Using controlled environment food production to solve food shortages

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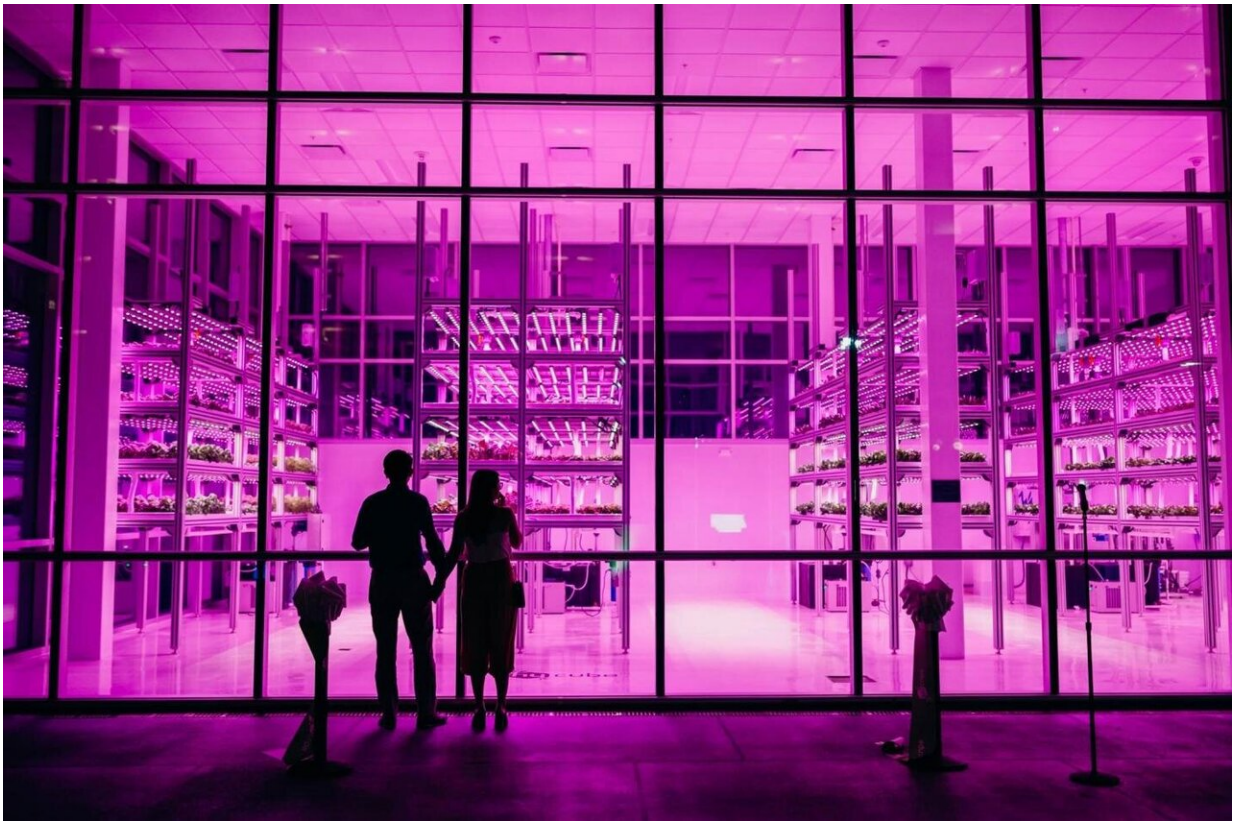

Kalera Plant Factory at the Orlando World Center Marriott. Credit: Celina Gomez

A review of the literature led by researchers from the University of Florida attempts to provide clarification and analysis on various aspects

of what a controlled environment system entails and the extent to which differing food production approaches can be applied to the many current and hopeful endeavors of Urban Agriculture.

Before land and labor shortages prompted by the Industrial Revolution forced food production to move away from cities, agriculture was central to urban environments and their planning. Now, certain shifts in consumption habits and preferences are allowing urban agriculture to make a comeback to address sustainability issues in our food system and promote social and environmental cohesion by reducing dependence of fossil fuels and increasing food security.

Celina Gómez and her fellow researchers delved into the likelihood that controlled environments will revolutionize urban food systems and exactly what techniques can be employed for them to do so. Their full analysis is detailed in their article "Controlled Environment Food Production for Urban Agriculture" published in *HortScience*.

The push for more effective urban agriculture is as much a desire as it is a need. There has been a calculable increased market demand for locally grown produce that has helped generate interest in the application of techniques developed for the controlled environment agriculture industry. These systems and methods have the potential to contribute to year-round crop production and to decrease food costs within an urban setting.

Controlled environments provide advantages to predict plant responses and increase production efficiency, optimize plant yield, and improve plant quality. Among the topics described by the researchers, soilless culture systems allow plants to grow in nonconventional spaces. Light-emitting diodes help reduce energy consumption and improve product quality. Greenhouses built on vacant rooftops of city buildings can capitalize on sunlight to produce plants in close proximity to consumers.

Plus, these greenhouse systems can be customized to fit unique needs requiring special construction materials, including photovoltaic systems and rainwater harvesting strategies, increasing their potential to expand sustainability. Controlled environments provide many opportunities to help expand and maximize urban agriculture.

Vigeo Gardens, plant factory inside an old warehouse in Akron, Ohio. Credit: Celina Gomez

For urban farmers to benefit from controlled environment agriculture, analysis will need consideration of local demand and supply of food,

location, population density, facility design, and crops produced. Preliminary research suggests that sustainability for these urban farms hinges on capital investment and operating costs, production volume, product quality and consistency, and local market trends.

Indoor urban farms demonstrate more challenges, due in part to their heavy reliance on electricity. However, these added challenges are not insurmountable, and in considering the factors of food-safety issues and environmental or seasonal limitations, they may easily be deemed worth it.

Says Gómez, "Establishing scalable approaches that support urban agriculture has significant potential to reduce food and nutritional insecurity in urban and peri-urban spaces. More importantly, well-designed business plans can help boost local economies by creating job opportunities and may help contribute to support community-based education programs."

The researchers have offered a detailed examination of multiple facets of the controlled environment: carbon dioxide enrichment, humidity control, water and soil cycling and the environmental footprint, food safety, economic factors, electric lighting, and quite a bit more.

The applicability of controlled environment agriculture within urban settings as a solution to current challenges in our food-supply chain will be context-dependent. They offer different guarantees to the farmer as advantages over traditional field-based production systems. Although large-scale outdoor farms will continue to be instrumental in being able to deliver fresh produce to the areas needing it, urban farms will increase in importance as populations move into cities and the demand for local food increases.

Adds Gómez, "Consumers today have tremendous opportunities to get

involved with many aspects of the food production process, and controlled environments will play a central role as cities continue to be transformed by fostering urban agriculture."

More information: Celina Gómez et al, Controlled Environment Food Production for Urban Agriculture, *HortScience* (2019). DOI: 10.21273/HORTSCI14073-19

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