



Keynote lecture by  
**Henry Gordon - Smith**



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**CROP**

**INNOVATION  
& BUSINESS**

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# Nice to meet you!



Henry Gordon - Smith



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# Crops in Vertical Farming



Leafy Greens



Herbs



Microgreens



Strawberries



Cannabis



Mushroom

# My 2021 prediction



## Vertical farming is headed for the 'trough of disillusionment.' Here's why that's a good thing

December 14, 2021 Henry Gordon-Smith

Henry Gordon-Smith is CEO at [Agritecture](#), an urban farming consultancy based in New York, US. The views expressed in this guest commentary are the author's own and do not necessarily reflect those of AFN.



**Global Food Industry News**  
<https://www.just-food.com/news/upward-farms-thr...>

### Upward Farms throws in towel on vertical-farming business

4 Apr 2023 — Upward Farms, a US vertical-farming business, has thrown in the towel after the company was founded under a different identity.

**Iron Ox lays off 50, amounting to nearly half its staff**  
3 Nov 2022 — All told, 50 jobs were cut this week, a figure that amounts to nearly half of the company's staff of "just over 100 people." Chief Legal Officer ...

**Food Dive**  
<https://www.fooddive.com/news/aerofarms-files-ch...>

### AeroFarms files for Chapter 11 bankruptcy protection

12 Jun 2023 — Indoor agriculture company AeroFarms filed for Chapter 11 protection, it announced last week. The company said it entered an ...

**dealtown**  
<https://deal.town/agfunder/appharvest-files-for-cha...>

### AppHarvest files for Chapter 11, layoffs at Miyoko's, alt ...

28 Jul 2023 — AppHarvest files for Chapter 11, layoffs at Miyoko's, alt meat sales continue to slide. AgFunder sent this email to their subscribers on July 28 ...

**Global Food Industry News**  
<https://www.just-food.com/news/french-indoor-far...>

### French indoor-farming firm Agricool looks for buyer after ...

4 Apr 2022 — French indoor-farming firm Agricool looks for buyer after calling in receivers. A French court has provided a six-month window for Agricool to ...

**Vertical Farm Daily**  
<https://www.verticalfarmdaily.com/article/nl-glowf...>

### NL: Glowfarms ceases all activities, unable to find ...

2 Nov 2022 — NL: Glowfarms ceases all activities, unable to find sufficient funds. "Glowfarms' communication channels have been silent for some months now.

**Vertical Farm Daily**  
<https://www.verticalfarmdaily.com/article/nl-glowf...>

### NL: Glowfarms ceases all activities, unable to find sufficient ...

2 Nov 2022 — Therefore, we are saddened to tell you that after 2,5 years, Glowfarms will be discontinued with immediate effect." "The problems started ...

**The Packer**  
<https://www.thepacker.com/news/packer-tech/ver...>

### Vertical farmer Kalera files for Chapter 11 bankruptcy

5 Apr 2023 — Kalera, a vertical farming company based in Orlando, Fla., filed April 4, for Chapter 11 bankruptcy, and the CEO stepped down.

**Vertical Farm Daily**  
<https://www.verticalfarmdaily.com/article/smallhol...>

### Smallhold Inc. files for bankruptcy

6 days ago — Following the departure of Andrew Carter, Co-founder of Smallhold, on February 18, 2024, Smallhold Inc. filed for bankruptcy Chapter 11 in ...

**End of Future Crops indoor nursery**

By means of: FaillissementsDossier.nl | April 5, 2023

The pioneering indoor nursery Future Crops, a vertical farm in Poeldijk, w

## Vertical Farming Startup Square Roots: Navigating Layoffs and Restructuring

# 5 metrics that Vertical Farming depends on

1

**Electricity rates:** Electricity costs can reach almost 80% of the total Operational Expenditure (OpEx) in vertical farming operations.

2

**Market demand for fresh crops:** The success of vertical farming hinges on how much people need and value fresh crops, shaping market demand and profitability.

3

**Labor costs:** In vertical farming, labor costs are high and skilled workers are needed to operate and maintain the complex systems efficiently.

4

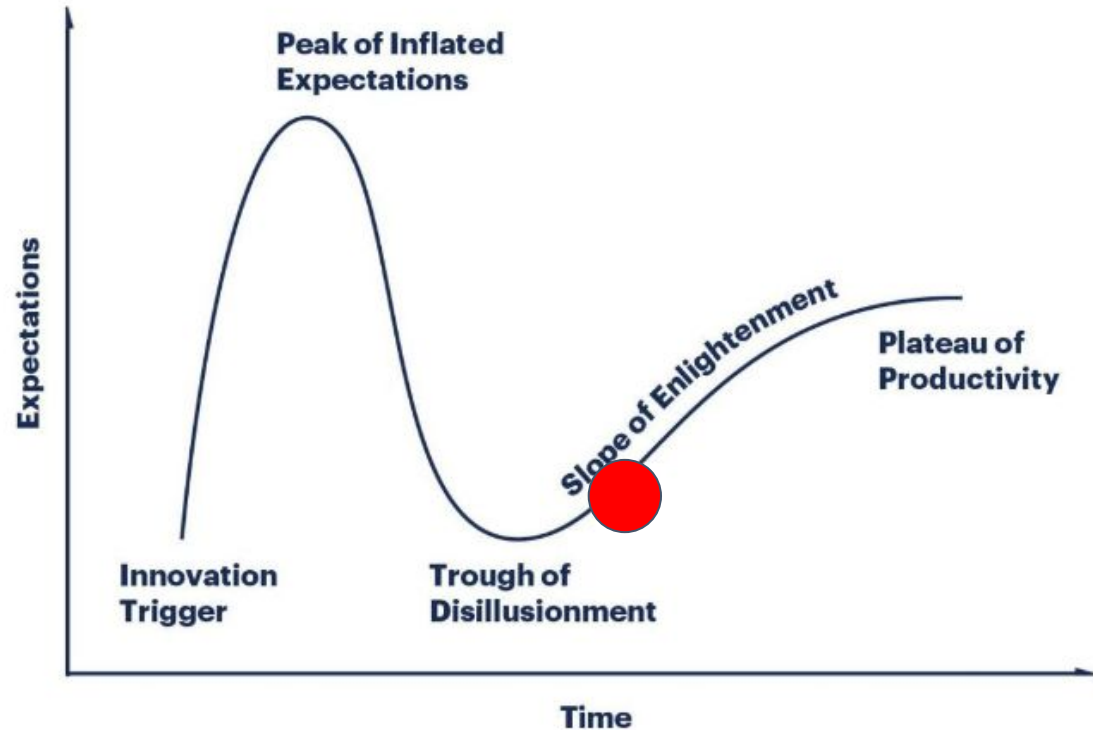
**Operations management:** Operations management is crucial due to the complexity of systems involved, requiring efficient coordination of tasks and resources to ensure optimal production and profitability.

5

**Access to capital:** Vertical farming companies often experience rapid access to capital, enabling swift scaling and innovation, but also necessitating prudent financial management to sustain growth and profitability over time.

# Where we are now and What's next

The Gartner Hype Cycle





# Paradoxical Investment & Economics

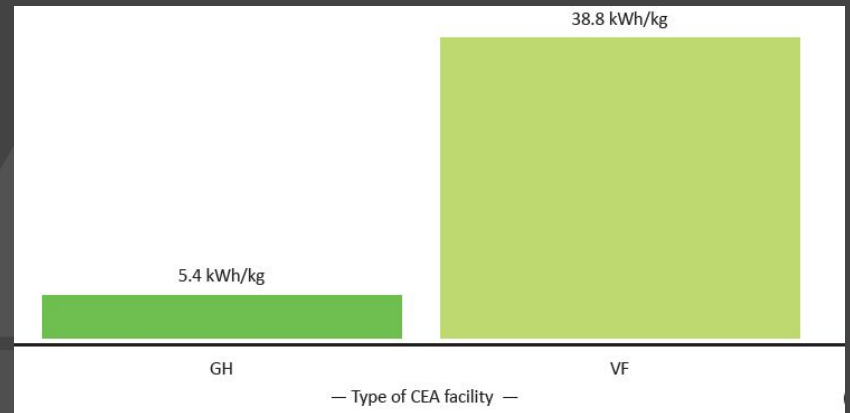
- New and existing CEA companies will gain investment while others will fail suddenly. The global vertical farming market size is projected to reach \$12.04B by 2026. The market was worth \$2.13B in 2018 and will exhibit a CAGR of 24.8% during the forecast period, 2019-2026. However, last year saw a 44% drop in Agritech investments from the prior year (AgFunder).

- Vertical farms have significantly higher energy costs than greenhouses, leading to higher operational costs and risks.



<https://www.prnewswire.com/news-releases/vertical-farming-market-to-rise-at-24-8-cagr-till-2026-growing-demand-for-efficient-crop-produce-will-contribute-to-market-growth-says-fortune-business-insights-300989629.html>

Amount of energy used (kWh/kg) x CEA Facility Type



2021 Global CEA Census Report

# The Hybridization of CEA

“Greenhouse growers, get 9-15 lettuce cycles per year. The hybrid approach is designed to address this issue. It is the unique combination of starting plants in a high-density vertical environment, followed by a transition to greenhouse, that allows to produce 17-30 crop cycles per year.”

- Craig Hurlbert, co-founder of Local Bounti (Vertical Farm Daily)



Agrivoltaics is a hybrid of colocated solar photovoltaic (PV) infrastructure and agriculture.

It involves field farmers adding solar panels on top of their fields and greenhouses.

The overall returns on the crops and the solar photovoltaics (PVs) revenue are both increased. (Agritecture)

# Plants in the Dark



**Square Roots grows plants “in the dark” to significantly reduce the energy needs of indoor vertical farming.**

New approach, supported by a grant from the Bill & Melinda Gates Foundation, aims to fundamentally change the economics for controlled environment agriculture.



Square Roots Indoor Farms · Follow

4 min read · Jan 31, 2024

# Case studies - Oishii, USA

## Oishii secures USD 134M investment to expand vertical farming operations

Mar 1, 2024



# Case studies - Greenhub solutions GmbH, Germany

1m<sup>2</sup>

Automation

Adjustable light spectrum

Data capture and management

Ideal for crop Research and  
Development (R&D)



# Case studies - ReFarm, Dubai

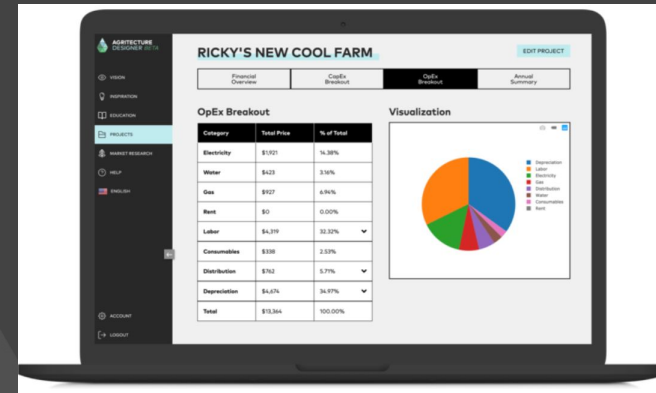


Circularity  
BioStimulant and BioFertiliser  
Carbon Reduction from Organic  
Waste  
Wastewater to Fertiliser  
Technology

# Case studies - Bather Farm, KSA



Partner with Agritecture  
Designer  
First Vertical Farm of  
the Kingdom



# What is Agritecture Designer

The screenshot displays the 'AGRITECTURE DESIGNER BETA' web application. On the left is a dark sidebar with navigation options: VISION, INSPIRATION, EDUCATION, PROJECTS (highlighted), MARKET RESEARCH, HELP, ENGLISH, ACCOUNT, and LOGOUT. The main content area is titled 'PROJECTS' and features a 'COMPARE MULTIPLE PROJECTS' button in the top right. Below the title are three filter tabs: 'All Projects' (selected), 'In Progress', and 'Completed'. The project list includes:

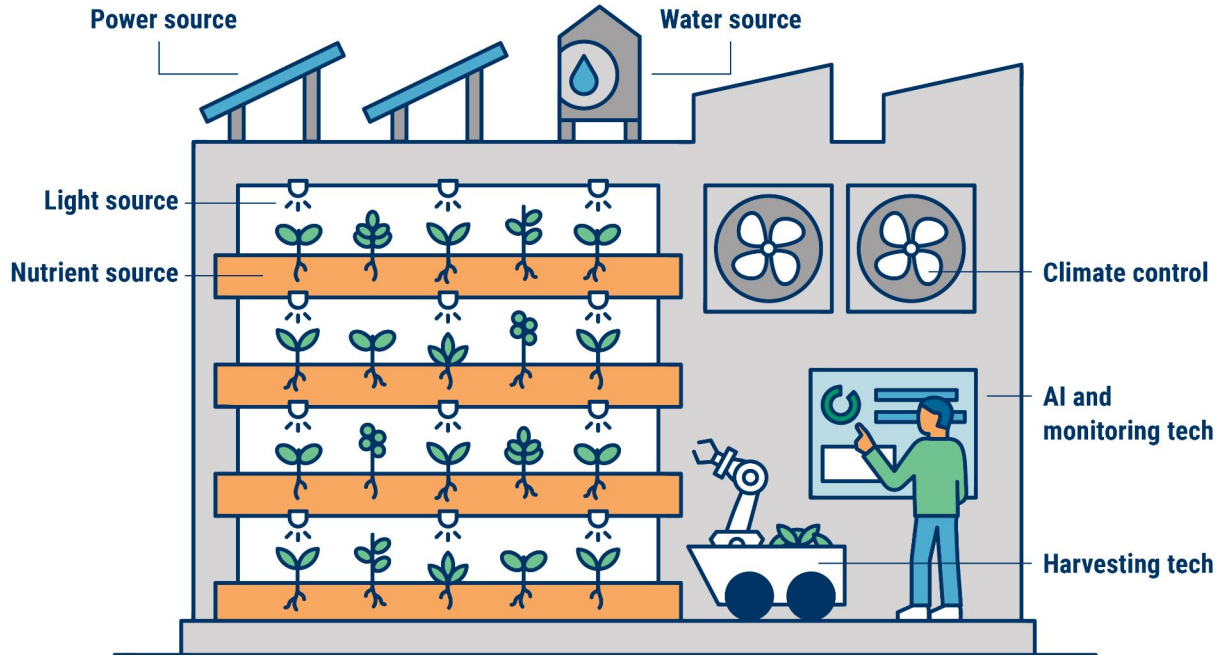
- Mexico City outskirts** (complete, Mon Sep 28 2020) with a 'VIEW' button.
- Ravi Test Farm** (complete, Wed Apr 22 2020) with a 'VIEW' button.
- Ricky's New Cool Farm** (complete, Thu Apr 09 2020) with a 'VIEW' button.
- Joseph Test Farm** (complete, Mon Apr 27 2020) with a 'VIEW' button.

A dashed box at the bottom right contains a plus sign and the text 'Start a New Project'.



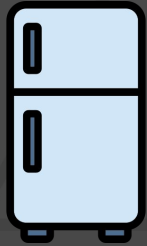
# How CEA can Benefit from Breeders

## Main components of a vertical farm



# What crops make sense in CEA and why?

These are the conditions needed for high tech CEA crops to be worthwhile:



Storage



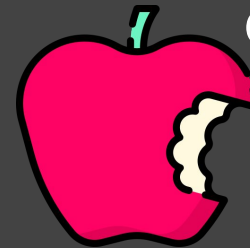
Customer's  
willingness to  
pay



Growth cycle



Form factor



Edible biomass

# CEA benefits to breeders



## Speed

Accelerated growth and speed breeding

Year-round production

Tissue culture and micropropagation



## Quality

Max control of variables for growth

Reduction of pests and disease issues

Isolation from external pathogens



## Standardization

Scalable protocols

Automated imaging

Advanced analytics and AI

# How to engage with CEA



**Collaboration with  
Technologists**



**Focus on Consumer Preferences**



**Education and Outreach**

Thank You !