



New Jersey Agricultural
Experiment Station

REPORT FOR THE NCERA-101 MEETING, April 14-17, 2019

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1. New Facilities and Equipment

We purchased a LI-COR spherical quantum sensor (LI-193) and accompanying datalogger (LI-1500). We plan to evaluate the light environment in tall canopies (e.g., vine crops) by comparing the output of the spherical quantum sensor with that of regular quantum sensors.

2. Unique Plant Responses

Yuan Li continues to work on the effects of soluble Silicon amendments used for hydroponically grown leafy greens.

3. Accomplishment Summary

We continue to evaluate a variety of lamps for light output, light distribution and power consumption using our 2-meter integrating sphere and a small darkroom. We evaluated the spectral output of a variety of lamp technologies (INC, CFL, CMH, HPS, and LED) and compared various waveband ratios with sunlight. We are continuing our work on a comprehensive evaluation of ventilation strategies for high tunnel crop production. We are continuing our work on the evaluation of energy use in commercial greenhouses and comparing the information to model-based predictions. A variety of outreach presentations on the engineering aspects of high tunnels, greenhouse production, and energy consumption have been delivered at local and out-of-state venues.

4. Impact Statement

Nationwide, Extension and NRCS personnel and commercial greenhouse growers have been exposed to research and outreach efforts through various presentations and publications. It is estimated that this information has led to proper designs of controlled environment plant production facilities and to updated operational strategies that saved an average sized (1-acre) business a total of \$20,000 in operating and maintenance costs annually. Greenhouse energy conservation presentations and written materials have been prepared and delivered to local and regional audiences. Greenhouse growers who implemented the information resulting from our research and outreach materials have been able to realize energy savings between 5 and 30%.

5. Published Written Works

Refereed journal articles:

Brumfield, R.G., L.B. Kenny, A.J. DeVincentis, A.K. Koeser, S. Verlinden, A.J. Both, G. Bi, S.T. Lovell, and J.R. Stewart. 2018. Analysis of Economic and Social Costs of Growing *Petunia × hybrida* in a Greenhouse Production System Using Alternative Containers. HortScience 53(8): 117961185.

Trade journal articles:

Shelford, T, T. Manning and A.J. Both. 2018. Vapor pressure deficit revisited. GrowerTalks, November issue. pp. 66, 67, 69.

Both, A.J. and T. Shelford. 2018. Afraid of your shadows? GrowerTalks, June issue. Available at: <https://www.growertalks.com/Article/?articleid=23645>

6. Scientific and Outreach Oral Presentations

Both, A.J. 2019. Two presentations: *Greenhouse standards* and *Research, trends and partnerships*. Presented as part of the National Greenhouse Manufacturers Association spring meeting. April 8. Austin, TX.

- Specca, D. and A.J. Both. 2019. Organized a two-day short course titled *Greenhouse Crop Production*. D. Specca and A.J. Both delivered presentations and hosted tours. March 21-22. Bordentown, NJ.
- Manning, T.O. 2019. Energy in greenhouses. Abstract in the Proceedings of the 64th New Jersey Agricultural Convention and Trade Show. February 5. Atlantic City, NJ. pp. 71-73.
- Both, A.J. 2019. Supplemental light in greenhouses. Abstract in the Proceedings of the 64th New Jersey Agricultural Convention and Trade Show. February 5. Atlantic City, NJ. pp. 74-75.
- Both, A.J. 2019. High tunnel ventilation. Extension presentation for the High Tunnel Bramble Workshop organized by the TunnelBerries project team during the Mid-Atlantic Fruit and Vegetable Convention. January 28. Hershey, PA.
- Both, A.J. 2018. Urban farming: Challenges, opportunities and perhaps a reality check from a commercial farming perspective. Presentation for the Rutgers Urban Ag Workshop. December 14. New Brunswick, NJ.

7. Other Relevant Accomplishments and Activities

Grant funding

- Both, A.J. Co-PI for the Lighting Approaches to Maximize Profits (LAMP) project. This project is headed by Prof. Marc van Iersel at the University of Georgia and is funded by the USDA-NIFA. <http://www.hortlamp.org/>
- Both, A.J. Member of the Greenhouse Lighting and Systems Engineering (GLASE) Consortium (Cornell, RPI and Rutgers). This project is headed by Prof. Neal Mattson at Cornell University and is funded by the New York State Energy Research and Development Authority. <https://glase.cals.cornell.edu/>
- Both, A.J. Co-PI for the TunnelBerries project. This project is headed by Prof. Eric Hanson at Michigan State University and is funded by the USDA-NIFA. <https://www.tunnelberries.org/>

Team awards

- Award for Excellence in Multistate Research. 2018. Presented by the Northeast Regional Association of State Agricultural Experiment Station Directors to the NE-1335 Committee on Resource Management in Commercial Greenhouse Production.
- Blue Ribbon Award, ASABE Educational Aids Competition. 2018. Comprehensive Publication: Light Management in Controlled Environments. R. Lopez and E. Runkle (eds.).
- ASHS (American Society for Horticultural Science) Extension Division. 2018. Material Award (Book): Light Management in Controlled Environments. R. Lopez and E. Runkle (eds.).
- ASABE Standards Development Award. 2018. ANSI/ASABE S640 JUL2017, Quantities and Units of Electromagnetic Radiation for Plants (Photosynthetic Organisms).

Pending publications

- Li, Y., C.A. Wyenandt, A.J. Both, and J.R. Heckman. 2019. Applying Wollastonite to soil to adjust pH and suppress powdery mildew on pumpkin. In preparation for resubmission to HortTechnology.
- Lewus, D. and A.J. Both. 2019. Using computational fluid dynamics (CFD) to improve high tunnel ventilation. Refereed conference proceedings article to be presented at the upcoming GreenSys meeting in Angers, France (June).
- Manning, T.O. 2019. Energy modeling in greenhouses: Suitability and utility for specific applications. Refereed conference proceedings article to be presented at the upcoming GreenSys meeting in Angers, France (June).
- Shelford, T., C. Wallace, and A.J. Both. 2019. Calculating and reporting key light ratios for plant research. Refereed conference proceedings article to be presented at the upcoming GreenSys meeting in Angers, France (June).
- Shelford, T. and A.J. Both. 2019. Plant production in controlled environments. Book chapter submitted for review to ASABE for a new textbook aimed at undergraduate engineering students.