Newsletter Summer 2019

Controlled Environment Agriculture Center

USDA/NIFA Conference

Controlled Environment Indoor and Vertical Food Production September 9 – 12, 2019

Its purpose is to Plan an Interdisciplinary Controlled Environment Indoor Agriculture R&D Roadmap and Coordinated Research Plan. It is supported by USDA/NIFA-AFRI program and is hosted by the Controlled Environment Agriculture Center at the University of Arizona, Tucson, AZ and Biosphere 2, Oracle, AZ biosphere2.org/ on September 9 – 12, 2019. Pre-registration ends June 30th; invitation to attend conference July 15th; Final registration, room reservations and payment due August 1st; Conference events begin Monday September 9th.
Please follow us at our website ceac.arizona.edu for the upcoming conference website for registration and detailed information.

This conference will facilitate interdisciplinary discussions centered on several major thematic R&D areas for CEA/VF/GH, each of which will interface with the others to identify cross-disciplinary areas of synergy, opportunity and need. Thematic areas include:

1. Economics
2. Engineering
3. Production Systems
4. Plant Breeding
5. Pest and Disease Management
6. Food Nutrition and Safety
7. Marketing
8. Industrial ecology in closed loop systems

Conference participants are additionally welcome to join writing teams and collaborate on a proposal for a coordinated agricultural project (CAP) grant on VF that builds off of conference discussions. Writing teams may also choose to develop proposals for relevant funding programs at USDA-NIFA SAS, SCRI, NSF/USDA/DOE INFEWS, and NSF.

USDA | College of Agriculture & Life Sciences | UA SCIENCE Biosphere 2 | College of Agriculture and Life Sciences, Controlled Environment Agriculture Center

Upcoming Events

USDA/NIFA Controlled Environment Indoor and Vertical Food Production Conference

- September 9-12, 2019, at Biosphere 2, Tucson, AZ

Tomato and Lettuce Intensive Workshops at UA-CEAC

- Lettuce only, October 5-9, 2019

- Combined tomato and Lettuce, January 2-9, 2020

More details to come!

Registration information will be available at ceac.arizona.edu/intensive

Save the Dates for

VertiFarm 2019

- 1st ISHS International Workshop on VerticalFarming

- October 13-15, 2019, Wageningen University, The Netherlands

2020 NCERA 101 International Conference on Controlled Environment Technology and Use

- March 15-19, 2020, University Marriott Park Hotel , Tucson, Arizona.

2020 CEAC Annual Greenhouse Engineering and Crop Production Short Course

- March 2-6, 2020, University Marriott Park Hotel , Tucson, Arizona.

2019 Short Course Success

Our 2019 Short Course was a success! We had approximately 100 participants representing 19 US states and 6 countries. 25 technical presentations were given by 20 experts from academia and industry with topics from CEA technology, systems and design, fundamentals of hydroponics growing, plant nutrition, sensors and controls, supplemental lighting, water quality and treatment, food safety, bio-tech and tissue culture, seed varieties, marketing and packaging, and urban agriculture. We look forward to seeing you at our next Short Course in March 2-6, 2020!

Thanks to Our Invited Speakers

Thank you to our 2019 Short Course Sponsors and Exhibitors

ARGUS CONTROLS
A CONVIRON COMPANY

RIDDER

BAYER

Stuppy GREENHOUSE

BC Blackmore Company
"Growing with you for more than 50 years"

ihort

1913 we make it grow

bioBest SUSTAINABLE CROP MANAGEMENT

heliospectra

bpgrower.com
BEAVER PLASTICS

HORT AMERICAS

CONLEY'S GREENHOUSE MANUFACTURING & SALES

Grodan®

PREMIER TECH

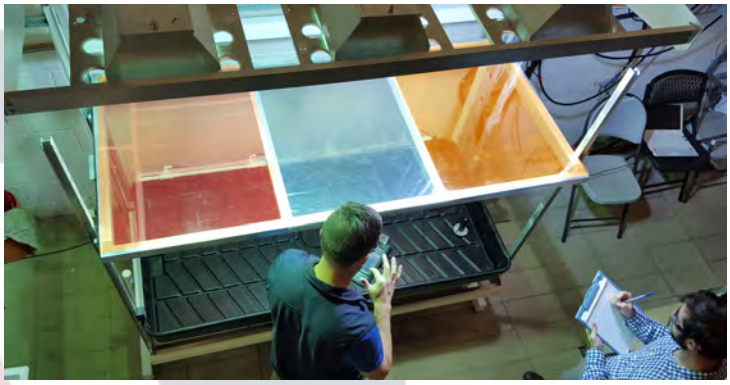
MICRO GROW GREENHOUSE SYSTEMS INC.

Special Thanks to Wholesum Harvest for hosting us at their greenhouse facility for the technical tour!

Wholesum

Ongoing Research Activities

UbiQD, Inc.



Charles Parish, Graduate Student

Gene Giacomelli, PI

Matt Bergren, POC

Charles Parrish began studies in Fall 2018 to evaluate the performance of new greenhouse film products with applications in space. A tech company spun out of Los Alamos National Laboratory, UbiQD (Ubiquitous Quantum Dots) and VP Matthew Bergren, PhD, recognized the major challenge for crop production in CEA of providing light and thus developed quantum dot (QD)-embedded greenhouse films. The physics of QD technology enhances light intensity [brightness] and quality [spectral distribution} of light from any source to improve production capability and efficiency. Here efficiency is defined as grams of edible biomass produced per kilowatt hour of electricity required to power the lamps.

Premier Tech Horticulture – Strawberry Substrate trials

Myles Lewis and Gene Giacomelli, PI

Jose Chen Lopez, POC

Neal Barto, Engineering support

Substrate Evaluation of Off Season Greenhouse Strawberries, supported by Dr. Remi Naasz and Catherine Viel, Premier Tech Horticulture POC's with Dr. Jose Chen Lopez, onsite advisor and Myles Lewis, AZ Vegetable Co. as operations manager, has continued the ground-breaking development by Dr. Chieri Kubota, Ohio State University [formerly UA-CEAC] for developing a greenhouse strawberry system for Arizona growers. The performance of four different substrates, two of Premier Tech, in a greenhouse trial to assess the yield and quality of strawberry, and to establish the crop management protocol.

Premier Tech Horticulture – Tomato Substrate trials

Robert Heintz, Graduate Student

Gene Giacomelli, PI

Jose Chen Lopez, POC

Neal Barto, Engineering support

Robert Heintz, PSM-CEA program, began greenhouse trials on tomato crop production with different blends of PremierTech Horticulture root zone substrate products. This continues for a second year to assess plant growth performance, including yield and quality of tomato fruit. Dr. Jose Chen Lopez directs the research and production of high quality and high yielding tomato fruit.

Mushrooms on Mars

Sean Gellenbeck, Graduate student
Gene Giacomelli, PI
Dr. Barry Pryor, Mycologist and collaborator

Sean Gellenbeck working on the *Mushrooms on Mars* project supported by the Dubai Future Foundation to address major challenges of bioregenerative life support, including efficiently re-utilizing the nutrients locked within inedible biomass and other compostable materials that remain in closed system from plant production of food; and producing high quality protein for human consumption. As Dr. Barry Pryor explained, "Mushrooms are the consummate recyclers of plant material on earth and produce high quality protein in the process. They will perform the same function in space". A major reduction of required energy and production area were determined when mushrooms were incorporated as a protein component of the space diet. Developing systems for co-production of mushrooms and plants in space will drastically increase the sustainability of space habitats and has application to smart building design on Earth to complete the nutrient recycling of a closed system.

Seed Corn Production System

TilakMahato, Production manager, Gene Giacomelli, PI
Dr. Jason Licamele, Neal Barto, Engineering support

The project has culminated after 4+ years of development of a seed corn production system for a greenhouse breeding program sponsored by Bayer Crop Science. A state of the art 7 acre greenhouse facility is being completed in Marana, AZ to begin seed production activities that will require less farmland and water, and reduce breeding time. More than 30 undergraduate students gained the unique experience of year round indoor production of corn requiring highly orchestrated hand-pollination! Dr. Jason Licamele, POC and BE program alumnus, led the most recent projects.

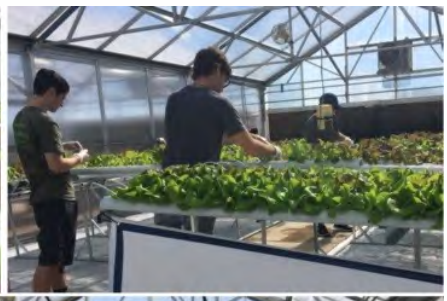
Energy producing greenhouse: Organic Photovoltaics Integrated Greenhouse

Rebekah Waller, Graduate Student, Murat Kacira, PI, Neal Barto, Engineering Support

This collaborative research project between UA-CEAC, Volcani Research Center-ARO with Dr. Meir Teitel and Triangle Research and Development Center with Dr. Ibrahim Yehia was designed to evaluate the use of organic photovoltaics wavelength selective film technology in the greenhouse production system on greenhouse microclimate, plant growth, yield and quality, and energy generation. Project is supported by Us-Israel Binational Agricultural Research and Development Fund (BARD)

Nutrient Film Technique based Leafy Greens Production

Donald Coon (Graduate Student), Stacy Tollefson (Collaborator), Murat Kacira (PI)



Evaluation of growth, yield and quality of three lettuce crop varieties and production strategies within Nutrient Film Technique based production system, supported by Jenny and Paul Harris, and in collaboration with Joe Swartz, American Hydroponics (AmHydro).

Optimizing Resource Use Efficiency in Vertical Farming based Indoor Agriculture System

Ying Zhang, Rebekah Waller, Caroline Schulte (Graduate Students), Murat Kacira, PI

Research program enhancing environmental uniformity with improved HVAC systems designs and integrations, design and implementation of innovative sensing and monitoring system, and control strategies for improved resource use efficiency in vertical farming indoor agriculture systems. We appreciate the support of our collaborators AeroFarms, HortAmericas, Illumitex, Enza Zaden, and Grodan.

NSF/NRT-IndigeFEWSS: Indigenous Food, Energy, and Water Security and Sovereignty

Rebekah Waller (Graduate Student), Karletta Chief (PI), Co-PIs Murat Kacira, Kimberly Ogden, Benedict Colombi, Erin Ratcliff, Kelley Simmons-Potter, Valerie Shirley, Robert Arnolds.

Project that bridges natural, social and physical sciences with engineering to develop novel and sustainable solutions for off-grid production of safe drinking water, brine management operations, and controlled environment agricultural systems to address challenges of food, water and energy in Native American Community. Project is supported by National Science Foundation-NRT program.

Four UA Students Were Chosen to Participate in the Produce Marketing Association (PMA) Career Pathways Program

For the 5th year, Dr. Stacy Tollefson chose four students to chaperone at the Produce Marketing Association (PMA) Career Pathways Program, April 30-May 2 in Monterey, CA. The students were Matthew Core (AGTM), Sam Heward (SPS), Jackie Kondkhorov (AGTM), and Juan Morales (SPS-Yuma). The students were paired with industry mentors, participated in customized career education sessions, toured an artichoke farm and two packing plants, and participated in the PMA Tech Knowledge Industry Event. They learned about the many different job opportunities within the Fresh Produce industry and made great connections with industry leaders. Congratulations!

Mars-Lunar Greenhouse Glows Purple Again

Sean Gellenbeck, Charles Parrish, KC Shasteen, Gene Giacomelli, Murat Kacira, Neal Barto, Barry Pryor, Bree Rodriguez

Lettuce now thrives in the MLGH at the campus Lab, and Chris Gunn, a science and technology photographer, is engaged in a pictorial essay for National Geographic about Mars and the technology to "live off the land." He plans to feature the Mars-lunar greenhouse prototype, and with the professional efforts of writer Chris Wanjek, there will be lettuce greens and a mushroom surprise, as well. Notable fact: the MLGH has been featured in the media, including, "Spacefarers: How humans will settle the Moon, Mars, and beyond" (Harvard University Press, Spring 2020) a book authored by Chris Wanjek.

Roof Top Greenhouse ends production year

Stacy Tollefson,
Todd Millay
Gene Giacomelli

The Roof Top Greenhouse located on the Student Union Memorial Center completed its first school year of tomato, cucumber and pepper production, providing 440 lbs per month to the Student Pantry. Todd Millay, Director SUMC and Dr. Stacy Tollefson supported and mentored students, Chris Patzke, Devon Valdivia, Tyler Rodriquez, and Quinn Waltz to gain crop production experience. Dr. Gene Giacomelli and Neal Barto of CEAC, and Larry Jones, SUMC assured that the design, construction and operations of the RTGH were completed. Seeding has been completed for a new crop season to begin in June.

To our Covering Environments Seminar Speakers

Thank you to all of our wonderful guest speakers this Spring 2019 Semester! Our guest speakers and topics included:

Emre Toker: The Why and the How of Entrepreneurship in a University Setting

Ravi Palanivelu, PhD: Pollen: Nothing to Sneeze At!

S. Patricia Stock, PhD: Harnessing Secondary Metabolites from Nematode Bacterial Symbionts: Application in Pest Management

Dr. Stacy Tollefson, Biosystems Engineering Professor of Practice,

was honored as one of six STEM superheroes to celebrate International Day of Women and Girls in Science on Feb. 11, 2019 on the UA's home page. She continues to teach and mentor students in growing crops hydroponically through her courses, internship program, and her management of the Student Union Rooftop Greenhouse.

Interested in watching any of these seminars

Visit our Youtube Channel here!

You can also attend upcoming seminars virtually by checking here.

Congratulations to Our Recent Graduates

Donald Coon graduated with Professional Science Masters degree with CEA emphasis. Donald's conducted research on mushroom and leafy greens production within controlled environment systems. His committee included Dr. Barry Pryor (member), Dr. Stacy Tollefson (member) and Dr. Murat Kacira (Chair). He will be working as lead horticulturist at Traders Hill Farm in Florida.

Sean McBride graduated with Professional Science Masters degree with CEA emphasis. Sean's research focused on distribution center paired greenhouse production for private labels. His committee included Myles Lewis (member), Dr. Gene Giacomelli (member), and Dr. Murat Kacira (chair). Sean started working as horticulturalist at Vertical Roots in South Carolina.

Congratulations to Donald and Sean. CEAC wishes you the best of success on your future endeavors!

Introduction of our New Graduate Students

Sean Gellenbeck

PhD,Biosystems Engineering

Sean holds a BS in Aerospace Engineering and an MS in Systems Engineering from the U A, and has been a part of the CEAC Mars Lunar Greenhouse and the Mushrooms on Mars projects. He is passionate about the advancement of human space travel and with Dr. Joel Cuello as his adviser, will perform research on integrated bioregenerative life support systems. Sean works as an engineer for Paragon Space Development Corporation and has worked on the NASA OSIRIS-REx Asteroid Sample Return Mission. Sean participated in a rotation at the Mars Desert Research Station and hopes to one day set foot on the surface of Mars.

Robert Heintzz

MS,Applied Biosciences, Professional Science Masters

Robert came to University of Arizona from Hawaii where he managed the farm, papaya orchards and grounds of an Eco-Resort. No stranger to growing crops in unusual places Robert fit right in at the CEAC. In Hawaii Robert grew papayas in a novel substrate of macadamia nut husks and volcanic cinders. He is now experimenting with different substrates and beneficial organisms for use in hydroponics. Robert is interested in joining the multi-million dollar seed corn industry in Hawaii after graduation. He hopes to help feed the word by speeding up the maize breeding process. Robert also has a passion for orchids, especially the vanilla orchid, which is as challenging to cultivate as it is delicious.

KC Shasteen

MS, Biosystems Engineering

KC graduated from Midwestern State University with a Bachelors of Science dual majoring in Mathematics and Physics. While at the University of Arizona he will study the principals of Controlled Environment Agriculture. He hopes to apply this knowledge in the upcoming industry of space-based agriculture via the design and development of Bioregenerative Life Support Systems for orbital habitats and planetary bases. His advisor is Dr. Murat Kacira, and, with his guidance, he will attempt to develop computer software for the remote monitoring and assessment of crop development and health using crop models and data gathered through sensors and through machine vision.

Introduction of our New Team Member

Megan Dragony

CEAC Program Coordinator

Megan worked in London as a Program Coordinator for the Young Foundation for 5 years. The Young Foundation is a leading Social Innovation think tank dedicated to developing better connected and more sustainable communities across the UK. Most recently she has been working as a manager in behavioral health, enabling her to engage meaningfully with some of the most vulnerable communities in Arizona. At CEAC, Megan hopes to help increase our social media presence and continue to promote CEAC as a leader in sustainable agriculture within controlled environments by highlighting our innovative courses, research, and outreach/extension programs. Megan holds a BA in Anthropology from the University of Arizona, and an MSc in Anthropology from the University of Oxford. Contact Megan with any questions at dragonym@email.arizona.edu.

Upcoming Symposia and Conferences

- GreenSys 2019, June 16-19, 2019, Angers, France. Click here for details.
- Controlled Environment Indoor Agriculture Conference. September 9-12, 2019, Biosphere2, Tucson, Arizona. Click here for details.
- VertiFarm 2019: 1st ISHS International Workshop on Vertical Farming, October 13-15, Wageningen University, The Netherlands.
- NCERA 101 International Conference on Controlled Environments Systems and Technology. March 15-18, 2020, Marriott University Park Hotel, Tucson, Arizona. Click here for details.
- 9th International Symposium on Light in Horticulture. June 8-12, 2020, Malmo, Sweden. Click here for details.

Honoring Michael F. Munday

Mike Munday awarded CEAC Mission Award for 2019

The CEAC Mission Award was presented posthumously to Michael [Mike] Munday during an award ceremony at the Annual Greenhouse Crop Production and Crop Design Short Course on March 11th. Accepting the award was Michele Munday for Mike's supporting promotion, branding, and business development activities with UA-CEAC during the past eight years through Tech News Arizona, Desert Rain Research, LLC, and Gain, USA

A Celebration of Life was hosted by CEAC for friends and family of Mike on March 28th.

The Controlled Environment Agriculture Program is a collaboration among UA College of Agriculture and Life Sciences (CALS) Departments, Centers and Institutes. Its programs are supported in part by State funding directed to the Department of Agricultural & Biosystems Engineering, and School of Plant Sciences. Center Director: Dr. Murat Kacira

Controlled Environment Agriculture Center

The University of Arizona
College of Agriculture and Life Sciences
Department of Agricultural & Biosystems Engineering
1951 E Roger Rd • Tucson, AZ 85719 • (520)626-9566