

**NE 1035 Annual Meeting  
The University of Connecticut (Storrs, CT)  
Nathan Hale Inn and Conference Center  
855 Bolton Road, Storrs, CT**

**June 25-27, 2012  
Multistate Research Project  
Station Publications Report**

**PROJECT NUMBER:** NE 1035

**TITLE :** Commercial Greenhouse Production: Component and System Development

**PROJECT DURATION :** October 1, 2011 to September 30, 2012

**REPORT DATE:** 23 August, 2012

**PUBLICATIONS**

**Dissertations/Theses**

Patterson, R.L. 2011. Description, Operation and Production of the South Pole Food Growth Chamber. M.S., University of Arizona, Tucson, AZ (Advisor: G. Giacomelli, Committee: M. Kacira, R. Wheeler, P. Sadler)

Villarreal- Guerrero, F. 2011. Enhanced greenhouse cooling strategy with natural ventilation and variable fogging rates. PhD Dissertation, University of Arizona, Tucson, AZ (Advisor: M. Kacira, Committee: G. Giacomelli, C. Kubota, Y.J. Son)

**Books**

Vanek, F.M., L.D. Albright and L.T. Angenent. 2012. Energy Systems Engineering: Evaluation and Implementation. Second Edition. McGraw-Hill, New York. ISBN 978-0-07-178788-9.

**Book Chapters**

Mattson, N. and N. Catlin. 2011. Carbon dioxide: building block for plant growth. in Ball Redbook Volume 1, 18<sup>th</sup> edition (Beytes, C., Ed.) Ball Publishing, West Chicago, IL. pp. 132-134.

Short T. and P. Ling. 2011. Greenhouse Ventilation. In Chapter 6 The Greenhouse Environment. 2011. Ball Redbook volume 1. 18th Edition. Edited by C. Beytes. Ball Publishing, Chicago. Pp. 107-111.

**Refereed Journal Articles (Published)**

- Balal, R.M., M.M. Khan, M.A. Shahid, N.S. Mattson, T. Abbas, F. Garcia-Sanchez, U. Ghazanfer, and Z. Iqbal. 2012. Comparative studies on physio-biochemical, enzymatic and ionic modifications in salt tolerant and salt sensitive citrus rootstocks under NaCl stress. *Journal American Society Horticultural Science* 137:86-95.
- Bartzanas, T., M. Kacira, H. Zhu, S. Karmakar, E. Tamimi, N. Katsoulas, I. Lee, C. Kittas. 2012. Computational fluid dynamics applications to improve crop production systems. *Computers and Electronics in Agriculture* (In Press).
- Boscheri, G., M. Kacira, L. Patterson, G. Giacomelli, P. Sadler, R. Furfaro, C. Lobascio, M. Lamantea, L. Grizzaffi. 2012. Modified energy cascade model adapted for a multicrop lunar greenhouse Prototype. *Advances in Space Research*. (In Press).
- Bumgarner, Natalie, R. Mullen, M. Bennett, P. Ling, and M. Kleinhenz. 2011. Canopy cover and root-zone heating effects on fall- and spring-grown leaf lettuce yield in Ohio. *HortTech. HortTechnology. HortTechnology* 21:737-744.
- Bumgarner, Natalie, J. Scheerens, R. Mullen, M. Bennett, P. Ling, and M. Kleinhenz. 2011. Root-zone temperature and nitrogen affect the amount and composition of fall and spring-grown leaf lettuce. *Journal of the Science of Food and Agriculture*. <http://onlinelibrary.wiley.com/doi/10.1002/jsfa.4549/pdf>.
- Burnett, S.E., N. Mattson, B. Krug, and R. Lopez. 2011. Floriculture sustainability research coalition: Bringing the latest sustainability research to the industry. *HortTechnology* 21:692-693.
- Cervený, C.B., W.B. Miller, T. Björkman, and N.S. Mattson. 2012. Soaking temperature of dried tuberous roots influences hydration kinetics and growth of *Ranunculus asiaticus* (L.). *HortScience* 47:212-216.
- Chandra Thammina, Mingyang He, Litang Lu, Kaishuang Cao, Hao Yu, Yongqin Chen, Liangtao Tian, Junmei Chen, Richard McAvoy, Donna Ellis, Degang Zhao, Yuejin Wang, Xian Zhang and Yi Li. 2011. In Vitro Regeneration of triploid plants of *Euonymus alatus* 'Compactus' (burning bush) from endosperm tissues. *HortScience* 46:1-7.
- Crane, T.C., C. Kubota, J. L. West, M.A. Kroggel, B.C. Wertheim, and C.A. Thomson. 2011. Increasing the vegetable intake dose is associated with a rise in plasma carotenoids without modifying oxidative stress or inflammation in overweight or obese postmenopausal women. *Journal of Nutrition*, 141: 1827-1833.
- Crowe, B., S. Attalah, S. Agrawal, P. Waller, R. Ryan, J. Van Wagenen, A. Chavis, J. Kyndt, M. Kacira, K. L. Ogden, M. Huesemann. 2012. A comparison of *Nannochloropsis salina* growth performance in two outdoor pond designs:

- conventional raceways versus the ARID pond with superior temperature management. *International Journal of Chemical Engineering* (In Press).
- De Villiers, D.S., L.D. Albright and R, Tuck. 2012. Next generation, energy-efficient, uniform supplemental lighting for closed-systems plant production. *Acta Horticulturae* 952:463-470.
- Elmer, W.H., M.P.N. Gent, R.J. McAvoy. 2012. Partial saturation under ebb and flow irrigation suppresses *Pythium* root rot of ornamentals. *Crop Protection* 33:29-33.
- Frantz, J.M. and P.P. Ling. 2011. Growth, Partitioning, Nutrient and Carbohydrate Concentration of *Petunia × hybrida* Vilm. Are Influenced by Altering Light, CO<sub>2</sub>, and Fertility. *HortScience* Vol. 2, no. 46. : 228-235.
- Gent, M. and R. McAvoy. 2011. Water and Nutrient Uptake and Use Efficiency with Partial Saturation Ebb and Flow Watering. *HortScience* 46:791–798. 2011.
- Gent, M., W. Elmer, and R. McAvoy. 2011. Rapid Watering to Achieve Partial Saturation of Root Medium on Flooded Floors. *Acta Horticulturae* 893:1065-1072.
- Gent, M.P.N and I. Seginer. 2012. A Carbohydrate Supply and Demand Model of Vegetative Growth: Response to Temperature and Light. *Plant Cell Environment* 35:1274-1286.
- Gent, M.P.N. 2012. Rate of change of composition of lettuce in response to nitrogen depletion or resupply. *J. Sci. Food. Agric.* (in press).
- Gent, M.P.N. 2012. Composition of hydroponic lettuce: Effect of time of day, plant size, and season. *J. Sci. Food. Agric.* 92:542-550.
- Gent, M.P.N. and M.R. Short. 2012. Managing a Simple System to Recycle Nutrient Solution to Greenhouse Tomato Grown in Rockwool. *Acta Horticulturae* 927.
- Garland, K., S.E. Burnett, M. Day, and M.W. van Iersel. 2012. Influence of substrate water content and daily light integral on photosynthesis, water use efficiency, and morphology of *Heuchera americana*. *J. Amer. Soc. Hort. Sci.* 137:57-67.
- Gent, M.P.N., W.H. Elmer, R.J. McAvoy. 2012. Water Use Efficiency with Rapid Watering of Potted Plants on Flooded Floors. *Acta Horticulturae* 927.
- Harlan, B.R. and Hausbeck, M.K. 2012. Epidemiology and management of downy

- mildew, a new pathogen of coleus in the United States. *Acta Horticulturae* 952:813-818.
- Hawkins, G., S.E. Burnett, and L.B. Stack. 2012. Survey of consumer interest in organic, sustainable, and local bedding plants in Maine. *HortTechnology* (In Press).
- Kim, J., M.W. van Iersel, and S.E. Burnett. 2011. Estimating daily water use of two petunia cultivars based on plant and environmental factors. *HortScience* 46:1287-1293.
- Li, H., L. Zhao, P. Ling, and J. Liu. 2011. A Model for Predicting Wireless Signal Transmission Performance of ZigBee-Based Sensor Networks in Residential Houses. *ASHRAE transactions*.
- Linker, R., M. Kacira, A. Arbel. 2011. Robust climate control of a greenhouse equipped with variable-speed fans and a variable-pressure fogging system. *Biosystems Engineering*, 110(2): 153-167.
- Liu, J., W.R. Leatherwood and N.S. Mattson. 2012. Irrigation method and fertilizer concentration differentially alter growth of vegetable transplants. *HortTechnology* 22:56-63.
- Mattson, N.S. and M.W. van Iersel. 2011. Application of the “4R” nutrient stewardship concept to horticultural crops: applying nutrients at the “right time”. *HortTechnology* 21:667-673.
- Rothrock, M.J., Jr., Frantz, J.M., S. Burnett. 2012. Effect of volumetric water content and clover (*Trifolium incarnatum*) on the survival of *Escherichia coli* O157:H7 in a soil matrix. *Journal of Food Protection* (In Press).
- Shahid, M.A., R.M. Balal, M.A. Pervez, T. Abbas, M. Ashfaz, U. Ghazanfar, M. Afzal, A. Rashid, F. Garcia-Sanchez, and N.S. Mattson. 2012. Differential response of pea (*Pisum sativum* L.) genotypes to salt stress in relation to the growth, physiological attributes, antioxidant activity and organic solutes. *Australian Journal of Crop Science*. 6:828-838.
- Striemer, G.M., D. L. Story, A. Akoglu and M. Kacira. 2011. A Node and Network Level Self-Recovering Distributed Wireless Sensor Architecture for Real-Time Crop Monitoring in Greenhouses. *Transactions of ASABE*, 54(4): 1521-1527.
- Villarino, G. and N.S. Mattson. 2011. Assessing tolerance to sodium chloride salinity in fourteen floriculture species. *HortTechnology* 21:539-545.
- Villarreal-Guerrero, F., M. Kacira, E. Fitz-Rodríguez, R. Linker, C. Kubota,

- G.A. Giacomelli, A. Arbel. 2012. Simulated performance of a greenhouse cooling control strategy with natural ventilation and fog cooling. *Biosystems Engineering*, 111: 217-228.
- Villarreal-Guerrero, F., M. Kacira, E. Fitz-Rodríguez, C. Kubota, G.A. Giacomelli, R. Linker, A. Arbel. 2012. Comparison of three evapotranspiration models for a greenhouse cooling strategy with natural ventilation and variable high pressure fogging. *Scientia Horticulturae*, 134:210-221.
- Waller, P., R. Ryan, M. Kacira, P. Li. 2012. Algae raceway integrated design (ARID) for optimal temperature management. *Journal of Biomass and Bioenergy*. (In Press).
- Yang, Z. C, C. Kubota, P. L. Chia, M. Kacira. 2012. Effect of end-of-day far-red light from a movable LED fixture on squash rootstock hypocotyl elongation. *Scientia Horticulturae*, 136: 81-86.

### **Symposium Proceedings Articles**

- Fitz-Rodríguez, E., J. Nelkin and C. Kubota. 2011. Use of disposable film sensor for analyzing uniformity of daily light integral inside a greenhouse. *Acta Horticulture* 893:517-524.
- Fitz-Rodríguez, E., M. Kacira, and F. Villarreal-Guerrero. 2011. Neural network predictive control in a naturally ventilated and fog cooled greenhouse. *Acta Horticulturae*. (In Press)
- Gent, M.P.N. and M.R. Short. 2012. Managing a Simple System to Recycle Nutrient Solution to Greenhouse Tomato Grown in Rockwool. *Acta Horticulturae* 927:913-919.
- Gent, M.P.N., W.H. Elmer, R.J. McAvoy. 2012. Water Use Efficiency with Rapid Watering of Potted Plants on Flooded Floors. *Acta Horticulturae* 927:101-107.
- Giacomelli, G., G. Boscheri, R. Furfaro, M. Kacira, C. Lobascio, L. Patterson, P. Sadler, M. Pirolli, R. Remiddi, D. Story, M. Thangavelu, M. Catalina. 2012. Bioregenerative Life Support System Development for Lunar/Mars Habitats. 42<sup>nd</sup> Int. Conf. on Environmental Systems, July 15-19, San Diego, California. (Accepted)
- Hausbeck, M.K. and Harlan, B.R. 2011. How to choose what works for disease control. Pages 2-7 in: *Greenhouse IV Session Summaries, Great Lakes Fruit, Vegetable and Farm Market Expo*. Online.
- Kacira, M., G. Giacomelli, L. Patterson, R. Furfaro, P. Sadler, G. Boscheri, R. Wheeler, C. Lobascio, M. Lamantea, and S. Rossignoli. 2011. System dynamics and performance factors of UA-CEAC lunar greenhouse prototype bioregenerative

- life support system. *ActaHorticulturae*. (In Press)
- Kubota, C., P. Chia, Z. Yang, and Q. Li. 2012. Applications of far-red light emitting diodes in plant production under controlled environments. *Acta Horticulturae* (In Press).
- Kubota, C. 2012. Environmental control technologies to improve greenhouse product quality. *Acta Horticulture* (In Press).
- Kroggel, M., W. Lovichit, C. Kubota, and C. Thomson. 2012. Greenhouse baby leaf production in semi-arid climate: seasonal effects on yield and quality. *Acta Horticulturae* (In Press).
- Morrice, J.J., and Hausbeck, M.K. 2011. Controlling cucumber diseases under extreme production conditions. Pages 5-9 in: *Pickling Cucumber Session Summaries*, Great Lakes Fruit, Vegetable, and Farm Market Expo Online.
- Patterson, R. L., P.D. Sadler, R.M. Wheeler, M. Kacira, and G.A. Giacomelli. 2011. Description, operation and production of the South Pole food growth chamber. *ActaHorticulturae*. (In Press).
- Villarreal-Guerrero, F., M. Kacira, and E. Fitz-Rodriguez. 2011. Simulation of fixed and variable pressure fogging in naturally ventilated greenhouse, water and energy savings and stability of climate. *ActaHorticulturae*. (In Press).

### **Popular Articles**

- Both, A. J., R. Hansen, M. Kacira. 2012. Hydroponics Give Growers Control. *Greenhouse Grower*, May 25.  
<http://www.greenhousegrower.com/article/27924/hydroponics-give-growers-control?browserPass=1>. Accessed 05/29/2012.
- Burnett, S., G. Meyer, M. van Iersel, and R. Hansen. 2012. Controlling irrigation using automation and sensors. *Greenhouse Grower*.  
<http://www.greenhousegrower.com/article/28854/save-water-with-automation-and-sensors>
- Burnett, S., M. van Iersel, and J. Kim. 2012. Predicting plant water uptake. *Greenhouse Grower* 3:44,46.
- Gent, M.P.N. 2011. Composition of salad greens: A comparison of locally-grown and supermarket produce. *Connecticut Agric. Experiment Station Bulletin 1032*. 5 pp.  
<http://www.ct.gov/caes/lib/caes/documents/publications/bulletins/b1032.pdf>

- Elliott, G, R. McAvoy, M. Gent. 2012. Subirrigation: Watering From The Ground Up. Greenhouse Grower 26 April.  
<http://www.greenhousegrower.com/article/26828/subirrigation-watering-from-the-ground-up>
- Elliott, G. and Mattson, N.S. 2012. Hand watering, booms, sprinklers or drip? Greenhouse Grower Magazine. 30(4):24-27.
- Hausbeck, M. 2012. Downy mildew on cucumber confirmed in Michigan. MSU Extension News for Agriculture, Vegetables: Jul 11. Online.
- Hausbeck, M. 2012. Curcubit downy mildew confirmed in Ohio. MSU Extension News for Agriculture, Vegetables: Jun 14. Online.
- Hausbeck, M. 2012. More information on downy mildew on impatiens. MSU Extension News for Agriculture, Floriculture: May 4. Online.
- Hausbeck, M.K. 2011. Downy mildew causing problems on impatiens in the landscape. MSU Extension News for Agriculture, Floriculture: Oct 12. Online.
- Hausbeck, M.K. and Cortright, B.D. 2012. Evaluation of fungicides for control of downy mildew on pickling cucumber, 2011. Plant Dis. Management Rep. 6:V134.
- Hausbeck, M.K. and Cortright, B.D. 2012. Evaluation of fungicides and application methods for control of downy mildew of cucumber, 2012. Rep. No. 6:V136.
- Hausbeck, M.K. and Cortright, B.D. 2012. Evaluation of fungicides for control of downy mildew of cucumber, 2012. Plant Dis. Management Rep. 6:V137.
- Hausbeck, M., and Daughtrey, M. 2012. Impatiens downy mildew prevention and management. MSU Extension News for Agriculture, Floriculture: Mar 8. Online.
- Ling, Peter P. 2011. Growing Better Crops with Sensors. November 21. Greenhouse Management. <http://www.greenhousemanagementonline.com/gm1111-sensors-plant-health.aspx>
- McAvoy, R. 2011. 2012 Easter Lily Schedule. Greenhouse Management. <http://www.greenhousemanagementonline.com/gm1011-easter-lily-2012-crop.aspx>.
- Mattson, N. 2012. Slow release: making CRFs work in your greenhouse. Greenhouse Management. 32(1):58-64.

Mattson, N.S. 2011. Ammonium toxicity: avoid getting burned this winter. *GrowerTalks Magazine*. 75(6):36.

Mattson, N. and S. Burnett. 2011. Organic Substrates and Fertilizers. *OFA Bulletin*. 929:13-15.

Mattson, N. and B. Krug. 2011. Identify boron deficiency and corrective/preventative actions. *The Indiana Flower Grower*. 5(1):6.

Power, L. and P. Ling. 2011. Direct Sunlight Affects Temperature Measurement in Greenhouses. *ForiBytes (VI):2*. <http://www.oardc.ohio-state.edu/floriculture/images/ForiBytes0611-GHengineering-temperature.pdf>

van Iersel, M., S. Burnett, J. Lea-Cox, and P. Thomas. 2011. Improving irrigation with sensors. *GMPro* September:56-59.

### **Presentations**

Albright, L.D. 2012. Vertical Greenhouses. Presented at the 2012 annual meeting of the AERGC, Toronto, Canada.

Burnett, S. Top 10 Tips for Going Organic. Maine Agricultural Trades Show. January 12, 2011. Augusta, Maine.

Chiriboga, A., and D. A. Herms. 2012. Effects of nursery production practices on resource allocation patterns of hybrid elm and river birch after transplanting to the urban forest OARDC Annual Research Conference. Wooster, OH. April 26.

Currey, C., N. Mattson, W. Miller, and E. Runkle. 2011. OFA Short Course, Ohio Florists' Association, Columbus, OH, "Unconventional uses of Florel 2" July 10, 2011. 125 participants.

Currey, C., N. Mattson, W. Miller, and E. Runkle. 2011. OFA Short Course, Ohio Florists' Association, Columbus, OH, "Unconventional uses of Florel 1" July 10, 2011. 125 participants.

Hansen, R.C. 2011. How Ohio Benefits from Growing Lettuce in a Hydroponic Lettuce Research Laboratory. FABA Spring Quarter Graduate Seminar. April 8.

Hansen, R.C., P.P. Ling, M.H. Klingman and H.M. Keener. 2011. Potential process improvement challenges for hydroponic lettuce production. Paper No. 1111611. Presented at the ASABE Annual International Meeting, Louisville, Kentucky. August 7-11.

Kacira, M. 2012. Advanced Monitoring and Control of Greenhouse System for Optimized Resource Use Efficiency. Agronomy Week Conference, Faculty of



- Agronomy, University of San Luis Potosi, San Luis Potosi, Mexico, February 2012. (*Keynote Lecture*)
- Kacira, M. 201. Engineering CEA Systems for Sustainable Production. Arid-Land Agricultural Research Center (ALARC), Maricopa, AZ, June 2012.
- Kacira, M. 2011. Plant factory production systems in the United States. CIGR International Conference on "Sustainable Bioproduction - Water, Energy, and Food, Tokyo, Japan, September 2011. (*Session Keynote Lecture*)
- Kacira, M. 2011. Resource use efficient greenhouse production in semiarid climate. Chinese and Japanese Society Concurrent Meeting, CIGR International Conference on "Sustainable Bioproduction - Water, Energy, and Food, Tokyo, Japan, September 2011.
- Kacira, M., G. Giacomelli, L. Patterson, R. Furfaro, P. Sadler, G. Boscheri, R. Wheeler, C. Lobascio, M. Lamantea, S. Rossignoli. 2011. System Dynamics and Performance Factors of UA-CEAC Lunar Greenhouse Prototype Bioregenerative Life Support System. GreenSys2011 "Advanced technologies and management towards sustainable greenhouse ecosystems," Haldikidi, Greece, June 05-10.
- Kubota, C. 2011. Environmental control technology to improve product quality. GreenSys2011 "Advanced technologies and management towards sustainable greenhouse ecosystems," Haldikidi, Greece, June 05-10. (*Invited Lecture*)
- Lamb, E., Eshenaur, B., Mattson, N. and Sanderson, J. 2012. On the road again: Taking hands-on greenhouse IPM workshops to the growers. Abstract and poster at 7<sup>th</sup> International IPM Symposium. Memphis, TN, March 27-29, 2012.
- Lee, Wee Fong, Peter P. Ling, and Harold M. Keener. 2011. 3rd Place. Poster competition in Postdocs, research associates/technicians category. Cooling Capacity Assessment of Semi-closed Greenhouses. 2011 OARDC Annual Conference. April 28, 2011, Columbus, OH.
- Linker, R., M. Kacira, and A. Arbel. 2011. Robust climate control of a greenhouse equipped with forced ventilation. ASABE Annual and International Meeting, August 7-10.
- Little, H. and N.S. Mattson. 2011. Applications of silicon and a commercially available extract of the brown seaweed *ascophyllum nodosum* delayed wilting in greenhouse-grown *Petunia*, snapdragon, and tomato. Abstract and presentation at 108<sup>th</sup> Annual ASHS Conference. Waikoloa, HI, September 25-28. HortScience 46(9):S105-106.

- McAvoy, R. Handling wastewater from the greenhouse: Biofiltration ponds & bioswales for mitigating agricultural run off. University of Connecticut Winter Series, Feb. 8 Vernon, CT and Feb 15. Torrington, CT.
- Mattson, N.S. and T. Putzke. 2011. Substrate and fertilizer choice interact to affect growth of conventionally and organically produced *Calibrachoa* 'Cabaret Lavender'. Abstract and presentation at 108<sup>th</sup> Annual ASHS Conference. Waikoloa, HI, September 25-28. HortScience 46(9):S108-109.
- Mattson, N.S. 2012. Kentucky Landscape Industries Winter Conference, Louisville, KY, "Finishing spring annuals in a high tunnel with no heat" Jan. 26, 2012. 30 participants.
- Mattson, N.S. 2012. Kentucky Landscape Industries Winter Conference, Louisville, KY, "Top tips to save on greenhouse heating costs" Jan. 26, 2012. 30 participants.
- Mattson, N.S. 2012. Spring 2012 Master Gardener Training. Syracuse, NY, "Annual bedding plants", May 1, 2012. 40 participants.
- Mattson, N.S. 2012. Schaefer's Gardens Spring Open House, Triangle, NY, "Tips for high-yielding container vegetables and flowers" Apr. 28, 2012. 45 participants.
- Mattson, N.S. 2012. Cornell Floriculture Open House, Ithaca, NY, "Fertilizers and potting mixes research update", March 22, 2012. 30 participants.
- Mattson, N.S. 2012. Integrated Pest Management In-Depth workshop, CCE Saratoga County, Ballston Spa, NY, "Getting your hands dirty – testing container media for pH and salts", Mar. 13, 2012. 12 participants.
- Mattson, N.S. 2012. Integrated Pest Management In-Depth workshop, CCE Yates County, Penn Yan, NY, "Getting your hands dirty – testing container media for pH and salts", Mar. 8, 2012. 22 participants.
- Mattson, N.S. 2012. Fertility and nutrient management workshop, New York State Flower Industries, Alden, NY, "Fertility and nutrient management" Mar. 7, 2012. 20 participants.
- Mattson, N.S., 2012. Organic transplants media and fertility workshop, CCE Tompkins County, Ithaca, NY "Organic transplants media and fertility workshop" Feb. 23, 2012. 12 participants.
- Mattson, N.S. 2012. Integrated Pest Management In-Depth workshop, CCE Ontario County, Canandaigua, NY, "Getting your hands dirty – testing container media for pH and salts", Feb. 14, 2012. 15 participants.

- Mattson, N.S. 2012. Hudson valley nursery, greenhouse and vegetable production workshop, New Paltz, NY. “H<sub>2</sub>O in CEA: Managing water and fertilizer in soil-less vegetable production”, February, 9, 2012. 50 participants.
- Mattson, N.S. 2012. Hudson valley nursery, greenhouse and vegetable production workshop, New Paltz, NY. “Plant fertility discussion with focus on nutrient deficiencies and toxicities”, February, 9, 2012. 60 participants.
- Mattson, N.S. 2012. Cornell Greenhouse Update, Ithaca, NY. “Nutrient and water management to build a healthier plant and reduce pesticide use” Feb. 8, 2012. 60 participants.
- Mattson, N.S. 2012. Empire State Fruit and Vegetable Expo, Syracuse NY. “Update on peat moss availability and alternatives in transplant production” Jan. 25, 2012. 50 participants.
- Mattson, N.S. 2012. Long Island Greenhouse and Floriculture Conference, Riverhead, NY. “Replete with peat or need peat? Practical alternatives to peat-based substrates” January 17, 2012. 95 participants.
- Mattson, N.S., 2012. Western New York Bedding Plants School, Eden, NY. “Practical alternatives to peat in your potting mix”, Jan. 10, 2012. 90 participants.
- Mattson, N.S., 2012. Western New York Bedding Plants School, Eden, NY. “Building a better root-zone in container plant production”, Jan. 10, 2012. 90 participants.
- Mattson, N.S., 2011, Organic substrates and fertilizers, hands-on workshop, CCE Ulster County, Highland, NY, “Organic substrates and fertilizers, hands-on workshop”, December 8, 2011. 20 participants.
- Mattson, N.S. 2011. CCE Agriculture and Food Systems In-Service, Greenhouse Program Work Team, Ithaca, NY, “Greenhouse Tour at the Ken Post Lab”, November 16, 2011. 6 participants.
- Mattson, N.S. 2011. CCE Agriculture and Food Systems In-Service, Greenhouse Program Work Team, Ithaca, NY, “Diagnosing nutrient disorders”, November 16, 2011. 12 participants.
- Mattson, N.S. 2011. Education Day for Greenhouse Operators, CCE Broome County, Windsor, NY, “Building a better root-zone in container plant production”, October 25, 2011. 35 participants.
- Mattson, N.S. 2011. Fall 2011 Master Gardener Training. Owego NY, “Indoor plants and home greenhouses”, October 18, 2011. 65 participants.

- Mattson, N.S. 2011. Customer Appreciation Day, W.H. Milikowski, Inc., East Syracuse, NY, "Growing Spring Crops Successfully with NO HEAT", October 12, 2011. 60 participants.
- Mattson, N.S. 2011. Integrated Pest Management In-Depth workshop, CCE Suffolk County, Riverhead, NY, "Diagnosing nutrient disorders", September 14, 2011. 30 participants.
- Mattson, N.S. 2011. Integrated Pest Management In-Depth workshop, NYS Ornamentals IPM and Cornell University, Ithaca, NY, "Diagnosing nutrient disorders", July 18, 2011. 30 participants.
- Patterson, R. L., P.D. Sadler, R.M. Wheeler, M. Kacira, and G.A. Giacomelli. 2011. Description, Operation and Production of the South Pole Food Growth Chamber. GreenSys2011 "Advanced technologies and management towards sustainable greenhouse ecosystems," Haldikidi, Greece, June 05-10.
- Reid, J.E., K. Klotzbach, N. Hoover, and N.S. Mattson. 2011. Hanging baskets of petunias increase revenue in high tunnel tomato production. Abstract and presentation at ISHS Symposium on High Tunnel Horticultural Crop Production. State College, PA, October 16-19, 2011.
- Rodriguez, E. F., M. Kacira, F. Villarreal-Guerrero. 2011. Neural Network Predictive Control in a Naturally Ventilated and Fog Cooled Greenhouse. GreenSys2011 "Advanced technologies and management towards sustainable greenhouse ecosystems," Haldikidi, Greece, June 05-10.
- Sadler, P., G. Giacomelli, L. Patterson, M. Kacira, R. Furfaro, C. Lobascio, G. Boscheri, M. Lamantea, L. Grizzaffi, S. Rossignoli, M. Prirolli, and S. DePascale. 2011. Bio-regenerative Life Support Systems for Space Surface Applications. The 41<sup>st</sup> International Conference on Environmental Systems (ICES), Portland, Oregon, July 17-21.
- Villarino, G.H., M. Hanson, M. Scanlon, D. Nero and N.S. Mattson. 2011. Cloning, sequencing, characterizing and assessing functionality of the *Petunia* trehalose-6-phosphate synthase (TPS1) gene through complementation in yeast. Abstract and presentation at 108<sup>th</sup> Annual ASHS Conference. Waikoloa, HI, September 25-28. HortScience 46(9):S103-104.
- Villarino, G.H. and N.S. Mattson. 2011. Assessing tolerance to sodium chloride salinity in fourteen floriculture species. Abstract and presentation at 108<sup>th</sup> Annual ASHS Conference. Waikoloa, HI, September 25-28. HortScience 46(9):S209.
- Villarreal-Guerrero, F., M. Kacira, E. F. Rodriguez, C. Kubota, G.A. Giacomelli, R. Linker, A. Arbel. 2011. Simulation of Fixed and Variable Pressure Fogging in a Naturally Ventilated Greenhouse, Water and Energy Savings and Stability of

Climate. GreenSys2011 "Advanced technologies and management towards sustainable greenhouse ecosystems," Haldikidi, Greece, June 05-10.

Zhen, S. and S. Burnett. Water use of perennial plants. 2012 American Society for Horticulture Science Meeting. 2, August, 2012, Miami, FL.

### **Other Creative Works**

Nothing to report

### **Video**

Nothing to report

### **Websites**

Story, D., G. Giacomelli, M. Kacira. Prototype Lunar Greenhouse Project.  
<http://www.ag.arizona.edu/lunargreenhouse/>

### **Abstracts**

Nothing to report

### **Software**

Nothing to report

### **Workshop Sponsor**

Greenhouse Crop Production and Engineering Design Short Course. Controlled Environment Agriculture for Food Production with Special Concerns for Water, Energy Use and Environmental Stewardship, April 9-13, 2012. [G. Giacomelli, P. Rorabaugh, C. Kubota, M. Jensen, M. Kacira, K. Fitzsimmons]

NE-1035 2012 Meeting [Richard McAvoy]

### **Workshop Participant**

Giacomelli, G. 2012. Energy Systems and Conservations. Greenhouse Crop Production and Engineering Design Short Course, University of Arizona, Tucson, AZ, April 2012.

Giacomelli, G. 2012. My First Greenhouse. Greenhouse Crop Production and Engineering Design Short Course, University of Arizona, Tucson, AZ, April 2012.

Kubota, C. 2012. Plant Factory, Challenges and Opportunities. Greenhouse Crop Production and Engineering Design Short Course, University of Arizona, Tucson, AZ, April 2012.

Kubota, C. 2012. Plant Lighting Basics and Applications. Greenhouse Crop Production and Engineering Design Short Course, University of Arizona, Tucson, AZ, April 2012.

Kubota, C. 2012. Application of LED lighting. Greenhouse Crop Production and Engineering Design Short Course, University of Arizona, Tucson, AZ, April 2012.

Kacira, M. 2012. Greenhouse structures and design. Greenhouse Crop Production and Engineering Design Short Course, University of Arizona, Tucson, AZ, April 2012.

Kacira, M. 2012. Greenhouse environmental control. Greenhouse Crop Production and Engineering Design Short Course, University of Arizona, Tucson, AZ, April 2012.

Kacira, M. 2012. Sensors and Control Basics. Greenhouse Crop Production and Engineering Design Short Course, University of Arizona, Tucson, AZ, April 2012.

Kacira, M., P. Juang, J. Hoogeboom. 2012. Solar PV System Integrated Off-Grid Greenhouse. Greenhouse Crop Production and Engineering Design Short Course, University of Arizona, Tucson, AZ, April 2012.

### **Refereed Journal Articles (Pending)**

Linker, R., A. Arbel, M. Kacira, O. Gutman. 2012. Robustness and Transferability of Fogging and Ventilation Controllers for Mechanically Ventilated Greenhouses. Computers and Electronics in Agriculture.

Sase, S., M. Kacira, T. Boulard, L. Okushima. 2012. Determination of porosity parameters for tomato canopy: An experimental study in a wind tunnel. Transactions of the ASABE.

Villarreal-Guerrero, F., M. Kacira, E. Fitz-Rodríguez, R. Linker, G. A. Giacomelli, A. Arbel, C. Kubota. 2012. Implementation of a Greenhouse Cooling Strategy with Natural Ventilation and Variable Fogging Rates. Transactions of the ASABE.