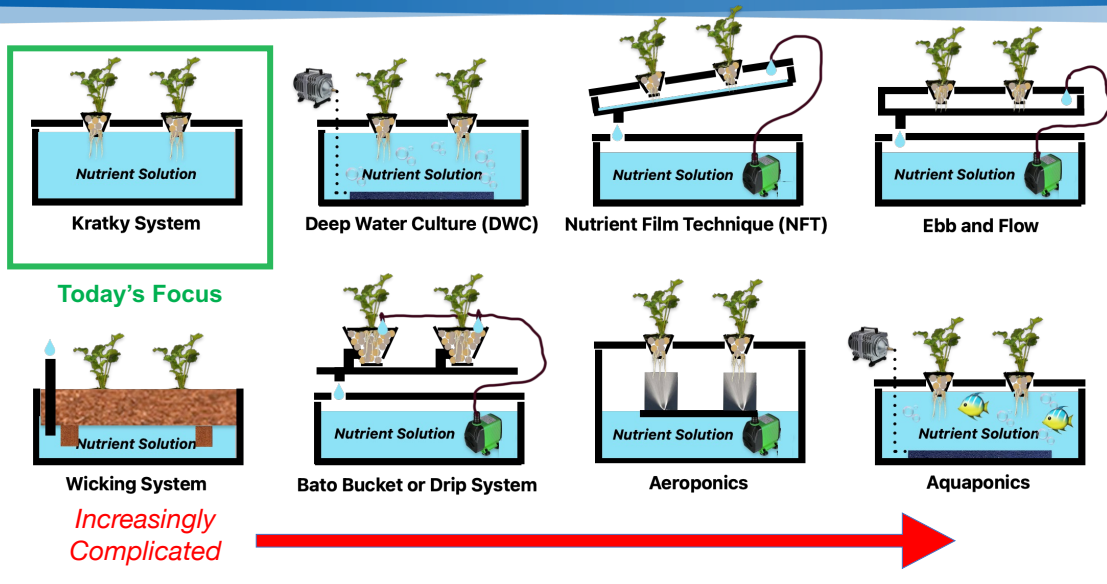
Photo credit: Alvin Lam

Note: \* Applies when growing indoors



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## Hydroponic Systems



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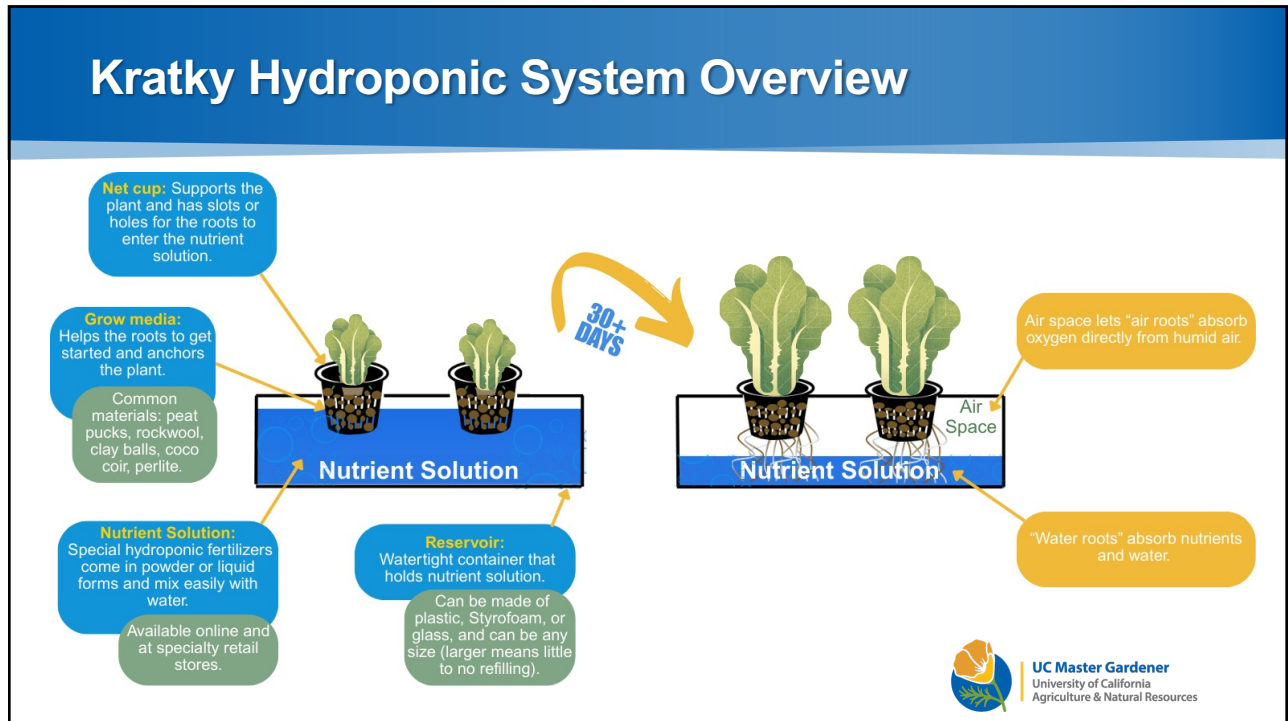
## Kratky System



- Dr. Bernard A. Kratky
- University of Hawaii professor
- Simplest system to put together
- No pump or moving parts
- Most affordable system
- Minimal maintenance
- Harvest in 30 days
- Great for beginners

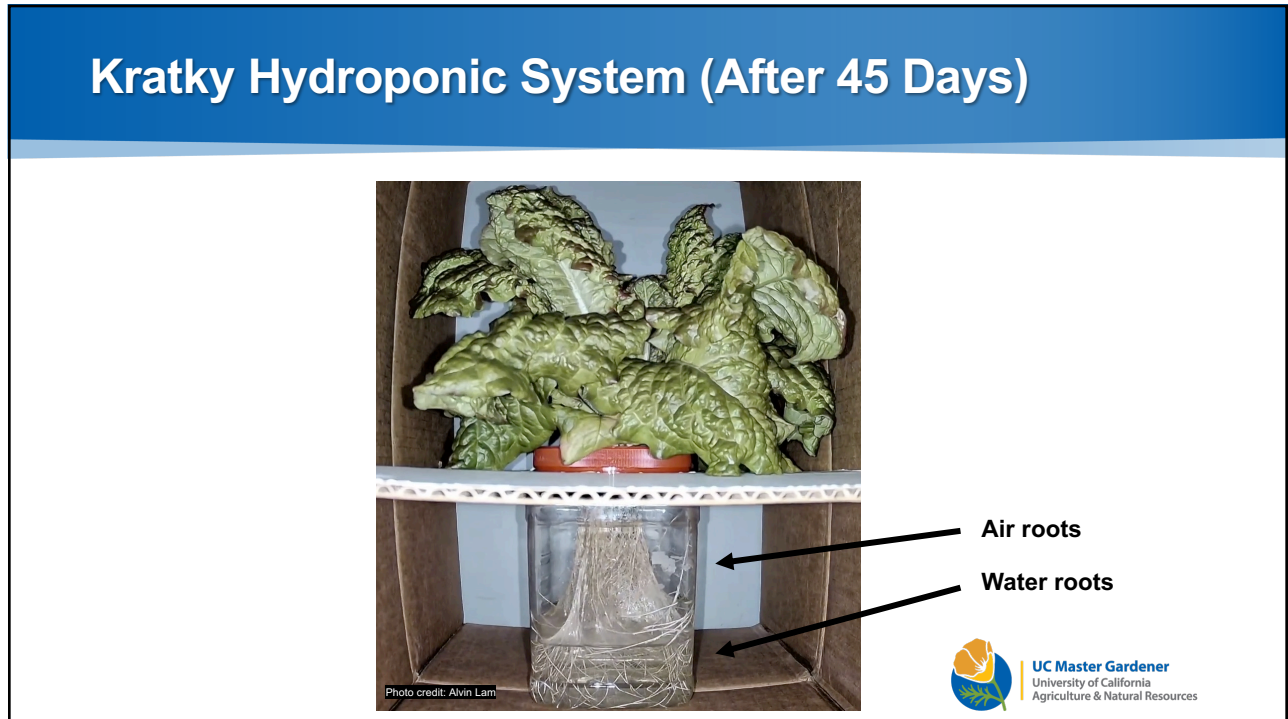
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# Kratky Hydroponic System Overview



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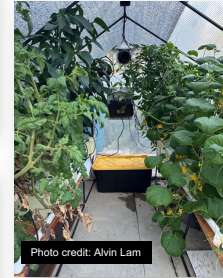
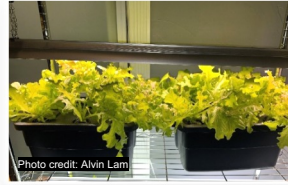
# Kratky Hydroponic System (After 45 Days)



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# What Can We Grow?

BEGINNER	INTERMEDIATE	ADVANCED
<p>Leafy greens Herbs</p>	<p>Tomatoes Cucumbers Peppers Cabbage Carrots Beets Garlic Onions Strawberries Flowers</p>	<p>Squash Melons Potatoes Other berries Houseplants</p>



**• Key considerations**

- Vegetables you like
- Growth pattern - single head, leaves, vining, is support needed?
- Mature size - height, width, and root ball size
- Harvest – in weeks or months?
- Grow from seed or use nursery starts



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# Hydroponic Materials

**• Anchoring the plant**

- Growing media - peat pucks, rockwool, oasis cubes, clay balls, coco coir, perlite, pool noodle
- Net cups or net pots - 1" to 8"
- DIY – yogurt cups

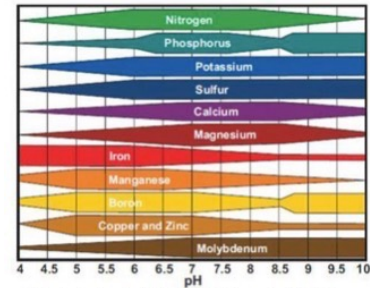
**• Choosing the right reservoir**

- Plastic, glass, styrofoam
- Paint or cover with dark or reflective material
- How many plants per reservoir
- Mature plant size
- Buy or DIY
- Food-grade is recommended



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# Hydroponic Fertilizers + pH



- **Specialized hydroponic fertilizers**
  - **Macro nutrients** (NPK & Calcium, Magnesium, Sulfur) + **Micro nutrients** (Boron, Chlorine, Copper, Iron, Manganese, Molybdenum, Zinc)
  - Granulated or liquid forms (Liquid is usually more costly)
  - Organic versions are available
  - Follow the directions

- **Target pH 5.5 to 6.5 range**
- **Test using pH meter or test strips**
- **Adjust using pH up and pH down solutions**



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# Hydroponics Starter Kit



- **64 oz painted nut jar**
- **Lid with hole for net cup**
- **2" net cup**
- **Peat puck**
- **Fertilizer packet – enough for 2 grow cycles**
- **Instruction guide**



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# Indoor Lighting

- Mimics the sun on a very small scale
- Color spectrum
  - Cool blue light – vegetative growth & seed germination
  - Warmer red light – bud formation, flowering & fruiting
  - No UV
- LED (Light-Emitting Diodes) preferred
- South-facing window is usually not enough
- What your eyes perceive as bright, might not be enough for the plants
- Plants collect light energy over time

## REGULAR HOME LED LIGHTS

Not wide spectrum (blue or red)  
 Low intensity  
 Requires height adjustability  
 Energy efficient  
 Use what you have  
 Low cost



- Target >2500 lumen output
- 5000K blue light for leafy greens
- 3000-4000K red for flowering/fruiting

## SPECIALTY LED GROW LIGHTS

Wider spectrum  
 Higher intensity  
 Height adjustability usually needed  
 Uses more electricity  
 Many options available  
 Higher purchase cost

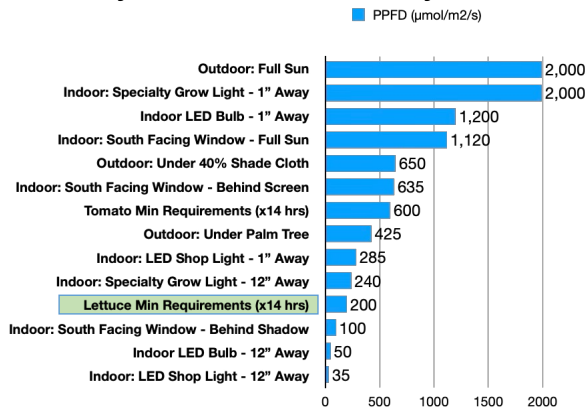


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# Light Intensity Examples

## Light Intensity Photosynthetic Photon Flux Density PPF



Full Sun (2,000)



Under Palm Tree (425)



Under Shade Cloth (650)



Window – Sun (1,120)



Window – Screen (635)



Window – Shadow (100)

Note: Measurements from southern exposure using VBR-300 Quantum PAR meter – Source: Alvin Lam Mar 2025.



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## Estimated Hydroponic System Costs

- **Potential upfront costs**

- Nutrient solution reservoir
- Net cups
- Plants
- Grow media
- Hydroponic fertilizer
- Lights (indoor)

- **Estimated upfront system costs (<\$45)**

- \$20 2.2lb Bag of hydroponic fertilizer (makes up to 150 gallons)
- \$10 2" Net cups (50) — Clean and reuse
- \$ 6 Peat pucks (36)
- \$ 5 Seed packet
- Free reservoir – Clean and reuse nut/coffee jars or water/milk/juice jugs (+\$10 for 5-gallon tote)
- Ongoing costs – 10 to 25 cents per plant (peat pucks, hydroponic fertilizer and electricity costs)



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## Indoors – What Do We Need?



- Location: dining room, garage, table, shelf, desk, kitchen, etc.
- Sunny south facing window
- Artificial lighting (regular LED or specialty grow lights)
- Timer: 12 to 16 hours on per day
- Dark reservoir to prevent algae growth
- Light height adjustment needed
- Seeds vs nursery starts
- Leafy greens, herbs, or flowers



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## Outdoors – What Do We Need?



- Location: patio, balcony, deck, etc.
- Appropriate amount of sunlight
- Dark reservoir to prevent algae growth
- Rain prevention
- May require stakes or overhead support (trellis)
- Monitor pH, nutrient, and water levels regularly
- Seeds or nursery starts
- Fruiting vegetables



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## Integrated Pest Management (IPM)

Use least toxic methods of pest control to minimize adverse impacts on the environment



UCANR IPM Website



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## Pest and Disease Prevention

- Clean tools after every use
- Remove dead or diseased plants immediately
- Wash and quarantine new plants before bringing indoors
- Cover reservoirs to:
  - Minimize mosquitos
  - Minimize algae growth
- Frequent monitoring of plants



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## Potential Issues With Hydroponics

- **Avoid using water from a water softener**
  - Salt level is too high
- **Nutrient solution level drops less than half, but plant not ready to harvest**
  - Add nutrient solution, but no more than halfway
- **Small flying insects**
  - Quarantine new indoor plants
  - Yellow sticky traps
  - Respond quickly to any signs of pests
- **Root rot**
  - Whitish roots are healthy; dark brown or black, or smelly roots are unhealthy (bacterial growth)
- **Algae growth in root zone**
  - Improve light blocking for container
- **Indoor lights - too close (heat damage) or too far (stunted growth)**
  - Regular lights should always be kept a couple inches away from top leaves and special grow lights need more distance - 6" to 12"
- **Growing taller plants**
  - May need support from above
  - Secure plant and container against high winds
- **Sun heats up nutrient solution too much**
  - Block/reflect sunlight



Photo credit: Alvin Lam



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# FAQs

- **Won't the plants drown in the nutrient solution?**
  - No, the container is filled just high enough for the roots to be dangling in the solution and as the plants absorb and use up the nutrient solution, air roots develop just above the water line. Usually, when the plant has used up the solution, it's ready to harvest.
  - If it's a small container, need to keep water level high enough for half the roots to be submerged.
- **Do I have to add more nutrient solution when it is used up?**
  - Anything that is mature and ready to harvest, you don't need to refill the container, i.e. lettuce in a 40oz container at 30 days.
  - If you are growing something for more than 30 days (herbs, tomatoes, etc.), you will need to add more solution, but no more than half of the container height. Try to keep the level around 50%.
- **Do you get mosquitos (in an outdoor system)?**
  - No, as long as it's a closed system or has moving water. If reservoir has an opening like a hole or crack, use mosquito bits or dunks.
- **Can I grow root crops hydroponically?**
  - Yes, but you can't grow directly in nutrient solution. Using the wicking method, you can grow onions, garlic, ginger, beets, etc. in the grow media above the nutrient solution.



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# UC Master Gardeners of Orange County

[UC Master Gardeners of Orange County - Hydroponics Website](#)



[Master Gardener Expo - Hydroponics Presentation](#)  
(Link at the bottom of the page)



[Hydroponics Starter Kit Instructions](#)



[Kratky Hydroponics: Soil-Free Growing Method Handout](#)



[Sally Richards - Hydroponics Radio Interview on KCIU](#)



All files available only until April 24, 2026



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# Questions?



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# Hydroponics Class Survey



**Please help us improve our classes with this 3-minute survey. Your feedback helps guide the direction of future classes.**



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# Your Gardening Resource

Website	mgorange.ucanr.edu
Email Hotline	ucceocmghotline@ucanr.edu
Facebook	UCCE Master Gardeners of Orange County
Instagram	ucmastergardenersoc



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# Help us Grow!

Our follow-up survey provides us the tools we need to grow and improve the quality of our program.



Workshop Registration Survey

Today's presentation: *Hydroponics for the Home Gardener*  
 Date: April 11, 2026



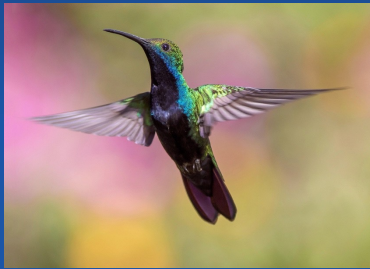
Photo credit: Erin Nelsen



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# COMING EVENTS

- Apr 12 – Bees, Butterflies & Other Pollinators



- Apr 15 – Compost Basics 101



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## Keep In Touch

Stay informed about upcoming events and receive valuable gardening insights by subscribing to our newsletter.



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CC email registration



Photo credit: KA Dawson



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