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FEATURES

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At the Intersection of Profitability & Sustainability

Dr. Jake Holley

Too often today, sustainability is viewed through the lens of increased costs or reduced performance. It's an understandable perception. Separating waste from recycling takes time, and sorting papers from plastics or glass can feel burdensome, while adding services like compost pickup introduces another expense. Even efficiency measures such as low-flow faucets and toilets are sometimes seen as giving something up. In the CEA industry, however, this perspective may be not only incomplete, but in some cases at odds with long-term financial success.

John and Steve Newell, co-founders of Windset Farms, with the 2025 Efficiency in Action Award from energy company FortisBC.

Recently, Windset Farms was awarded the FortisBC 2025 Efficiency in Action Award by FortisBC, the energy utility that provides power and natural gas to much of British Columbia. Windset was recognized for implementing a suite of technologies not only for their sustainability benefits, but also for their role in creating optimal crop environments while reducing operational costs. It's one example of targeting actions that achieve multiple goals.

To explore the topic further, I sat down with Richard Lee, Executive Director of the Ontario Greenhouse Vegetable Growers, to discuss the technologies that are helping bridge the divide between sustainability and profitability. Many of the same approaches highlighted in Windset's recognition emerged again in that conversation.

Energy curtains

"For climate control, double energy curtains," Richard started with for listing energy efficient implementations. "With a lower ceiling, these can bring down heating costs by 25% to 35%."

Energy curtains are a logical place to start, particularly double energy curtain systems. These curtains reduce the volume of air a greenhouse needs to heat at night by effectively lowering the roof height, while also providing an additional tool for managing light levels at the crop canopy. When a light-diffusing curtain is installed beneath a more opaque curtain, control systems can fully deploy the lower curtain and fine-tune the

upper curtain to regulate light intensity. This approach maintains good light uniformity while minimizing shadowing across the crop.

A top blackout curtain can also be fully drawn at night, allowing supplemental lighting to be operated at any time of day. This flexibility helps growers comply with local light-pollution regulations without sacrificing production schedules.

The primary drawback of double energy curtain systems is humidity management. Greenhouse glazing often acts as a passive dehumidifier and separating airflow from the ceiling reduces heat loss, but can lead to elevated humidity levels. However, newer through-curtain vertical airflow fans allow growers to precisely control how much air passes through closed curtains, helping to mitigate humidity buildup while preserving the energy-saving benefits.

LED lighting

"LED lighting can save as much as 50% on lighting costs," Richard explained. However, adopting LEDs does introduce new considerations. Climate control becomes more nuanced when transitioning from less-efficient High-Intensity Discharge systems such as HPS, often requiring adjustments to environmental setpoints and control strategies. Because LEDs operate more efficiently, they generate less radiant heat than HPS fixtures.

As Richard noted, "Using LEDS can reduce cooling requirements," an effect that many growers didn't initially anticipate.

To fully realize these benefits, LEDs must be integrated thoughtfully into the broader greenhouse system. Pairing LED lighting with properly designed blackout curtains allows growers to maximize lighting flexibility without violating community light-pollution regulations. While LEDs still carry a higher upfront cost than legacy lighting technologies, prices have fallen substantially over the past decade. Ultimately, the strongest returns come when LED investments are combined with appropriate blackout strategies and climate-control adjustments, reinforcing the idea that lighting upgrades are most effective when approached as a system-level decision rather than a standalone swap.

Greenhouse climate controllers

Automated climate systems were next on Richard's list, reducing energy use and taking advantage of a spread of sensors. This technology should come as no surprise to growers. Sensor networks and automation have become increasingly pervasive, not only in greenhouses, but across the built environment. From smart thermostats in homes to climate-managed, LEED-certified buildings, automated control systems have demonstrated how precisely managing environments can significantly reduce energy use.

Using shade curtains in conjunction with control systems improves light uniformity while minimizing shadows.

In greenhouses, however, automation carries an added layer of complexity: plant physiology. Modern control strategies are evolving beyond simply maintaining setpoints toward optimizing conditions for plant growth and productivity. Advances in artificial intelligence are enabling climate controllers to integrate data from sensors, cameras and yield measurements, allowing systems to continuously refine how temperature, humidity and light are managed in the most efficient way possible.

These platforms have also evolved alongside new greenhouse technologies. The ability to manage multiple

layers of energy and shade curtains, or to dynamically dim supplemental lighting, only became feasible with recent advances such as LED fixtures and more sophisticated controls. As a result, automated climate systems now serve as the backbone of greenhouse efficiency, enabling growers to unlock the full energy and performance benefits of every new technology they deploy.

Water conservation and recycling

The next item on Richard's list was water conservation and recycling. While the underlying concept isn't new, continued innovation is pushing how effectively these systems can be implemented. Through approaches such as drip irrigation and water recapture, CEA operations are able to reuse a significant portion of the water delivered to crops, reducing both water use and nutrient waste.

Recent advances in monitoring technology are helping take this a step further. This year saw the release of the new Capillary Electrophoresis (CE) Line system, available through Dramm. Previously, growers often relied on sending water samples to external laboratories for analysis, a process that could take several days and return results too late to make timely adjustments. With CE systems, growers can now monitor fertilizer concentrations in near real time, allowing them to confidently recycle irrigation water while still maintaining precise nutrient targets. In doing so, water reuse becomes not just a sustainability measure, but a practical tool for improving consistency and operational efficiency.

Windset Farms

Returning to Windset Farms, why did they earn the Efficiency in Action Award? The technologies credited as key to their success included energy curtains, LED lighting, a biomass boiler that captures both heat and carbon dioxide, and vertical airflow fans. It's no surprise that this list closely mirrors the technologies highlighted in my conversation with Richard.

Taken together, these tools represent more than isolated upgrades. They're becoming foundational investments for CEA operations seeking to reduce energy use, improve environmental control and strengthen long-term financial performance. In that sense, Windset's recognition reflects a broader shift in the industry toward sustainability strategies that also make strong commercial sense.

"CEA and diversification of crops is our way of reducing our reliance on imported produce and ensure what we consume is grown in a sustainable manner," Richard added, an important mission goal. Richard also emphasized that as an industry, we should recognize that "we are directionally correct" when it comes to sustainable goals.

Myth-busting, CEA style

I asked Richard if there are any myths about indoor farming he'd like to disappear.

"(The) term greenhouse gas emissions refers to atmospheric gasses, not glass or poly structures used for growing crops. We greatly reduce overall emissions," he noted, adding he'd like "people to consider greenhouse gas emissions are not directly related to greenhouse farming."

Ultimately, earning public trust by demonstrating that greenhouses can advance, rather than undermine, sustainability goals will be critical to the industry's long-term success. **IG**

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