

How to Specify LED Lighting

NEW LED LIGHTING OPTIONS MAY AT FIRST SEEM OVERWHELMING, BUT POTENTIAL REWARDS MAKE UNDERSTANDING THE OPTIONS VITAL.

By Kevin Wells

When it comes to lighting, the future is upon us. High-powered LED products, once the exclusive province of cutting-edge research, are invigorating today's commercial greenhouse market. Your new choices, ranging from shelf lights and growth bulbs to high-bay greenhouse fixtures, may at first seem overwhelming, but the potential rewards make understanding your options prudent. LED lighting now figures into the mix for growers seeking to add or retrofit supplemental greenhouse lighting. Growers making the switch to LED fixtures are drawn by the opportunity to control rising energy costs while increasing yield and productivity.

But as with other greenhouse technologies, one size does not fit all. In the end, lighting decisions should be based on the answer to a fundamental economic question: Which combination of lighting technology, layout and schedule proves most effective in converting improved growth and quality into bottom-line gains?

Quantifying the Opportunity

In answering this question, you'll first want to get a handle on the financial returns that LED lighting could bring your business. For example, are you looking to increase yields of existing crops or expand your operation? How do you expect that these gains will translate into increased revenue? Additionally, if you currently operate supplemental lighting, could you reduce your energy bill with LED lighting? By quantifying these financial returns, you'll understand if looking at LED lighting is worth your while.

If you decide that you could indeed achieve greater profits by reducing electrical costs and boosting greenhouse productivity, the next step is figuring out how much supplemental light you'll need. This exercise will enable you to ballpark your lighting investment.

How Much Light is Needed

Generally speaking, there is a straight-line relationship between light and yield — i.e., the more, the better. However, you don't want to purchase

more light than you need. Your local university extension or lighting provider can help you pinpoint appropriate light levels based on your production goals.

In calculating the delta between the light you have and the light you need to achieve your goals, you'll look at photosynthetically active radiation (PAR). Note that the traditional notion of PAR includes all light between 400 and 700 nanometers. But research demonstrates that photosynthesis is triggered by specific wavelengths within the PAR spectra, primarily the blue and red regions.

Lighting manufacturers now have the ability to develop fixtures that emit targeted wavelengths within the PAR spectra to trigger plant responses without energy waste. This is arguably the area of greatest progress for LED technology. Consider that last year saw the release of lights that double the red and blue PAR output of HID lights.

This technological advance necessitates a change in the way lights are specified. When determining how much LED light you'll need, a rule of thumb

is to use approximately half the PAR value you would specify for high-intensity discharge (HID) lighting. PAR values, measured in micromoles, should be halved because LED lights designed for horticulture emit less, if any, light in the 500 to 600 nanometer range as it is of little value to plants.

Developing a Lighting Plan

The proposal you receive from your lighting provider should indicate the number of fixtures you'll need to achieve your desired light levels. Ask for a lighting plan that includes fixture placement in greenhouse zones based on targeted light levels. As you prepare to make the leap, make sure you understand the coverage you'll be getting with your new lights. Generally, a high-bay LED light should be hung at the same height as a HID light of comparable power, but you'll want to confirm this. Adding or replacing supplemental lighting presents the ideal time to improve crop uniformity with even coverage.

Comparing your Options

When sorting through your lighting options, there are a number of features to look for to ensure that the fixtures you select meet your expectations and withstand the rigors of a greenhouse environment. Recommended light-fixture attributes include:

- Compact size to minimize shading of your natural light.
- Hardware design free of any ventilation holes or other perforations on horizontal surfaces to avoid drip hazards.
- Independently proven to perform by third-party testing laboratories.
- Robust thermal management, including heat sinks and fans, to deliver 10+ years of use.

Additionally, services including technical support, system performance monitoring, warranty and upgrade plans should figure in your buying decision.

A feature common to all LED lights is that they run cooler than other lighting types. If you've needed fans or other devices to cool your greenhouses, you may turn up additional

electrical savings here. Growers in cool climates that previously used HID lighting to heat their greenhouses report that the energy savings achieved with LED lights more than make up

for the cost of additional heating. You'll want to calculate the BTU output of your planned lighting fixtures and adjust conditioning systems accordingly.

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Replacing aging HID lights with LED lights is an effective strategy for increasing light while decreasing energy consumption and costs. Author Kevin Wells is depicted in the above photo of a greenhouse in the Northwestern United States.


Implementing Your Strategy

At this point in the process, you have a game plan. Now it's time to figure out the best way to implement your strategy. Some growers replace all of their lights at once to maximize their energy savings and potential for utility rebates that may return 30 to 50 percent of fixture purchase price. For others, it makes more sense to replace aging HID lights with LED lights. Either approach will increase the available light in your greenhouses without increasing your power consumption. A pilot program may be the ideal way for you to assess light performance before you commit to a larger purchase.

More and more growers are easing the transition into LED lighting with financing. In some cases, the savings achieved with LED lights exceed monthly lease payments, making these growers cash-flow positive with their first energy bill. When reviewing your ROI, include hidden operational

expenses such as replacing HID bulbs, upgrading your electrical wiring and training staff. Be sure to understand which services your lighting provider will cover, and which will be on your dime.

Fine-Tuning for Success

Once your new lights are up and running, be on high alert and ready to make adjustments to other variables. For example, LED-illuminated plants transpire less water and nutrients than plants under HID lights. Therefore, you may be able to reduce irrigation and enjoy a lower water bill. Attempt to control variables, adjusting one input at a time, when you make tweaks. After all, smart lighting is a mission critical to your crops and your business. It's worth getting right. 

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