

Engineering CEA Systems for a Sustainable Future: Status, Challenges, and Opportunities

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Controlled Environment Agriculture (CEA) CEA integrates science and engineering to maximize plant and biosystems productivity so that regulated, engineered environments have the capacity to maximize production and optimize use of resources including: Water, Energy, Land & Space, Capital & Labor, and Human Satisfaction. There are various challenges faced by the CEA crop production industry. Energy and resource input prices have been rising and US economy has been slowing down. Many greenhouse growers have been wondering how they would survive and are looking for ways to improve their efficiency and profitability in their businesses. Consumers' diet has been changing and they seem to be willing to pay premium prices for greenhouse produce only if the produce offers superior quality, value, taste, and freshness relative to other alternative products. Consumers' awareness has increased with "buy local, fresh, and safer" movement. Interest in urban agriculture, rooftop farming, and indoor production seems to be growing. Interests are both in high tech production with semi-closed greenhouses while capturing the niche market with low cost high tunnel crop production systems. With energy prices rising, search for best alternative energy option for a particular greenhouse system is of interest. The challenge of greenhouse crop production remains the same as managing a growing environment with optimal use of resources to produce an ideal ecosystem for the crop and make profit. Therefore, this presentation will focus on; some of the frontiers, new and innovative engineering designs and climate control strategies, limitations, advances, challenges and opportunities, interdisciplinary approaches, and theoretical, commercial, societal, and long-term impact of the work as relates to CEA and address how the CEA technology will affect people's lives.