



# Controlled Environment Agriculture: A Growing Industry

## Key Facts

Controlled environment agriculture (CEA) uses technology to manipulate a crop's environment to the desired conditions.

Jobs in CEA tend to be higher-paying, higher-skilled, and more varied than traditional agriculture and food production.

### Types of CEA include:

- Indoor growing/Indoor farming
  - Aeroponics
  - Aquaponics
  - Greenhouse
  - Hydroponics
- Protein production
- Vertical farming

On a national scale, the industry is projected to grow **10.32%** annually, reaching **\$239.8 billion by 2027.**

Across the United States, CEA industries are most concentrated in California, Texas, Florida, and Washington. (Source: EMSI/Lightcast)

## Assets

- Virginia is home to over 86 colleges and universities that provide high-skilled labor to operate and monitor the advanced technologies used in controlled environment agriculture. According to the [State Council of Higher Education for Virginia](#), 25,503 students in the state received STEM degrees in 2022-23.
- The state has multiple research centers that help support new technologies, such as the Institute for Advanced Learning and Research (IALR) in Danville, VA. The Controlled Environment Agriculture Innovation Center is a joint project between Virginia Tech and IALR. By developing strategic partnerships with both industry and academia, the Innovation Center conducts research and educational programming to develop, promote and advance the controlled environment agriculture sector in the U.S. and internationally.

## Needs

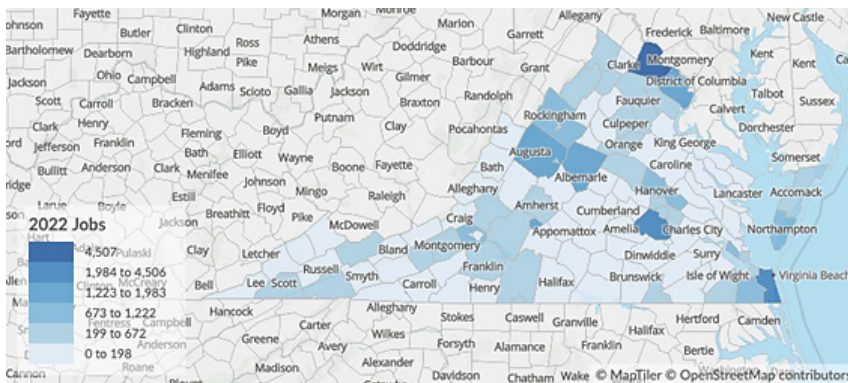
- There is a need to improve **public understanding of the CEA industry** to clarify misconceptions and encourage CEA growth. Some people perceive CEA-sector jobs as lower skill and lower wage. Raising awareness of CEA career opportunities, especially among middle and high school students, can help shift these perceptions.
- There are gaps in **entrepreneurial support**, including lack of connectivity among resource providers and limited awareness of entrepreneurship resources among providers and potential resource users.
- There are limited **prepared sites** for CEA. Significant investment is needed to boost site Tier ratings. There are few, if any, existing shell-buildings for CEA, and the lack of utility connections means potentially higher construction costs and challenges that limit a prospect's time to market. The costs of CEA production remain high overall. A 2020 study from Cornell University estimated that lettuce from indoor farms in Chicago or New York was more than twice as expensive to produce as lettuce grown and delivered from the West Coast.
- There are **workforce and talent attraction** limitations. Existing jobs in areas such as animal production, aquaculture, and crop farming tend to be lower paying compared to other sectors, though some of these are entry-level CEA-related positions. The number of existing employees with CEA-relevant skillsets is smaller compared to similarly sized regions, which could impact companies looking to hire immediately. Beyond AeroFarms, Blue Ridge Aquaculture, and Plenty, the number of existing CEA-specific employers (and jobs) is also limited.

# CEA Industry in Virginia

Virginia has seen an increase in CEA companies locating in the state, with major projects like Plenty in Chesterfield County expected to bring 300 new jobs and \$300 million in investment to the area and AeroFarms, a vertical farming operation that announced a corporate restructuring in 2023 and is ramping up operations at its Danville facility, with nearly 150 total jobs and investments approaching \$42 million. Virginia also has a presence of existing CEA companies and indoor agriculture operations, including Blue Ridge Aquaculture, a Martinsville-based company that is the largest indoor system producer of tilapia in the world. The state has a history of robust smaller-scale and start-up activity in the CEA space, with companies like Babylon MicroFarms in Richmond, founded in 2017, and Area 2 Farms in Arlington.

## Selected CEA Companies in Virginia

- [AeroFarms, Danville](#)
- [Area 2 Farms, Arlington](#)
- [Babylon Micro-Farms, Richmond](#)
- [Beanstalk, Herndon](#)
- [Blue Ridge Aquaculture, Martinsville](#)
- [Bright Farms, Culpeper County](#)
- [Four Oaks Farms, Wirtz](#)
- [Fox Urban Farms, Winchester](#)
- [FreshH2O Growers, Stevensburg](#)
- [Fresh Impact Farms, Arlington](#)
- [Greenswell Growers, Goochland County](#)
- [Magic Sun Farms, Richmond](#)
- [Plenty, Chesterfield County](#)
- [Red Sun Farms, Dublin](#)
- [Schuyler Greens, Schuyler](#)
- [Soli Organic, Harrisonburg](#)
- [Sunny Farms, Virginia Beach](#)
- [TrueFarms, Prince William County](#)
- [WeGrow Company, Alexandria](#)



CEA Employment Throughout Virginia

The unique nature and diverse range of CEA and CEA-related industries require a wide variety of job occupations and skills. Job opportunities in the CEA space can include HVAC services to keep indoor conditions stable and favorable for crop production as well as highly specialized computer science and electrical engineering jobs that are responsible for the automation, control, and tracking of CEA-related processes in indoor growing operations or CEA-related manufacturing.

Description	2017-2022 % Change	2022-2027 % Change	Avg. Hourly Earnings	Avg. Annual Earnings
Computer and Information Systems Managers	7%	10%	\$82.83	\$172,286.40
General and Operations Managers	56%	6%	\$61.11	\$127,108.80
Food Scientists and Technologists	21%	5%	\$41.32	\$85,945.60
Soil and Plant Scientists	106%	6%	\$31.97	\$66,497.60
Food Science Technicians	52%	9%	\$25.06	\$52,124.80
Farmers, Ranchers, and Other Agricultural Managers	-2%	2%	\$23.02	\$47,881.60
Maintenance and Repair Workers	5%	5%	\$21.50	\$44,720.00
Shipping, Receiving, and Inventory Clerks	20%	1%	\$17.58	\$36,566.40
Farmworkers, Farm, Ranch, and Aquacultural Animals	-6%	4%	\$14.74	\$30,659.20
Farmworkers and Laborers, Crop, Nursery, and Greenhouse	-7%	6%	\$14.37	\$29,889.60
Total	14%	6%	\$35.41	

## How to Grow CEA in Virginia

### 1. Develop and implement a comprehensive Virginia CEA Hub initiative, in conjunction with, or led by, IALR and the CEA Innovation Center

The primary recommendation focuses on a Virginia-wide CEA Hub initiative, concentrated in [GO Virginia Region 3](#), but advancing CEA activity state-wide. Such a project would represent a multifaceted approach with strong multiregional collaboration to catalyze further growth of the CEA sector across Region 3, and the Commonwealth of Virginia.

### 2. Conduct CEA Awareness and Informational Campaign

One aim of this recommendation is to better educate and inform policy-makers, partners, local officials, economic developers, workforce and education partners, as well as the general public, about CEA in Virginia and beyond. A primary focus is to highlight the CEA industry and its nature; to share the breadth of CEA operations and firms; and to raise awareness as to the range of CEA occupations and career pathways.

### 3. New venture development: tech entrepreneurs and existing producers

This recommendation encompasses support for start-ups, entrepreneurs, existing producers, and others interested in entering the CEA space. This includes a wide range of entrepreneur types, from the high growth ventures associated with commercialization and spin-off of CEA-related technologies to the (relatively) smaller-scale utilization of low-cost CEA greenhouse or indoor growing technologies by farmers or start-ups in Region 3, and beyond.

### 4. Provide specialized and accessible technical assistance for CEA firms, and conduct CEA industry engagement

This recommendation relates to the provision of specialized and accessible technical assistance for CEA firms, as well as for local government, policymakers, and economic developers in working with CEA firms, entrepreneurs, and prospects.

### 5. Accelerate Region 3 site development and readiness for CEA industry

The CEA Hub Initiative can be an advocate and source of information for site readiness, participating in meetings with economic developers and local officials to offer CEA industry knowledge and to champion the site needs of industry firms.

### 6. Closing the talent gap and meeting future workforce needs for CEA sector

Closing any existing talent gaps and meeting future workforce needs for the CEA sector (including allied support companies) is critical. This encompasses career awareness, workforce preparation, job connections, internships, and networking.

[Read CECE's full report on CEA in Virginia.](#)

## CEA Spotlight: Greenswell Growers in Goochland County, VA

Greenswell Growers is an innovative large-scale indoor growing facility providing delicious, safe, and healthy greens that give back to the community. Thanks to its recirculation systems, their indoor growing facility uses 95% less water than traditional growing methods and essentially eliminates water runoff into the environment.

Their automated harvesting system also eliminates the risk of food contamination. Using state-of-the-art indoor growing technology, the greens are grown and packaged completely hands free.

Greenswell Growers donates 5% of purchases to their community. They have partnered with Virginia's largest nonprofit food distributor, Feed More, and local food distributor, GoochlandCares, to provide in-kind donations of their greens.

Greenswell Growers sells a variety of blends, including the Essential Green Leaf, the Vibrant Greens Blend (green and red leaf lettuce and arugula), and the Refreshing Romaine Blend.

