

**REPORT FOR THE NCERA-101 MEETING, September 18-23, 2016**

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1. New Facilities and Equipment

None

2. Unique Plant Responses

None

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 dark room. A variety of outreach presentations on greenhouse operation and energy consumption have been delivered at several local and out-of-state venues. A variety of publications were completed, including the long-awaited “Guidelines for measuring and reporting environmental parameters for experiments in greenhouses” (as a scientific paper and as a stand-alone publication).

4. Impact Statement

Nationwide, Extension personnel and commercial greenhouse growers have been exposed to research and outreach efforts through presentations, publications and evaluation tools. It is estimated that this information has led to proper greenhouse designs and updated operational strategies that saved an average sized (1-acre) greenhouse 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, regional, and national audiences. 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

Wallace, C. and A.J. Both. 2016. Putting lights to the test. *GrowerTalks*, June issue. pp. 60, 62, 64.

Wallace, C and A.J. Both. 2016. Evaluating operating characteristics of light sources for horticultural applications. *Acta Horticulturae* 1134:435-443.

Kubota, C., M. Kroggel, A.J. Both, J.F. Burr, and M. Whalen. 2016. Does supplemental lighting make sense for my crop? – Empirical evaluations. *Acta Horticulturae* 1134:403-411.

Ishii, M., L. Okushima, H. Moriyama, S. Sase, N. Fukuchi, and A.J. Both. 2015. Experimental study of natural ventilation in an open-roof greenhouse during the summer. *Acta Horticulturae* 1107:67-74.

Mitchell, C.A., J.F. Burr, M.J. Dzakovich, C. Gómez, R. Lopez, R. Hernández, C. Kubota, C.J. Currey, Q. Meng, E.S. Runkle, C.M. Bourget, R.C. Morrow, and A.J. Both. 2015. Light-Emitting Diodes in horticulture. *Horticultural Reviews* 43:1-87. John Wiley & Sons, Inc., Hoboken, NJ.

Both, A.J., L. Benjamin, J. Franklin, G. Holroyd, L.D. Incoll, M.G. Lefsrud, and G. Pitkin. 2015. Guidelines for measuring and reporting environmental parameters for experiments in greenhouses. *Plant Methods* 11(43). 18 pp.

6. Scientific and Outreach Oral Presentations

- Both, A.J. 2016. Urban agriculture. Presented at the 2016 Urban Agriculture as an Economic Tool Conference, hosted by the New Jersey Urban Mayors Association. Trenton, NJ. May 5.
- Both, A.J. 2016. Crop lighting (abstract). Proceedings of the 61th New Jersey Agricultural Convention and Trade Show. February 9. Atlantic City, NJ. pp. 32.
- Both, A.J. 2015. A video presentation titled 'Greenhouse Energy Efficiency' was delivered as part of the NE-SARE funded Farm Energy IQ project (collaboration with Penn State and the University of Vermont).

7. Other Relevant Accomplishments and Activities

- Both, A.J. 2016. Urban agriculture. Presented at the 2016 Urban Agriculture as an Economic Tool Conference, hosted by the New Jersey Urban Mayors Association. Trenton, NJ. May 5.
- Both, A.J. and D. Specca. 2016. Greenhouse Production Short Course, NJ EcoComplex. Columbus, NJ. March 7-8.
- Johnstonbaugh, E., D. Ciolokoz, G. Musgarve, G. Roth, C. Callahan, S. Hawkins, A.J. Both, Z. Helsel, T. Manning. 2015. Farm Energy IQ workshops (In-service training). Columbus, NJ. April 8-10.
- International Committee for Controlled Environment Guidelines. 2016. Guidelines for measuring and reporting environmental parameters for experiments in greenhouses. 34 pp.

*Pending publications*

- Both, A.J., J.M. Frantz, B. Bugbee. 2016. Carbon dioxide enrichment in greenhouses. Submitted for publication in 'Light Management in Controlled Environments' (R. Lopez and E. Runkle, eds.) to be published by Meister Media.
- Runkle, E. and A.J. Both. 2016. Delivering long-day lighting – Technology options and costs. Submitted for publication in 'Light Management in Controlled Environments' (R. Lopez and E. Runkle, eds.) to be published by Meister Media.
- Both, A.J. and J.E. Faust. 2016. Light transmission: The impact of glazing material and greenhouse design. Submitted for publication in 'Light Management in Controlled Environments' (R. Lopez and E. Runkle, eds.) to be published by Meister Media.
- Fisher, P., A.J. Both, and B. Bugbee. 2016. Supplemental lighting technology, costs and efficiency. Submitted for publication in 'Light Management in Controlled Environments' (R. Lopez and E. Runkle, eds.) to be published by Meister Media.
- Johnson, M., T.S. Villani, J.E. Simon, A.J. Both. 2016. Effects of nitrogen, CO<sub>2</sub> and harvesting method on various algae species grown on vertical substrates. Submitted for publication in the Journal of Applied Phycology.
- Ishii, M., L. Okushima, H. Moriyama, S. Sase, N. Fukuchi, T. Maruo, and A.J. Both. 2015. Evaluating environmental conditions in open-roof greenhouses. Accepted for publication in Acta Horticulturae.