Content and Format for NCERA-101 Station Reports
(revised 2023)

All NCERA-101 members are requested to prepare a 1-3 page station report that summarizes the past year's activities (regardless of whether you will participate in the annual meeting or not). Reports will be posted on the NCERA-101 website and provide information to the entire membership about your activities. Our secretary will also consolidate the group's accomplishments and impacts and submit a single report that is posted on the USDA's National Information and Management and Support System (NIMSS). The Executive Committee thanks you in advance for following the guidelines below. These guidelines are also available on our website http://www.controlledenvironments.org/

Please Note: the reporting guidelines have changed significantly by NCRA. Station reports should be **multistate** in focus, showcasing mainly collaborative efforts, with good linkages across states and entities external to agricultural experiment stations (i.e. industry, non-profits, federal agencies, etc.). A few, significant single-state accomplishments can be included but please be sure to highlight any accomplishments that were multistate in nature.

Please submit your report by the annual meeting date to both the secretary and webmaster in the requested formats:
[1] To the current Secretary as a **MS Word document.**
[2] Carole Saravitz, Webmaster, carole@ncsu.edu in **Adobe PDF format.**

Content for NCERA-101 Station Reports

1. New Facilities and Equipment. Include sensors, instruments, and control systems purchased/installed.

2. Unique Plant Responses. Include noteworthy findings in controlled environment research.

3. Accomplishments: These should be short (1-3 sentence) bullet points that summarize research or outreach accomplishments that relate to the NCERA-101 objectives (see below). Please indicate significant evidence of linkages both internal to the project/committee and to external peer groups, stakeholders, clientele, and other **multistate** activities. Please use language that the general public can readily comprehend. These, should be organized by category:

3.A. Short-term Outcomes: Quantitative, measurable benefits of the research outputs as experienced by those who receive them. Examples include the adoption of a technology, the creation of jobs, reduced cost to the consumer, less pesticide exposure to farmers, or access to more nutritious food.

3.B. Outputs: Defined products (tangible or intangible) that are delivered by a research project. Examples of outputs are reports, data, information, observations, publications, and patents.

3.C. Activities: Organized and specific functions or duties carried out by individuals or teams using scientific methods to reveal new knowledge and develop new understanding.

3.D. Milestones: Key intermediate targets necessary for achieving and/or delivering the outputs of a project, within an agreed timeframe (this relates to upcoming/planned activities).

4. **Impact Statements**. Please draft 2-3 short (500 character max, each statement) actual or intended potential long-term outcomes and impacts related related to the NCERA-101 objectives (listed below). Statements should be quantitative when possible and be oriented towards the general public. Also, list any grants, contracts, and/or other resources obtained by one or more project members as a result of the project's activities. Include the recipients, funding source, amount awarded and term if applicable. This is perhaps the most difficult yet most important part of the report. Two examples are listed below.

5. **Published Written Works**. Include scientific publications, trade magazine articles, books, posters, websites developed, and any other relevant printed works produced in the last year. Please use the formatting in the examples below.

NCERA-101 Objectives:

The overall goal of the NCERA-101 committee is to develop or improve the theory and practice of controlled environment technology with particular reference to problems important to the North Central Region, and relevant to other regions as well. As a non-funded committee, the objectives of NCERA-101 are based on education, research, communication, and coordination. The committee will foster a range of cooperative efforts especially in the following specific areas:

(1) Technology Advancement and Transfer: Advance the technology of controlled environment agriculture (e.g., growth chambers, indoor vertical farms, greenhouses) for agricultural research and production. Disseminate novel technologies to users including controlled environment manufacturers, managers, and commercial users; teach historical and recent controlled environment technologies to students.

(2) Standards and Guidelines: Develop quality assurance procedures for environmental control and monitoring in research and production facilities to improve reproducibility of biological results. Continue to develop and update guidelines for measuring and reporting environmental parameters for studies in controlled environments.

(3) 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. The NCERA-101 committee has a website (www.controlledenvironments.org) to facilitate outreach activities.

(4) Instrument Calibration: Maintain a calibrated set of environmental measurement instruments that are available for use by researchers and commercial members.

(5) Environmental: To promote the sustainable development and energy efficient operation of controlled environment facilities.

(6) Education and Training: Support participation of undergraduate and graduate students in the Committee through student sponsorship, research presentations, and networking among all committee members to benefit career development of future researchers, academia, and commercial scientists and help develop US human resource capacity for research and industry.

Examples of Accomplishments

Short-term Outcomes:

- Rutgers University quantified the impact of a manually operated energy curtain on the recorded inside soil and air temperatures and daily light integrals during early season high tunnel production of tomato. Data collected from late March through mid-May for two New Jersey locations and two growing seasons revealed that the use of an energy curtain inside a high tunnel increased the inside nighttime air temperature on average by 1.4 °C (or 13%) compared to a tunnel without a curtain but also decreased the accumulated inside light by approximately 5%.

Outputs:

- Qingwu Meng (DE) published two articles with Erik Runkle (MSU) in the Produce Grower magazine. These articles summarized their latest research on LED lighting in indoor hydroponic lettuce production for professionals in the controlled-environment agriculture industry.

Activities:

- M.S. student Sean Tarr and Roberto Lopez (MSU) investigated how air temperature and CO_2 concentration (500, 800, and 1200 $\mu mol \cdot mol^{-1}$) influenced growth of 'Rouxaï' and 'Rex' at a light intensity of 300 $\mu mol \cdot m^{-2} \cdot s^{-1}$. Fresh mass was greatest for both cultivars at day/night temperatures of 82/70 °F and CO_2 concentrations of 800 $\mu mol \cdot mol^{-1}$ for 'Rouxaï' and both 800 and 1200 $\mu mol \cdot mol^{-1}$ for 'Rex'.

Milestones:

- Cornell University is planning 8 commercial greenhouse pilot projects to test advanced greenhouse lighting control systems in 2023 as part of a NY Specialty Crop Block Grant. Energy savings vs. baseline controls will be quantified.

Examples of Impact Statements [ideally would highlight multi-state or industry collaboration]

- Lighting and temperature studies at Michigan State University have quantified the effects of growing bedding plants under different greenhouse conditions. As a result, flowering time and plant quality can be more accurately predicted by commercial greenhouse growers to meet their scheduled market dates. This information can be incorporated with energy consumption models to predict the amount of energy consumed when crops are grown at different temperatures. Growers who optimize temperature and light can potentially reduce their energy consumption by up to 30%.
- The availability of water for agricultural use is under pressure, and more efficient use of the available water is increasingly important. Research at the University of Georgia has shown that efficiency can be increased by applying water based on the actual needs of the crops. This can be done using automated irrigation controllers that maintain substrate water content at a grower-determined level. Research indicates that a substrate water content of 15% (v/v) is adequate for most crops. Using automated controllers to maintain this substrate water level may reduce water use by 40% to 70%.

Format for Published Works (arrange alphabetically)

Books

Hartmann, H.T., D.E. Kester, F.T. Davies, Jr. and R.L. Geneve. 2002. Hartmann and Kester's Plant Propagation: Principles and Practices. Seventh Edition. Prentice-Hall, Inc., Englewood Cliffs, NJ.

Book Chapters

Gent, M.P.N. and R.J. McAvoy. 2000. Plant growth retardants in ornamental horticulture. In: Plant Growth Regulators in Agriculture and Horticulture: Their Role and Commercial Uses. A.S. Basra, (ed.) Good Products Press, NY. pp. 89-146.

Refereed Journal Articles

Shimizu, H., E.S. Runkle, and R.D. Heins. 2004. A steady-state model for prediction of poinsettia plant shoot-tip temperature. J. Amer. Soc. Hort. Sci. 129:303-312.

Symposium Proceedings

Fleisher, D.H., H. Baruh and K.C. Ting. 2001. Model-based predictive control for biomass production in advanced life support. Proceedings of the 2nd IFAC-CIGR Workshop on Intelligent Control for Agricultural Applications, Bali, Indonesia. August 22-24. pp. 198-203.

Poster Presentations

Padhye, S., E.S. Runkle, and A.C. Cameron. 2005. Quantifying the vernalization response of *Dianthus gratianopolitanus* 'Bath's Pink'. HortScience 40:1013 (poster presentation).

Popular Articles

Albright, L.D., R.S. Gates, K.G. Arvanitis and A. E. Drysdale. 2001. Control strategies for plant shoot and root environments on Earth and in space. IEEE Control Systems Magazine: Agriculture and the Environment 21(5):28-47.

Fausey, B., E. Runkle, A.C. Cameron, R.D. Heins, W.H. Carlson. 2001. Herbaceous perennials: *Heuchera*. Greenhouse Grower 19(6):50-62.