

Global Oil Depletion, The Local Food Movement and the Implications for Agriculture in New York State

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Think Global – Act Local

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Three Global Issues Pushing The Local Food Movement

- Oil Depletion
- Climate Change
- Population Growth

Four Elements of Global Oil Depletion

- Peaking of global oil production
- Demand outracing supply
- Producer withholding (peak exports)
- Much higher energy prices

Common Local Issues (Political, Economic and Environmental)

- Growing interest in local food production
- Growing concern over environmental and health issues:
 - Water quality
 - Field crop contamination
 - Pesticide-free produce
 - Food security, diversity of supply

Role for Controlled Environment Agriculture (CEA) in New York State Production of Fruits and Vegetables

- A complement to seasonal field production and low tech greenhouse production agriculture
- In response to local demand

Two Current Trends are Boosting New York State Production of Fruits and Vegetables

- Controlled Environment Agriculture (CEA)

NYSERDA focus for production agriculture R&D

- Modified Environment Agriculture (MEA)

Includes low tunnel and high tunnel field applications and low tech greenhouses where the plant environment is protected to reduce the impacts of weather extremes, but otherwise offers minimum control of the plant growing environment.

Why CEA?

- Local production
- Consistent production every day of the year
- Consistent high quality
- Food security
- Almost no environmental discharge
- Almost no pesticides used (biological control)
- No contact with animal manures (no E coli)
- Can operate under HACCP principles
(Hazard Analysis Critical Control Points)

The NYSERDA Perspective on Controlled Environment Agriculture

- CEA Supports a Sustainable Economy
 - Complements renewable energy resource development
 - A strategy for carbon management
 - Keeps food dollars in local economy
- CEA industry in New York will benefit from strong energy efficiency and peak load management practices
- Reduced dependence on Oil Imports
 - An energy policy priority

Average Distances Shipped for Selected Produce Consumed in New York

Geographic source	Average distance shipped -- miles				
	Fresh Spinach	Fresh Straw-	Fresh Tomato	Head Lettuce	Fresh Apple
	miles	miles	miles	miles	miles
Outside NY State, US	2,962	2,897	1,695	2,983	2,615
Outside NY State, Foreign	2,850	2,850	2,879	2,822	6,458
Outside NY State, All	2,956	2,894	2,224	2,980	2,995
Inside NY State	100	100	100	100	100
All Utilized in NY State	2,897	2,742	2,026	2,953	520

Baseline Energy Data: Out of State vs. Local CEA Lettuce

	Field	CEA
MJ/kg Total energy	15-20	61-116
MJ/kg Liquid fuel	15-20	3.9-7.4

Field energy reflects primarily travel distance to NY

CEA energy has three variables:

1. Supplemental light adds energy
2. CO₂ reduces energy
3. Shorter season reduces energy

Estimated Total Energy for New York Consumption (MJ/kg)

Tomato Boston Lettuce Baby Spinach Apple Iceberg Strawberry

Source	Field	Green house	Field	Green house	Field	Green house	Field	Field	Field
Calif.	17	N/A	19	N/A	27	N/A	24	16	18
All Out of State	9-17	22	15-20	Ca-nada 79	15-27	N/A	11	10-16	16-18
NY	7.5	66	10.8	97	9.6	89	5.8	5.6	2.6

Life Cycle Assessment

Conclusions for New York State

1. NY field crops, in season, use less oil and total energy than imports.
2. NY CEA production uses more total energy but less oil than imports.
3. CO₂ emissions are always higher in CEA scenarios, compared to field production, based on assumptions (natural gas heating and NY grid).

CEA and Profitability

1. NY CEA profitability can vary by crop, length of growing season (8-12 months) and cultivation practices. More energy use with longer season can sometimes increase profitability!
2. Optimal CO₂ use always improves profitability with or without supplemental light, regardless of growing season.
3. Marketing of CEA production to maximize grower revenue has been critical to successful NY growers.

Life Cycle Assessment Limitations for CEA/MEA in New York State

1. Energy efficiency improvements for CEA and MEA remain.
2. Renewable energy can reduce fossil energy/CO₂ burden of CEA and MEA.
3. NY MEA greenhouse production data is missing from this analysis (eg., Sun Works, Modern Landfill).
4. Non-energy drivers will push CEA and MEA development in New York.

Is Local Field Production Enough?

Geographic source	Quantities shipped -- 1000 cwt				
	Fresh	Fresh	Fresh	Head	Fresh
	Spinach	Straw-	Tomato	Lettuce	Apple
	1000 cwt	1000 cwt	1000 cwt	1000 cwt	1000 cwt
Outside NY State, US	403	952	1,937	3,960	451
Outside NY State, Foreign	20	79	1,563	79	49
Outside NY State, All	423	1,031	3,500	4,039	500
Inside NY State	9	59	360	38	2,950
All Utilized in NY State	432	1,090	3,860	4,077	3,450

Demand Factors Favoring CEA and MEA

1. Growing demand for local produce may overwhelm existing growers.
2. Factors driving demand growth are strong trends:
 - Water quality
 - Field crop contamination
 - Pesticide-free produce
 - Food security, diversity of supply

How Innovation Can Advance MEA and CEA in New York State

1. Very high conventional energy prices have increased interest in both energy efficiency and unconventional energy innovations.
2. Growers are seeking information on low energy greenhouse technologies.
3. Growers can benefit from strategies and technologies to reduce unit energy costs for product distribution to local markets.
4. Urban agriculture as a new model for CEA and MEA development in New York.

The Future of CEA in New York State?

- A vibrant New York CEA produce industry in 2020 means:
 - \$400-600 million annual sales
 - 10,000-15,000 jobs in crop production, packaging and sales
 - 1,000-1,500 acres of greenhouse

Technology Roadmap Logic



How to get Involved in the CEA Roadmap

[http://www.nyserda.org/Programs/
IABR/IndustryRD/CEA.asp](http://www.nyserda.org/Programs/IABR/IndustryRD/CEA.asp)