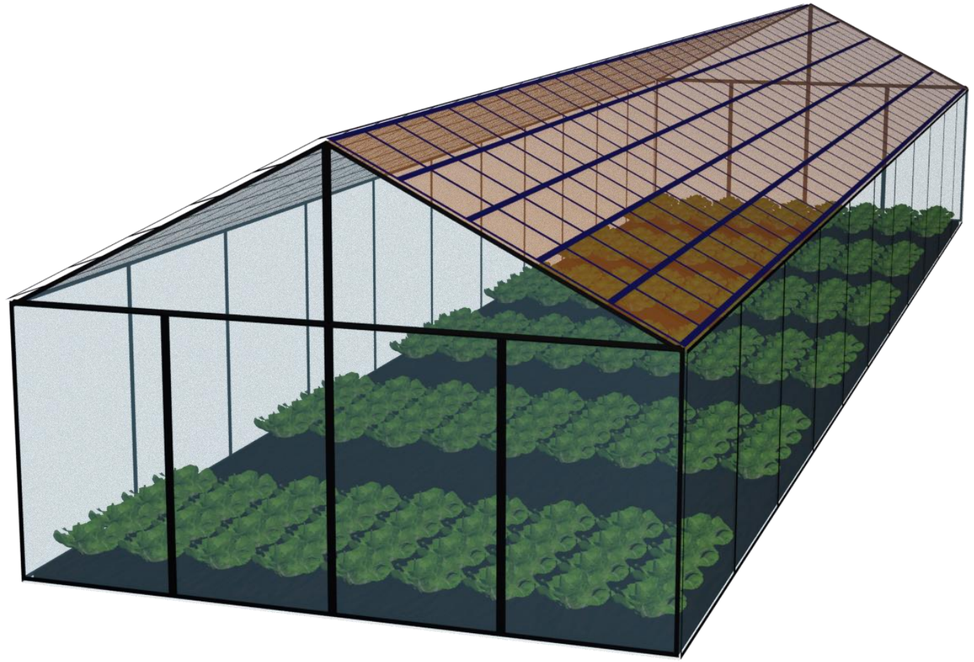
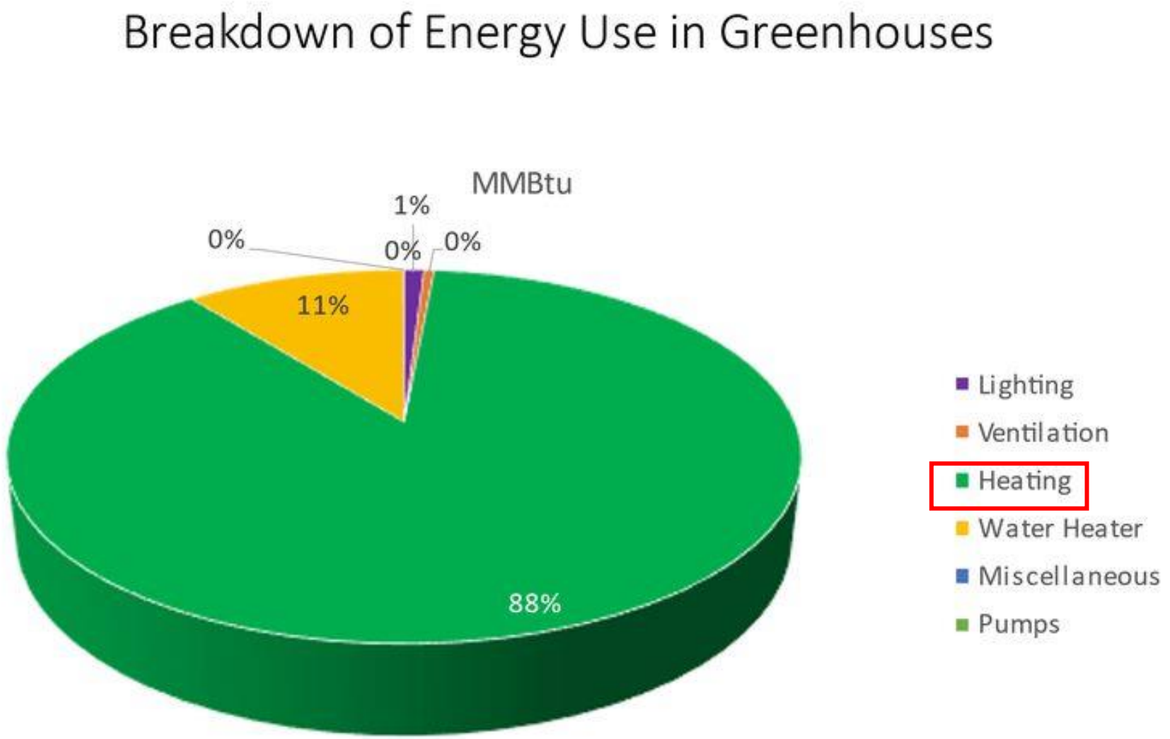
Solar-Powered Greenhouses for the Production of Lettuce and Clean Energy in the United States



Kristine Loh[1], Kale Harbick[2], Nathan J. Eylands[1], Uwe R. Kortshagen[1], Vivian E. Ferry[1]
[1]University of Minnesota; [2]USDA ARS
IonE Sustainability Symposium | April 12, 2024

Agrivoltaic Greenhouses: Food and Energy Production in a Controlled Environment

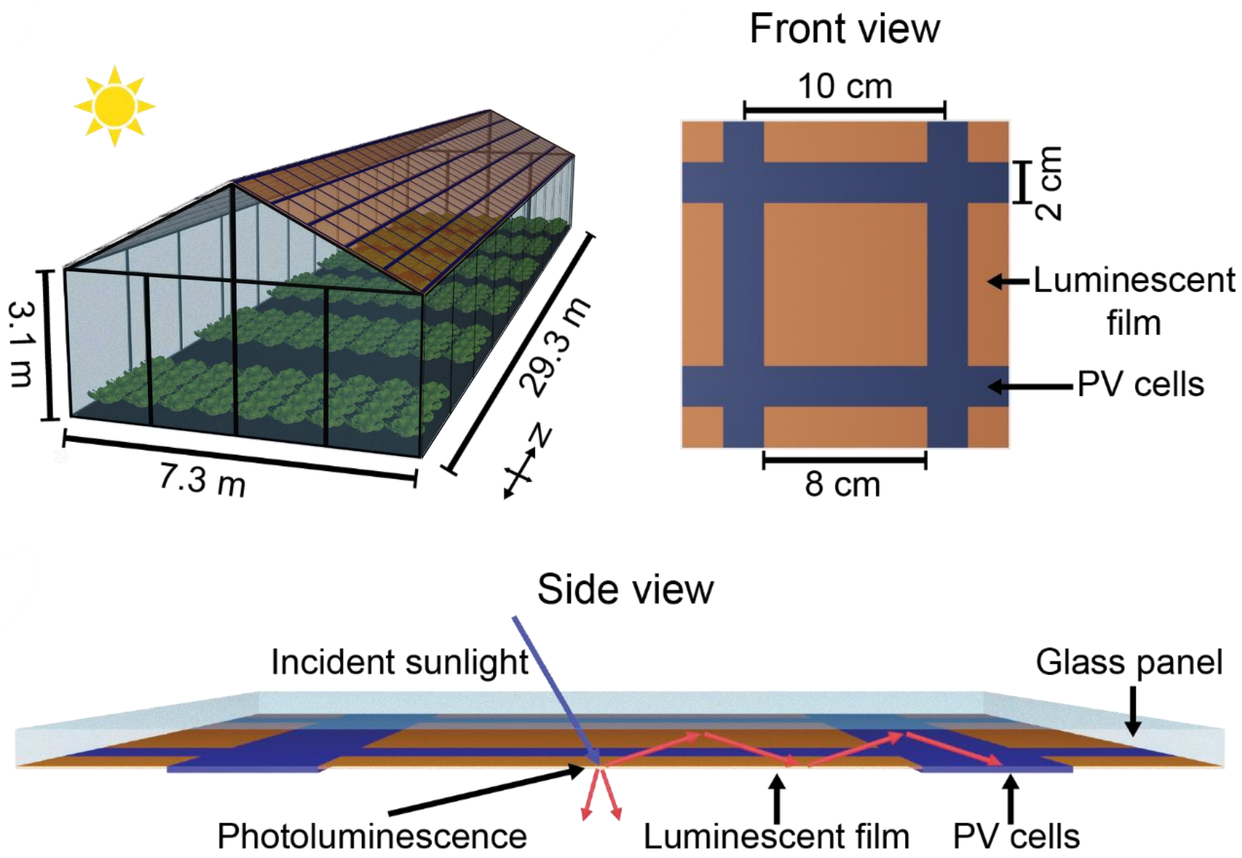
https://www.santacruztechbeat.com/2015/03/19/new-breed-solar-panels-fine-tunes-light-crops/



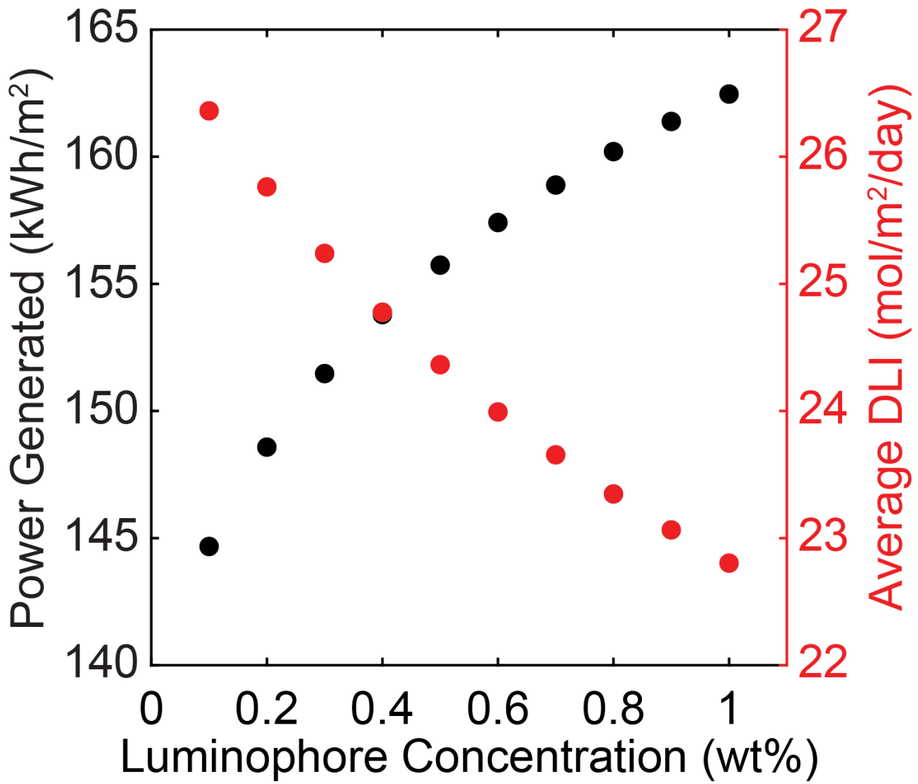
Michigan Farm Energy Program, 2021

How can agrivoltaic greenhouses offset or meet large energy demands while still producing crops?

Luminescent Solar Concentrator (LSC) Greenhouses



Liu, Y., et al, *Adv. Sustain. Syst.*, **7**, 8, 2300107 (2023)



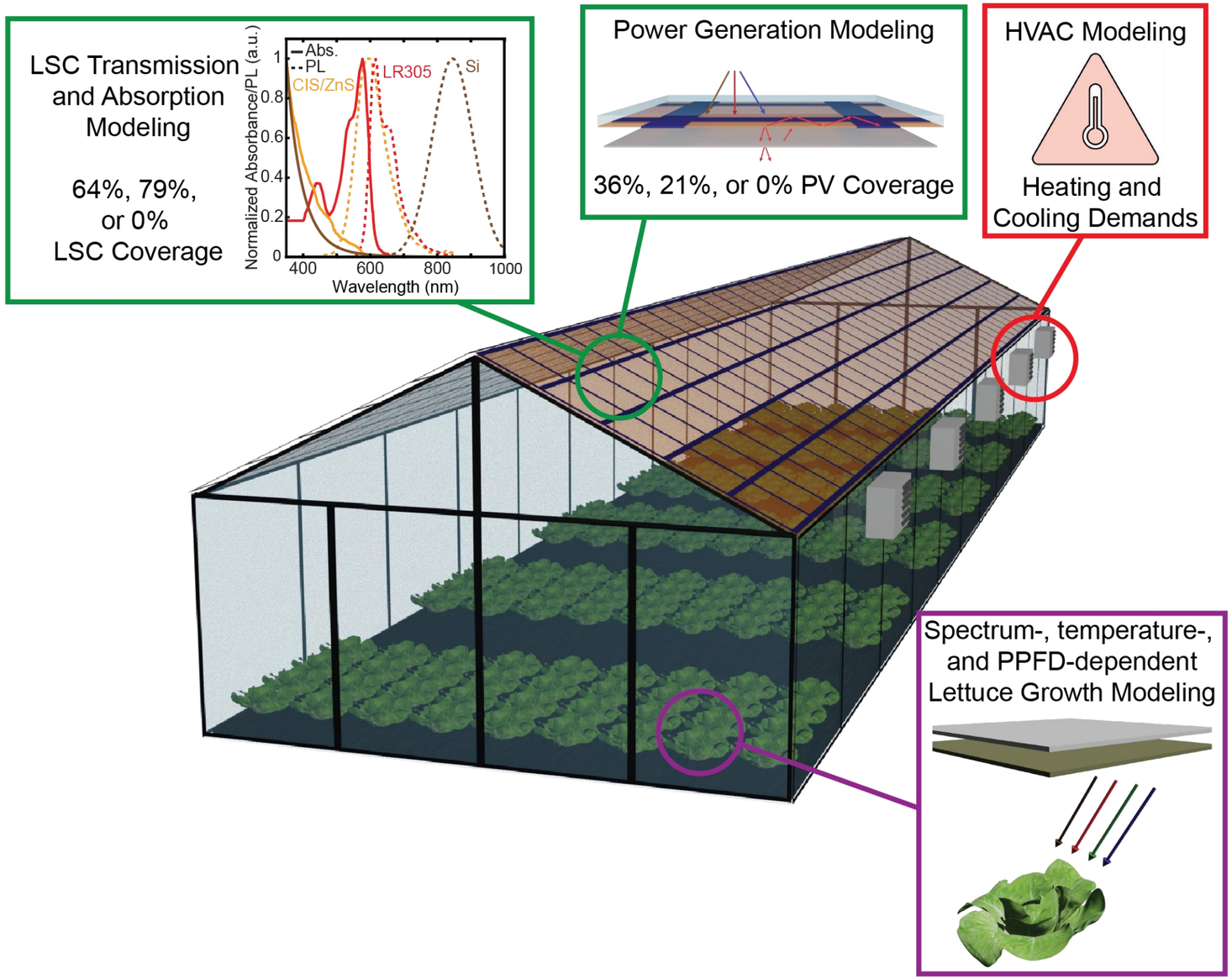
How can we design LSCs to balance the tradeoff between light transmission and energy generation?

Modeling Framework

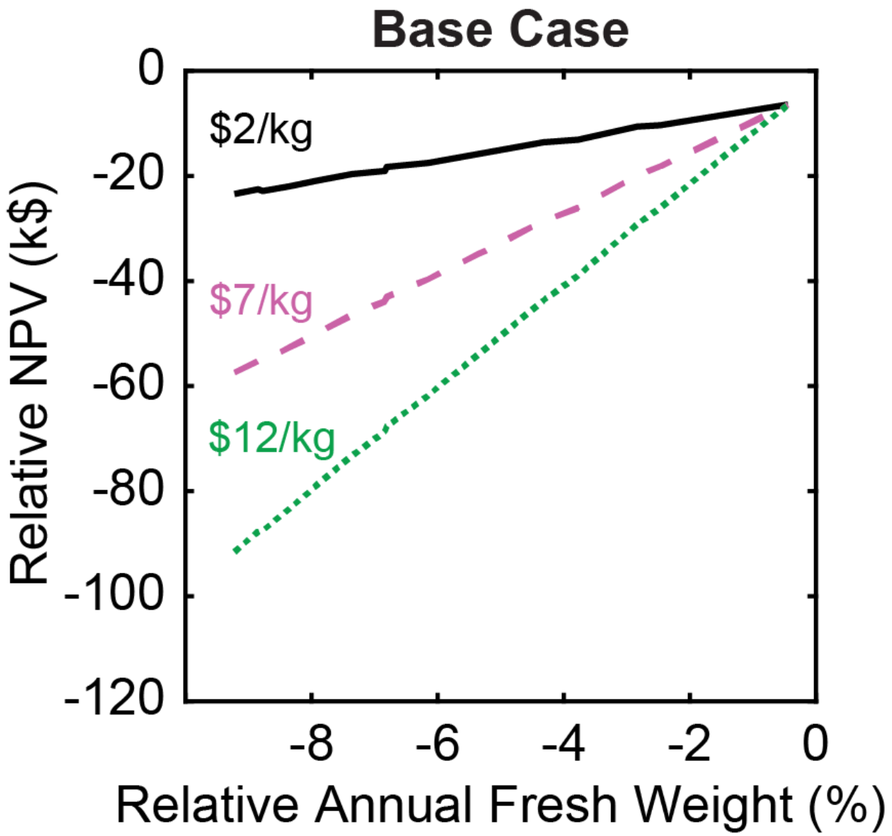
- Three nontoxic luminophores previously studied in agrivoltaic greenhouses

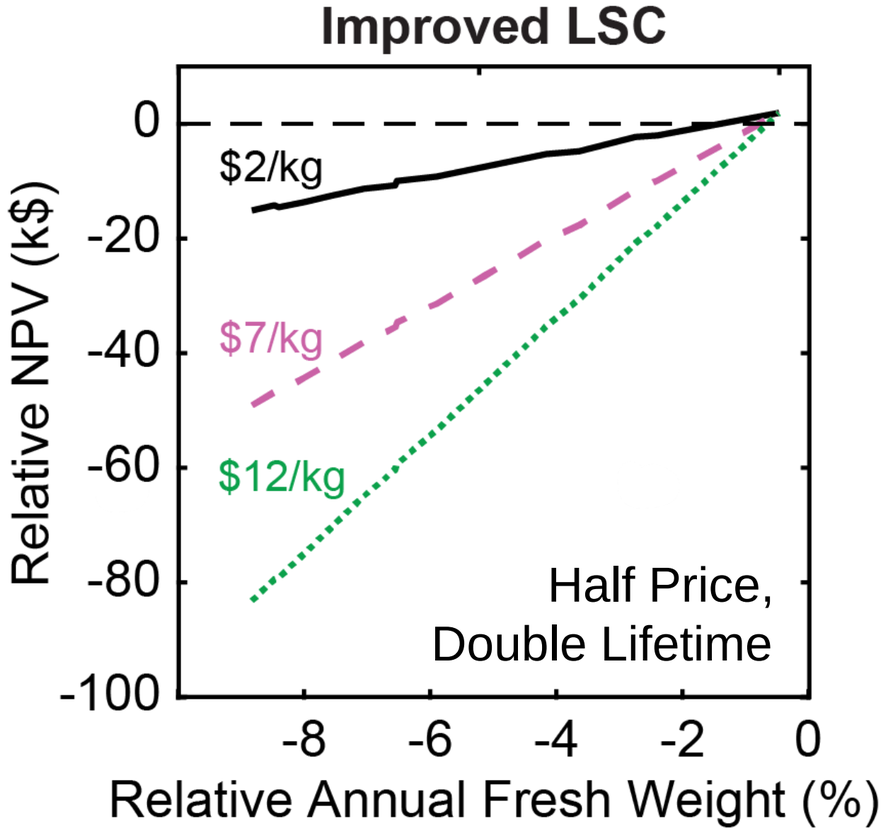
Transmitted Light			
	R	G	B
CIS/ZnS QDs	✓+	✓+	✗
LR305 (dye)	✓+	✗	✓
Si QDs	✓	✓	✗

- Compared to conventional glass greenhouse



Future Potential: Improved Si LSC Greenhouses in MN





At the lowest yield losses, greenhouses with cheaper LSCs can be as profitable as conventional glass greenhouses even in very cold climates.

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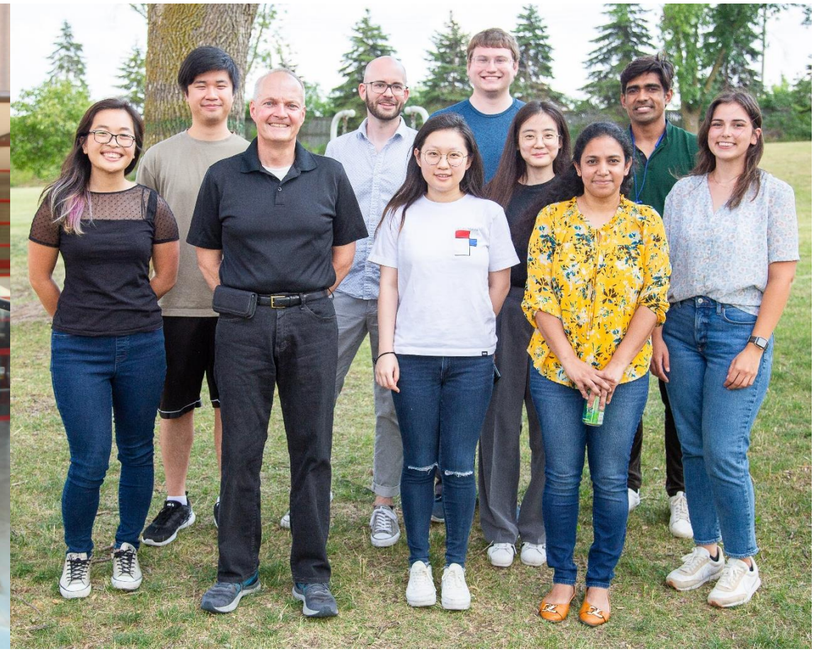
Dr. Teslim Fasasi
Clare Froehlich
Aquarina Hoanca
Mon Le
Dr. Emily McGuinness
Ayaka Moriyama
Maya Ramamurthy

Kortshagen Group Members
Masoumeh Amirifard
Dr. Himashi Andaraarachchi
Thomas Cameron Jr.
Dr. Julian Held
Mohammad Kazemi
Bailey Klause
Sachin Kumar
Dr. Yaling Liu
Yue Zhao



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