NCERA-101 station report (2019) – University of Maryland

1. **Representatives:**

   Dr. John Lea-Cox, University of Maryland, Dept. Plant Sciences and Landscape Architecture

2. **Accomplishments:**

NCERA-101 project areas addressed:

1. **Technology Advancement:** Specifically with regard to:
   - Controlled environment irrigation management
2. **Technology Transfer:** Disseminate novel technologies to users including controlled environment manufacturers, managers, and commercial users; teach historical and recent controlled environment technologies to students.
5. **Communication:** Publish research, exchange information, prepare educational materials, organize national and international symposia and conferences, and provide consultation and expertise for both scientists and commercial users of controlled environment facilities both domestically and abroad to research and industry stakeholders.
7. **Environmental:** To promote the sustainable development and energy efficient operation of controlled environment facilities. Specifically, with regard to:
   - Substrate and nutrition management,
   - Runoff water management and quality and
   - non-chemical pathogen management.

3. **Description of Activities and Outputs: (Specific outputs documented under Section 5)**

A. A primary focus of our current research is to better relate substrate volumetric water content (VWC) to plant-available water (matric potential, MP), so CE growers can better establish irrigation thresholds, increase the precision of irrigation applications, and maintain growth rates by avoiding water stress.
B. A primary focus of research activities during 2019 was finalizing deficit irrigation with greenhouse-grown strawberry and a series of urban vegetable crop production in green roof substrates. Incorporation of biochar had no significant effect on water-holding capacity in these substrates. Incorporation of 5% aluminum oxide significantly reduced soluble phosphate but not nitrogen leaching from compost amendments, without affecting the growth of three successive vegetable crop cycles.
C. A comparison of irrigation-water containment methods and management strategies between two ornamental production systems to minimize water security threats journal article was published.
D. A book chapter entitled “Advances in Irrigation Practices and Technology in Ornamental Cultivation” in the book entitled “Achieving Sustainable Cultivation of Ornamental Plants.”

4. **Outcomes/Impacts**:

A. Assist the controlled-environment industry to efficiently and successfully utilize available primary and secondary (recycled) water sources.
B. Examine disease risk factors associated with deficit irrigation strategies, to overcome real and perceived barriers to adoption of deficit irrigation techniques, particularly when using recycled water.

C. Evaluate the efficacy of recycled water remediation strategies in reducing / eliminating cryptic oomycete pathogens.
D. Evaluate the efficacy of slow sand filtration in reducing paclobutrazol (a widely-used plant growth regulator) concentrations in recycled irrigation water
E. Reduce the N and P loading potential of organic substrates used in urban rooftop vegetable production to local rivers and streams.

5. Activities, Outputs:

Grants:

1. Aydilek, A.H., A.P. Davis, J.D. Lea-Cox and A.G. Ristvey. 2019. Effect of Geotechnical and Environmental Properties of Maryland Compost and Compost Amended Topsoils on Vegetation Establishment and Growth. Maryland State Highway Administration. $399,313. (2 Years).
2. Hu, M., J.D. Lea-Cox and C. Johnson. 2019. Development and evaluation of microclimate-based decision support tools, for sustainable strawberry production. USDA-NIFA NE Integrated Pest Management Grant. $49,850. (2 Years).
3. Lea-Cox, J.D., A.G. Ristvey and N. Little. 2017. Defining Best Management Practices for Substrate, Water and Nutrient Management of Urban Farming Systems. University of Maryland AGNR - Integrated MAES/UME grant. $40,000 (2 Years).

Book Chapters

1. Lea-Cox, J.D. 2020. Advances in Irrigation Practices and Technology in Ornamental Cultivation. Chapter 12. ***In:*** Achieving Sustainable Cultivation of Ornamental Plants. M. S. Reid. (Ed.) Burleigh Dodds Science Publishing, Cambridge, UK.

Refereed Journal Articles

1. Del Castillo Múnera, J., B.E. Belayneh, J.D. Lea-Cox, and C.L. Swett. 2019. Effects of set-point substrate moisture control on oomycete disease risk in containerized annual crops, based on the tomato-Phytophthora capsici pathosystem. Phytopathology First look online: 04.11.19 https://doi.org/10.1094/PHYTO-03-18-0096-R
2. Del Castillo Múnera, J., B.E. Belayneh, A.G. Ristvey, E. Koivunen, J.D Lea-Cox, and C. Swett, 2019. Enabling adaptation to water scarcity: Identifying and managing root disease risks associated with reducing irrigation inputs in greenhouse crop production–A case study in poinsettia. Ag. Water Management. 26, 105737. https://doi.org/10.1016/j.agwat.2019.105737
3. Ristvey, A.G., B.E. Belayneh and J.D. Lea-Cox. 2019. A comparison of irrigation-water containment methods and management strategies between two ornamental production systems to minimize water security threats. Water 11, 2558. https://doi.org/10.3390/w11122558
4. White, S.A., J.S. Owen, J.C. Majsztrik, L.R. Oki, P.R. Fisher, C.R. Hall, J.D. Lea-Cox and R.T. Fernandez. 2019. Greenhouse and Nursery Water Management Characterization and Research Priorities. Water 11, 2338. https://doi.org/10.3390/w11112338

Non-Referred Conference Proceedings

1. Howard, I., A.G. Ristvey and J.D. Lea-Cox. 2019. Modifying Green Roof Substrates for Nutrient Retention in Urban Farming Systems. Proc. Nursery Assoc. Res. Conf. 64:163-168.
2. Lea-Cox, J.D., B.E. Belayneh, B.E., O. Starry and D. DeStefano. 2019. Monitoring Urban Landscapes to Measure Ecosystem Services. Proc. Southern Nursery Assoc. Res. Conf. 64:169-174.

Abstracts

1. Lea-Cox, J.D., B.E. Belayneh and A.G. Ristvey. 2019. Optimizing irrigation set-points for the growth and quality of two Chrysanthemum morifolium cultivars in two soilless substrates. ISHS IX International Symposium on Irrigation of Horticultural Crops, Matera Italy. pp. 67.

Posters

1. Belayneh, B.E. and J.D. Lea-Cox. 2019. Substrate moisture effects on growth, yield and fruit quality of strawberry (*Fragaria X ananassa*). ISHS IX International Symposium on Irrigation of Horticultural Crops, Matera Italy. 20 June, 2019. pp. 140.
2. Ristvey, B.E. Belayneh and J.D. Lea-Cox. 2019. A comparison of irrigation-water containment systems and management strategies, to ensure water security in two ornamental operations. ISHS IX International Symposium on Irrigation of Horticultural Crops, Matera Italy. 20 June, 2019. pp. 189.

Trade and Extension Articles, Reports

1. Lea-Cox, J.D., B.E Belayneh, M. Newell and M. Hu. 2019. Weather, pest and disease predictions -- and the value of microclimatic data. Strawberry Twilight Extension Meeting Report. University of Maryland Extension May, 2019.
2. Ristvey, A.G. and C.F. Schuster. 2020. Care and Calibration of Injectors. University of Maryland Extension Fact Sheet. FS-1121.
3. Little, N.G. and A.G. Ristvey. 2020. How to interpret salinity test results: Salinity matters for high tunnels and growth media. University of Maryland Extension Fact Sheet. FS-1128.

Extension Activities

1. State of Maryland Grower Certification (FTC) Training to write Water and Nutrient Management Plans for Nursery, Greenhouse and Controlled Environment Operations. 22 Jan and 28 Feb, 2019 (6 registrants; 3 Growers certified).
2. State of Maryland Grower Certification (FTC) Training to write Water and Nutrient Management Plans for Controlled Environment Operations. 2 July and 8 August, 2019 (12 registrants; 6 Growers certified).

Public Media, Websites

1. UMD Elevates Rooftop Farming (Video) July, 2019. https://www.youtube.com/watch?v=J8XjOXjaz00&feature=youtu.be
2. Maryland Helps Grow Urban Rooftop Farms: BTN LiveBig (Video) Jan, 2020. https://btn.com/2020/01/10/maryland-urban-rooftop-farming/

Awards

1. Dean Gordon Cairns Award for Distinguished Creative Work and Teaching in Agriculture. The highest career award made to a faculty member of the College of Agriculture and Natural Resources. University of Maryland, College Park, MD. 15 May 2019. (John Lea-Cox - Individual Award)