Controlled Environment Agriculture

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Controlled Environment Agriculture (CEA)

- integrates both science- and engineering-based approaches
- involves growing vegetable crops under managed environments
- improves productivity and optimizes resource use
CEA plays an important role in the ‘local food movement’

- Freshness
- Safety
- Improves local economy
- Availability of unique varieties
- Knowing where your food is coming from!
Commonly grown vegetables in controlled environment agriculture

- Lettuce
- Basil
- Spinach
- Microgreens
- Tomatoes
- Peppers
- Melons
- Sweet corn
Common platforms in controlled environment agriculture

Vertical-warehouse style

Horizontal-greenhouse style
Hydroponics
Hydroponics

- Roots receive oxygen, water and nutrients
- Water and nutrients recirculated
Hydroponics video

https://www.youtube.com/watch?v=6kUm_L7bLYw
Aeroponics

- Good supply of oxygen
- Disease free systems
  Requires sophisticated mist systems
Aeroponics
Flood and drain system

- Soilless media is used in containers
- Water is not supplied continuously
Flood and drain system
Plants are grown under high intensity artificial lights for year-round production
Water and fertilizer supply to plants is controlled using sensors.
CEA is an intensive farming system where input costs are high.
Monitoring input use using sensors in CEA

Sub-irrigation bench

Low EC
Moderate EC
High EC

Image processing
Automation & Control

Lamp
Heat
Lamp

Boom
Infra-red sensor
Spectral reflectance sensor
Camera
Smartphone Apps to monitor crop input use
Cameras monitor how crops are growing
Thermal imaging for crop temperature
Controlled Environment Agriculture is a signature area of research in the Dept. Horticulture and Landscape Architecture