

# Roots, Shoots & ENVIRONMENTALS

## PART 3

*Many environmental factors affect your plants. Depending on your production style, you decide which ones are worth manipulating.*

BY CARL SILVERBERG

In the first two parts of this series, we talked about the root zone and the shoot zone. In part three, we're going to discuss environmentals. While there is a push towards complete control in the greenhouse, our philosophy is that data should be used to help the grower fit his or her particular style, not to dictate how an operation should run.

"Instead of buying specific varieties, I can manipulate the root and shoot zone and cultivate the way I like," is how one Western grower put it. "This allows me to use a lot more varieties; it creates new markets and new avenues. I manipulate the environment and the nutrients, and I create the plant I want instead of relying on someone else and then hope that plant will adapt to different conditions. If a plant is bred for specific conditions and it doesn't get them, it suffers more."

So the question becomes, what are the environmentals that affect plants? Well, as you all know, there are a variety of factors, but today we're just going to focus on greenhouse materials, lighting and carbon dioxide.

### A HOLISTIC APPROACH

Kurt Parbst is with Envirotech Cultivation Solutions and his approach to CO<sub>2</sub> usage is holistic.

"How do we do a better job with fewer resources? That's the mission," he states. "It



Marc van Iersel (right) in the University of Georgia greenhouse.

doesn't happen unless you give the plant the right amount of light, the proper temperature conditions, and CO<sub>2</sub> — assuming that water, nutrients, and everything else is in line. The idea is at every stage of growth to bring these things up to an economic level so that the plant is fully expressing itself in a commercially viable way."

Okay, so as part of the overall environmental aspect what makes CO<sub>2</sub> a unique component?

Parbst says, "You can get tremendous increases in yields anywhere from 20 to 50% by augmenting CO<sub>2</sub>, but it has to be done in line with your other environmentals. Cannabis growers, for example, are pushing CO<sub>2</sub>. But if





GrowSpan newly designed greenhouse.

you’re going to augment CO<sub>2</sub> when you’re under a ventilation regime, there’s an economic aspect that comes into play.”

**STRUCTURAL IMPACT**

Keeping Kurt’s admonition in mind that the goal is to keep all the components working together and at their maximum abilities, one area

that often gets overlooked is the impact that the greenhouse structure can have. There’s a good reason that the construction of the greenhouse is usually the most expensive component in a CEA operation.

GrowSpan has been building greenhouses for 42 years, and Joey Viegas shared some thoughts on some keys to aligning your greenhouse with your particular operation.

“The design depends on many variables such as what you are growing, but the location of the greenhouse is critical,” says Viegas. Every greenhouse even on the same property could be designed differently depending on DLI, humidity and the microclimates in the area. For example, if you are on the north side of Oklahoma City we’d design your greenhouse differently than if you were on the south side.”

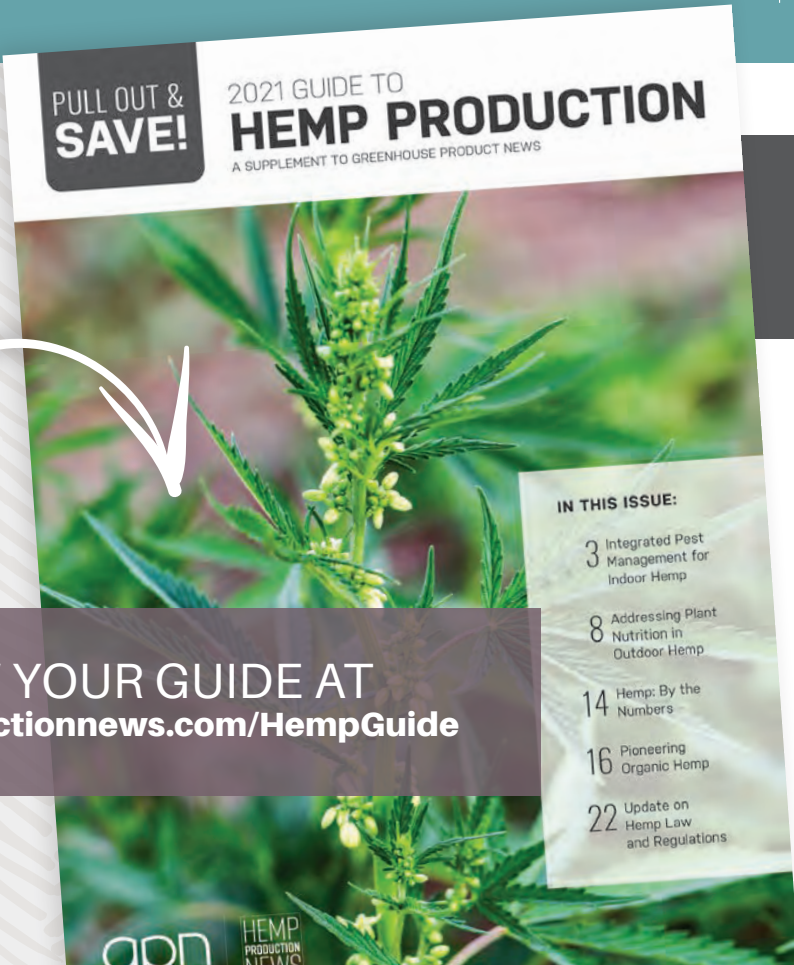
Designing your greenhouse is not just about location, it’s about creating the ideal environment for whatever crop you’re growing. “Look, the goal of a greenhouse is to capture the sunlight and control the environment,” Viegas continues. “Depending on the intensity of the sun, how many micromoles hit the greenhouse, how many hours of total sun you get, at what angle in the sky the sun is hitting the greenhouse the longest; all that affects heat, humidity and microclimates. Each commercial greenhouse needs to be considered through its own lens and designed based on the variables in that exact location.”

**LIGHTING CONSIDERATIONS**

For many growers, the ability to manipulate light is the variable that concerns them the most. We’re going to take a different approach and zero in on the cost. Marc van Iersel is a professor at the University of Georgia and one of the leading researchers in this field.

“How much does it actually cost to provide supplemental lighting in a greenhouse? Well, that depends on factors such as where in the world you are, what type of greenhouse you have, what type of crop you grow, and

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obviously the amount of supplemental lighting that you need to grow your crops changes over the course of the year,” says van Iersel. “It can be very difficult to estimate how much you are paying for electricity for that light. We estimate that depending on what type of crop you grow and where you are, the cost of electricity is typically between 10 and 30% of your operating costs.”

Viegas explained earlier all the factors that go into designing a greenhouse and lighting is one that you want to consider as well. The question is, how can you accurately estimate what those costs are, especially given all the variables in use? Again, we turn to van Iersel.

“To help people estimate the cost of supplemental lighting, we developed a lighting cost calculator and it is available on hortlamp.com,” he says. “It’s free, it will help you determine the cost of supplemental lighting in your specific greenhouse, and it’s very user friendly.”

EFFICIENCY THROUGH TECHNOLOGY

With all this voluminous data, the pressure to optimize efficiency increases and many growers are turning to technology to help manage the

information. One method that is rapidly growing in popularity is the use of AI and computer vision to bring all these variables together.

“Our goal is to match your environmental with a database of computer vision generated visuals to create crop recipes that growers can repeat over time,” states iUNU horticulturist Theodore Huggins. “Adding computer vision allows people to make better decisions and reduce the amount of risk.”

Today’s growers face a variety of challenges that were barely predictable 15 years ago, let alone at the time when many were graduating college. With the explosion in urban agriculture, the CEA industry is expanding at a faster rate than ever before. I’ll go back to my first paragraph. All these tools exist to make it easier for a grower to succeed. What makes things exciting is the variety of styles and approaches that growers use and how sharing those success stories benefits the entire industry. [gpn](#)

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Fully operational greenhouse courtesy of Envirotech Cultivation Solutions.



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Pictured: West Georgia Produce in the Atlas Pro-Com Greenhouse

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