

LED LIGHTING

and its Effect on Plants, Growers and the World

WHILE THE INITIAL INVESTMENT MAY SEEM COSTLY, THE BENEFITS OF LED LIGHTING ARE CERTAINLY WORTH A CONSIDERATION.

By Kevin Wells

As many growers have found out over the course of human history, even the sun needs some help from time to time. It's estimated that between 30 to 50 percent of solar radiation is blocked by greenhouse structures and glazing before it gets to plants. In areas with long dark winters and short growing seasons, this is an even bigger challenge and necessitates the use of supplemental lighting for optimal crop production. Forward-thinking growers are learning everyday that the best lighting sources for indoor operations — primary or supplemental — are LEDs.

Horticultural LED systems and the spectral science they have made possible have already revealed some amazing effects, including: using light alone to create bigger yields per plant; producing more marketable crops overall; and changing the

wavelength of light to change the flavor of foods. For these reasons and others, including the ones detailed below, LEDs are on their way to replacing legacy lighting systems in many new and newly renovated growing operations.

LEDs are less expensive. A lot less expensive.

Yes, the initial price of an LED lamp versus an old-fashioned light is higher, but not as much as is often believed because the cost of LED technology has been steadily declining every year. Beyond that, it doesn't take long for LEDs to pay for themselves in several ways. A savvy businessperson knows that you have to look past the purchase price of needed equipment to consider the total cost of ownership (TCO).

"The cost of supplemental lighting was always

The efficiency of LED systems can contribute to a reduced carbon footprint. (Photos courtesy of LumiGrow)

the downfall for indoor growing in the Midwest," says social entrepreneur Jim Bloom, owner of Toledo-based Sustainable Local Foods. "LED lights allow us to grow year round and keep the costs down."

According to the U.S. Department of Agriculture (USDA), energy costs are the third biggest expense for the vast majority of growers, with lighting costs representing a significant portion of that — both supplemental lighting in the case of greenhouses and sole-source lights for indoor operations. LEDs are 66 percent more efficient than legacy HPS (high pressure sodium) lights when measured lamp to lamp. If you include the granular control offered by LEDs

that's not available with HPS lights, the energy efficiency is even higher.

"Energy efficiency is essential, especially in the Midwest," says Bloom, echoing a sentiment shared by growers across North America and the world. "We think we're saving maybe 75-80 percent over what would be the case with HPS."

Not only do LEDs save on growers' electric bills, they reduce other costs as well. Without the harsh radiant heat blasting plants from above, growers can use less water because there's less evaporation. Finally, if keeping a grow space cool is a challenge, as it is in many parts of the United States, LEDs represent a significant energy and money savings

because they reduce the need for air conditioning.

LEDs help create bigger, better plants.

Legacy lighting systems offer binary control. That is, they are either on or off. If they're on, they give off the same fixed spectrum for every plant though they may vary in intensity depending on the replacement time-frame (older lamps mean lower intensity). So every plant basically gets the same spectral output as all the others even if you've got different varieties in the same space. If you don't give every crop the same nutrients, why would you give them the same light?

With LEDs and new networking hardware and software, growers can craft proprietary light formulas or recipes to bring out the characteristics of the plants they know will make them most marketable. For instance, at my company LumiGrow, we recently conducted a small study with basil. Our research team grew basil under five different light treatments — 0, 8, 16, 24 and 32 percent blue light — along with varying ratios of red and a constant level of white light. In a blind taste test, they found a very noticeable difference in outcome depending on which percentage of blue light was used, and that the 32 percent blue light produced spicier, more aromatic and tasty basil. Spectrum control is the new "secret sauce" growers can use to produce the foods and flowers their customers crave.

"[There has been] greater predictability than what I expected," shares Bloom. "In one of our units there's no sunlight, and we have been able to generate a full-range harvest cycle. Basil, mustard greens, kale, arugula, I think they're doing better in this enclosed environment under LED lights."

In other experiments conducted at respected institutions such as the University of Guelph in Canada or at UC Davis in California, scientists have shown again and again that LEDs lead to more marketable plants than legacy lighting systems using much less energy and the same space as before.

LEDs mean a healthier working environment.

The ability to steer plant growth with LEDs means that there is less need for plant hormones to do that work. In addition to reducing the need for hormones, some studies have

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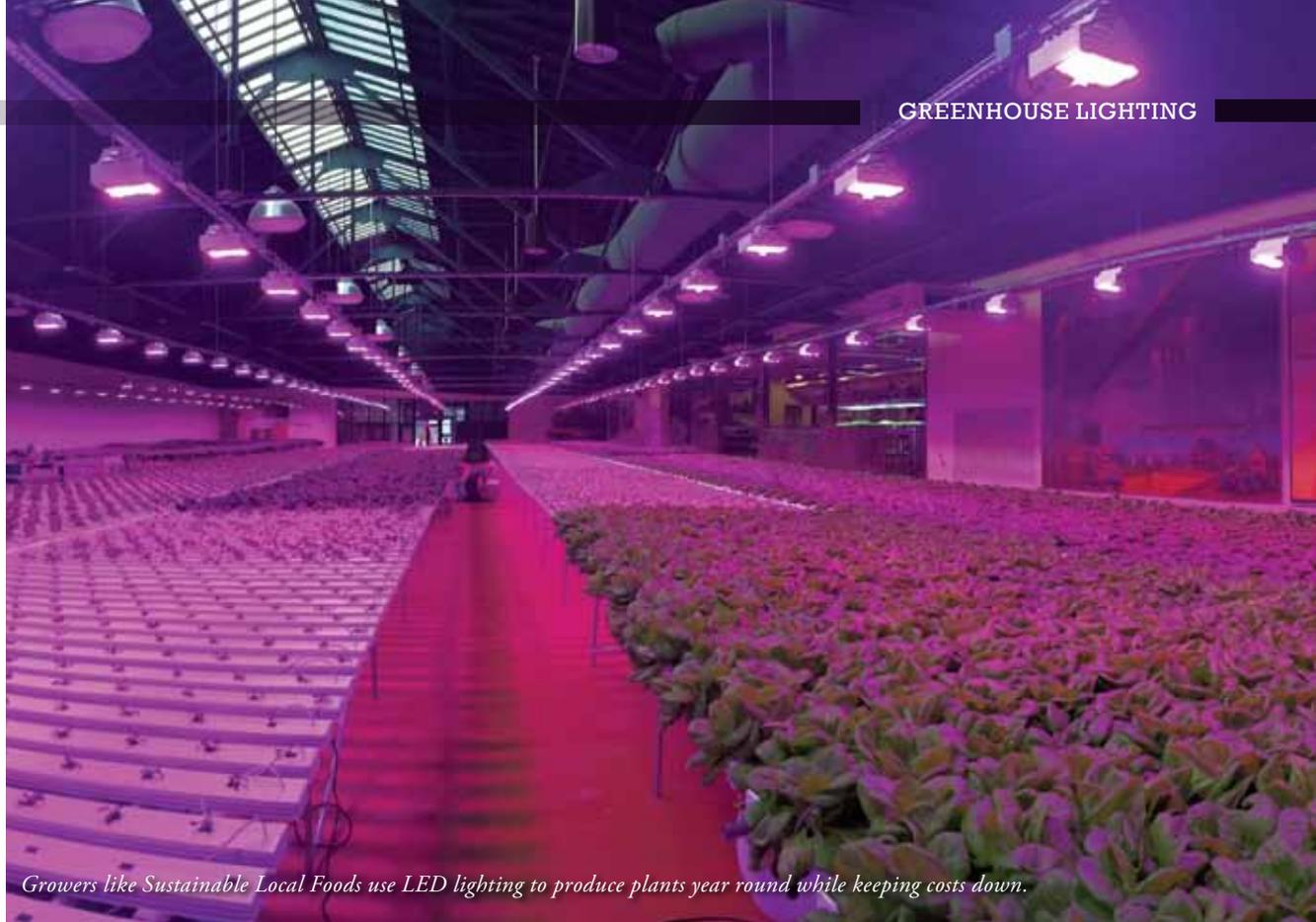


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shown that LEDs can reduce or eliminate the need for pesticides as well, further benefiting workers who no longer have to be exposed to these toxic substances. And, as mentioned above, the reduction of heat aimed at plants means less evaporation and a need for less fertilizer, so exposure to yet another chemical stew is reduced. Reducing the use of plant hormones, pesticides and fertilizer in confined spaces like greenhouses and indoor growing operations, means a healthier indoor environment for the people who work there.

LEDs mean a healthier environment period.

Controlled growing environments already mean less water waste, less chemical runoff and a more efficient use of space. Add LEDs into this mix and indoor growing becomes that much more environmentally friendly. As stated, reduced heat produced by LEDs leads to the use of significantly less water — increasingly important in times of record drought — and using light to steer plant growth instead of plant hormones leads to less reliance on chemicals. Include another factor — the savings discussed above that aren't just monetary. The efficiency of LED systems makes for a much reduced carbon footprint as well. Growers like Sustainable Local Foods that operate indoor urban farms can also add icing to the carbon-cutting cake by limiting



Growers like Sustainable Local Foods use LED lighting to produce plants year round while keeping costs down.

transport distances from vine (or stalk) to table.

Savvy growers, whether operators of a cutting-edge urban indoor farm or a more traditional large rural greenhouse, are always on the lookout for tools to give them the edge over mother nature and the competition. Horticultural LEDs, networked control systems and new developments in spectral science have led to a world of more efficient, less

expensive, more productive growing operations. If you haven't already experienced this for yourself, you really should. Your plants and your bottom line will thank you. ☺

Kevin Wells is CEO of LumiGrow, a leading provider of horticultural lighting solutions. For more information, go to www.lumigrow.com.

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