HYDROPONIC INTENSIVE WORKSHOPS
at the Controlled Environment Agriculture Center

January 2018

**Focus on Tomato Production**
Jan 2-6, 2019

**Focus on Lettuce Production**
Jan 5-9, 2019

**Combined Tomato & Lettuce**
Jan 2-9 2019

Controlled Environment Agriculture Center
1951 E Roger Road, Tucson, AZ 85719

College of Agriculture and Life Sciences
Arizona Controlled Environment Agriculture Center
Event Snapshot

January 2nd
• Tomato Workshop 9am – 5pm

January 3rd
• Tomato Workshop 9am – 5pm

January 4th
• Tomato Workshop 9am – 5pm

January 5th
• Tomato Workshop 9am – 5pm
• Lettuce Workshop 3:30pm – 6pm
• Dinner & Reception 6pm – 7:30pm

January 6th
• Tomato & Lettuce Combined Day 9am – 6pm

January 7th
• Lettuce Workshop 8am – 6pm

January 8th
• Lettuce Workshop 8am – 6pm

January 9th
• Lettuce Workshop 8am – 5:30pm
Jan 2 – Wednesday, 9am-5pm

*Light Breakfast Provided*

Check-in as early as 8:30am

*Schedule subject to change

From *Seed to Harvest Video (30min)* Tour of the CEAC including:
- Mist house (more on plant propagation)
- Teaching Greenhouse (Intro to the greenhouse, control systems, experiment, greenhouse set-up) (Chapter 3)
- Tomato plant rep assignments for the course

**Plant propagation (Chapter 6)**
- Seeds, media, fertilization, irrigation, environmental conditions
- Grafting

*Lunch Provided*

**Greenhouse set-up (Chapter 3 - PART 1)**
- Crop layout & Crop scheduling

**Crop maintenance – Emphasis on tomatoes (Chapter 3 PART 2) –**
- Training & pruning, finding the head, growth tapes

**Greenhouse Plant Work: Crop training & pruning**
- Finding the tomato head – Stem clipping & pruning
- Putting up growth tape
- Nodes, internodes and location of leaves & clusters on the stem
- Leaning & Lowering – proper techniques
- Note any leafy material on clusters

*Schedule subject to change
Jan 3 – Thursday, 9am-5pm
9am - Coffee & Previous Day Discussions

Discussions and questions from previous day

Factors Controlling Plant Architecture
• How to “steer” the plant (Chapter 3)
• Crop registration parameters

Greenhouse Plant Work:
  ➢ Exercises – Crop Registration, Reproductive vs Vegetative

Cluster Pruning, Fruit Problems, Harvesting
• Cluster maintenance (Chapter 8)
• Fruit problems and physiological disorders (Chapter 3)

Greenhouse Plant Work:
  ➢ Cluster maintenance, add J-hooks

Harvesting/grading/storage
• Individual versus cluster (TOV) harvesting
• Fruit categories including fruit problems
• Weighing & record keeping
• Types of packaging/storage, marketing and sales

Flowers, pollination and the fruit
• Bee hives / bee management (Chapter 7)

Greenhouse Plant Work:
  ➢ Exercise – Pollination % – Are the bees working?
  ➢ Harvest
  ➢ Sorting, weighing
  ➢ Continue Leaning and Lowering, plant work

*Schedule subject to change

*Light Breakfast Provided*

*Lunch Provided*
Jan 4 – Friday, 9am-5pm

9am - Coffee & Previous Day Discussions

Discussions and questions from previous day

Plant nutrition basics (Chapter 9&10)
• Essential nutrients
• Fertilizers used to make hydroponic nutrient solutions
• Basic nutrient recipes
• Water chemistry for nutrient management: pH, EC, Alkalinity

Type of Fertigation Systems
• Powered by water pressure (ex. Dosatrons) or pump
• Hand mixed sump tank (ex. NFT, DWC)
• Peristaltic pumps

Greenhouse Work:
➢ Tour of different fertigation systems

Greenhouse Work:
➢ Demo of how to mix tanks

Maintenance of Stock Tanks
• Fill with same recipe
• How to change recipes

Nutrient deficiencies (Chapter 9)
• Nutrient mobility
• Diagnosis/Dichotomous Key
• How to troubleshoot: Plant tissue analyses, water quality, humidity

Senescence and Weekly Leaf Removal
Monitoring Fertigation – Importance of lysimeters
• How to make and use lysimeters

Greenhouse Work:
➢ Exercise – Lysimeters
➢ Remove leaves

*Schedule subject to change

*Light Breakfast Provided*

*Lunch Provided*
Jan 5 – Saturday, 9am-5pm
9am - Coffee & Previous Day Discussions

Discussion and questions from previous day

Pest Identification and Damage (Chapter 4)
- Insects: Whiteflies, Aphids, Thrips, Tomato bugs, Fungus gnats, shoreflies & more
- Mites: Spider mites, russet mites
- Diseases: Powdery mildew, botrytis, clavibacter, pythium, fusarium
- Viruses: Tomato Yellow Leaf Curl, Torrado

Greenhouse Work:
- Exercise: Scouting and Pest ID

Integrated Pest Management
- Prevention
- Monitoring

Integrated Pest Management (Cont’d)
- Organic Controls
- Synthetic pesticide options and management

Group Exercise - What’s the problem here? Plus Q & A

If time:
- How to create a nutrient recipe based on target values (Chapter 10)
- Pepper and cucumber cultivation techniques

*Lunch Provided*

*Schedule subject to change

*Light Breakfast Provided*
**Combined Day**

Jan 6 – Sunday, 9am-6pm

*Schedule subject to change*

*Lunch provided during round table discussion with greenhouse engineers*

- Includes professors of Agricultural & Biosystems Engineering Department at The University of Arizona and CEAC / CAC personnel (as available): Dr. Gene Giacomelli, Dr. Murat Kacira, Mark Carson.

*Light Breakfast Provided*

**Greenhouse Basics**
- Greenhouse site selection (Chapter 11)
- Greenhouse designs & materials (Chapter 12)

**Environmental conditions and settings (Chapter 3 PART 3)**
- Light, temperatures, relative humidity, carbon dioxide, oxygen, air circulation
- Environmental control – including sizing heaters & fans (Chapter 13)

**Organic Hydroponic Production (Tollefson)**
- Certification issues
- Production methods and issues

**Food safety & GHP/GAP certification (Lewis)**
- Safe production & handling procedures
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<th>Jan 5 – Saturday, 3:30pm-6pm</th>
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<tbody>
<tr>
<td>• Introduction</td>
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<td>• Tour of CEAC Campus &amp; Analysis of Structures &amp; Systems</td>
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<td>• Common Questions</td>
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**Dinner & Key Note Speaker**

6pm – 7:30pm
- A Dinner & Networking Session provided for both Tomato & Lettuce Attendees

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Jan 7 – Monday 8am-6pm
8am - Coffee & Previous Day Discussions

“Greening the Greenhouse”
• Resource use Optimization

Deciphering your greenhouse – “Virtual Grower”
• Projecting heating costs
• Forecasting performance

Crop registration forms
• Data collection and measurements

Environmental control & system maintenance & monitoring
• Set-points and setup
• Monitoring methods
• System maintenance
• Plant/Environment Relationships
• Real-time monitoring – CEAC/tomatoes live

Propagation
• Substrate choices and starting materials
• Seeds and seeding
• Germination conditions
• Scheduling

*Schedule subject to change

*Lunch Provided*
Jan 8 – Tuesday, 8am-6pm
8am - Coffee & Previous Day Discussions

IPM, Disease, and Deficiencies
• Common pests and treatment procedures
• Diseases common to production
• Nutrient deficiencies

Growing Lettuce
• Nutrition
• Spacing and layout
• Crop maintenance and monitoring
• Harvesting

IPM, Disease, and Deficiencies
• Common pests and treatment procedures
• Diseases common to production
• Nutrient deficiencies

Post-harvest & Food safety
• Post-harvest procedures
• Packaging, storage, and shipment
• Food safety procedures
• Safe production and handling procedures

Certifications & GHP / GAP
• GHP / GAP
• Certified Naturally Grown, Organic, and other labels
• Audits, check-ups, and maintenance of certifications

*Schedule subject to change

*Light Breakfast Provided*

*Lunch Provided*
Jan 9 – Wednesday, 8am-5:30pm
8am - Coffee & Previous Day Discussions

Economics of production
• Materials costs and consumption
• Operating costs
• Financials

Business Considerations
• Business planning
• Marketing
• Customers and Selling

*Schedule subject to change

*Light Breakfast Provided*

*Lunch Provided*