NC STATE UNIVERSITY N.C. Plant Sciences Initiative

Controlled Environment Agriculture Consortium

2026 Proposal Guidelines & Instructions

Deadline for Application

Please submit the proposals through RED Proposal Development **by the end of the day, June 5, 2026.**

Program Requirements

Purpose

Composed of research scientists, engineers and in close partnership with industry, the Controlled Environment Agriculture Coalition and associated Consortium (CEAC) aims to develop CEA as an economically and environmentally sustainable option for agricultural practices by performing evidence-based, transformative research.

The proposed research projects must demonstrate the potential to bridge basic (fundamental) and applied (translational) research to accelerate the pace of discovery and application of new technologies, with a focus on CEA. Collaborative and interdisciplinary research proposals are strongly encouraged.

Who May Apply

All faculty members of NC State University are eligible to apply.

- The principal investigator (PI) and all Co-PIs must hold a full-time non-tenure-track, tenure-track or tenured faculty appointment, or an equivalent appointment as a full-time research faculty with a dedicated independent lab. Visiting scientists, post-docs and other non-permanent positions are not eligible as PIs or Co-PIs.
- Junior faculty are strongly encouraged to apply.

Research Topics

- Review the Research Topics from Industry Members provided along with this Request For Proposals (RFP). **You may request industry pre-review of your proposal by May 15, 2026.**
- Proposals should respond to Research Topics distributed with this RFP. *A PI or Co-PI may be included on only ONE proposal submission per Research Topic.*
- Additionally, PIs may submit one Proposal in a research area not covered by the Research Topics if it falls under the purview of the CEAC.

Funding Requirements

See "Budget Guidelines" on page 2 for additional budget information.

- A maximum of $25,000/year (including 10% indirect costs, calculated using a modified total direct costs rate) for up to 1 year can be requested.
- Requested funds may include salaries/fringe benefits for researchers and support personnel. Summer supplements (salaries/fringe benefits) for 9-month appointees can be requested.
- Requested funds may be used for travel, supplies, current services, and other direct costs related to the project.

Review Process

The Proposal review process is as follows:

- Proposals will be distributed electronically to Industrial Advisory Board (IAB) representatives from Member companies for review. IAB representatives will rank proposals for commercial potential, conformance with Research Topics and mission of the CEAC. Thus, it is important that the project is presented in a clear and structured manner in the project description, which is a central document in the review application.
- The top proposals will be subjected to a second round of discussion and final ranking for funding at the IAB meeting scheduled for **June 2026**. Up to five principal investigators may be invited to make a 5-minute presentation of the proposed research project during the IAB meeting. Funding decisions will be made at the IAB meeting. The decisions of the IAB are final. Applicants should be expected to be notified by email whether they were selected for funding by **July 2, 2026**. New projects are expected to start on or around **August 1, 2026**.

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Post-award Reporting

PIs are expected to provide a progress report or final report at the annual IAB meetings, as appropriate. Quarterly interim reports to Consortium Members are strongly encouraged.

Confidentiality

The IAB will endeavor to maintain the confidentiality of all applicants' information. However, the applicant is responsible for not disclosing any information that should not be discussed outside of the IAB meeting. Similarly, Research Topics are not to be disclosed outside the university, including to other industry members.

Application Instructions

General Proposal Formatting Guidelines

- Use standard font (such as Calibri, Cambria, or Times New Roman) no smaller than 12 point.
- Page set-up should be for single-spacing on 8½"x11" paper.
- Number each page.
- Margins should be 1".
- Each section should be titled using the headers listed below.
- Do ***not*** use logos or letterhead on ***any*** pages of the Proposal.
- **Do not include the name of the company that submitted the research topic to which you are responding.**

Proposal Requirements

The Proposal must include the following sections. The project description cannot exceed three (3) pages (as indicated below). This limit does NOT include the Title Page or Letter(s) of Support.

- **Title:** Include Project Title, PI (Co-PI)
- **Proposed Budget:** Total CEAC Request, including indirect costs.
- **Abstract:** Up to 300 words
- **Project Description:**
  - Introduction
  - Hypotheses, Goals, and Objectives
  - Methodology (including experimental design, data collection and analysis)
  - Anticipated Outcomes
  - Barriers (if any) to adoption of your research outcome(s)
- **Budget Justification:**
  - Maximum 1 page
  - Detailed outline of budget
- **PI and Key Personnel Bio sketch**
  - Maximum 1 page for each

Further information

For further information or queries, please contact:

- Dr. Kathleen Denya, Director of Innovation Partnerships, via email kmpitche@ncsu.edu

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Controlled Environment Agriculture Consortium

Research Topics from Industry Members

Cargill

1. Research on growth strategies to improve the production of secondary metabolites in CEA.
2. Research to support replicating field conditions to grow corn in an indoor environment. Doesn't need to be exclusive to corn. To build on this idea, the development of 'field twins' using CEA. What phenotype measurements in a CEA environment are translatable to field environments.
3. An accessible tool for vetting projects and performing a pre-analysis during design of operating costs in the United States.

LLK Greenhouse Solutions

1. Does the switch from HPS to LEDs have a harmful impact on beneficial insects typically used in cultivation? Are certain LED spectra more detrimental to BCA programs than others?
2. If using dynamic spectrum LEDs, can we use light recipe changes during crop production to trigger or enhance physiological events similar to fertigation? (i.e. starting high blue, switching to high red ratio)
3. Meta analysis of the state of AI in greenhouse controls and the Autonomous Greenhouse Challenge: what should the industry be prepared for in the coming 2-3 years? Review and testing of new tools that look promising.
4. Research on strategies to accelerate seed breeding (soy and corn). This could be a combination of light, fertigation and environmental conditions).
5. Research to determine the impact of internodal/ intra-canopy lighting on plant growth and development. Can top lighting be decreased if intra-lighting is used? Can energy consumption be decreased as intra-lighting is closer to the plants and therefore would consume less energy as the PPFD would be lower?

Seminis (Bayer)

1. Growth chamber-to-field inference model for vegetable seed germination and early vigor: calibrating growth chamber metrics to predict field emergence.
2. Using controlled-environment propagation windows to improve strawberry plug uniformity and downstream establishment.

Conviron

1. Research to determine if we can increase the shelf life and reduce waste of produce at a grocery store by spraying the produce with certain materials, such as hydrogen peroxide.
2. Research to determine the impact of internodal/ intra-canopy lighting on plant growth and development. Can top lighting be decreased if intra-lighting is used? Can energy consumption be decreased as intra-lighting is closer to the plants and therefore would consume less energy as the PPFD would be lower?
3. Building a prototype and proof of concept for the patent US11895953B2 our company holds. The patent is for apparatus and methods around a dual-wavelength IR measurement for non-contact plant health monitoring, alarming and closed loop automated control of the plant environment including events such as irrigation systems, temperature, humidity, light, CO2 etc. This would not be a production ready product, but instead a functional prototype.

Rimol Greenhouse Systems

1. Greenhouse Poly covering comparison- Light (spectral, PPFD, etc) + Plant Health
    a. Clear vs Diffused
    b. Clear vs ETFE
    c. Clear vs Luminescent
2. Greenhouse Heating comparison- Microclimate/thermal stratification + Plant Health + Energy costs
    a. Forced-air unit heaters
    b. High-efficiency condensing unit heaters
    c. Hydronic root zone heating
    d. Hydronic radiant heating
    e. Heat pump-based hydronic system
3. Hydroponic vs Soil Grown- Nutritional & Quality analysis
    a. Plant/Fruit/Vegetable tissue analysis- macro/micro nutrients, nutrient density, protein
    b. Vegetable/Fruit quality- BRIX, texture, shelf life, flavor compounds
    c. Health variables- phytonutrients, antioxidants, polyphenols, flavonoids, VOCs
4. Plant Patch for VPD- using 'Plant Patch' tech to track real-time leaf VPD- program greenhouse equipment (ventilation, cooling, heating, etc) to function off of leaf VPD instead of climate
    a. Comparison of Plant/Crop health/yield in greenhouse with VPD control vs Climate Control

5. Digital Twin for High Tunnels- continuation of Greenhouse Digital Twin presentations from last year- Energy cost modeling + Air flow dynamics- expanded for High Tunnels
    a. Illustrate crop cycles/costs/yields for different crops in High Tunnel production
6. Plant Communication- Collective Stress Signaling- plant-to-plant responses instead of plant-to-environment
    a. Do healthy plants exhibit measurable stress responses after exposure to stressed plants?
    b. Crop-to-crop signaling between different species / Inter-species plant communication/stress signaling
    c. Electrical signals through crop canopies?
    d. Metrics: VOCs, stress-induced metabolites, stress hormones, calcium signaling, stomatal conductance
    e. Working toward biologically responsive greenhouses

Great Lakes Growers (Non-voting Affiliate Member of CEAC)

- Research showing the effect of different light recipes (% of Blue, Red, Far Red, Light, and Green) under supplemental light (presence of the sun) and 100% artificial light (like in a vertical farm, without the sun)
- Research showing the effect of morning DIP on the shape and development of vegetable crops