10 TIPS FOR GREENHOUSE FACILITY DESIGN

EXCLUSIVE TAKEAWAYS
FROM CANNABIS CONFERENCE 2021

CANNABIS
CONFERENCE

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THE **EXPERTS**

Dr. Nadia Sabeh (A.K.A. “Dr. Greenhouse”) is president and founder of Dr. Greenhouse, Inc., an agricultural and mechanical engineering firm located in Sacramento, Calif., that specializes in the design of HVAC systems for indoor plant environments. She is considered the subject matter expert in the field of controlled environment agriculture (CEA).

Dr. Sabeh first became interested in CEA as an undergraduate, while working on a small shiitake and oyster mushroom farm in southern Idaho. For over 20 years, Dr. Sabeh has dedicated her education and career to helping farmers control their environments, allowing them to grow crops indoors, in greenhouses and in facilities that would otherwise be impossible or impractical to do so. She and her team have designed HVAC systems for facilities growing leafy greens, strawberries, cannabis, and vine crops all over the world. Dr. Greenhouse Inc. has consulted on over 100 projects.

Dr. Nadia Sabeh

ALL CONFERENCE PHOTOS BY LAS VEGAS EVENT PHOTOGRAPHY

THE **EXPERTS**

Michelle Hackett

Michelle Hackett is president of Riverview Farms (RVF), a fully integrated cannabis company in Salinas, Calif. Riverview Farms is female-minority-owned, and 75% of the company's workforce is minority women. Riverview Farms, established in 2016, was is the first operation in the Salinas Valley to receive an exemption to grow cannabis within Monterey County. Hackett, who was first exposed to agriculture in college, continued her path by joining her father and RVF Founder Mike Hackett in 2017 running the company's sales division. She eventually took over the company's full operation with her sister, Lauren. During her tenure at RVF, Hackett has fostered connections with some of the largest brands, distributors, and retail outlets in the state, and her "take-no-prisoners" attitude and drive has helped her break barriers and continue to challenge county regulators to improve its rules and guidance for cannabis operators. Hackett holds a bachelor's degree in business administration from Saint Mary's in Moraga, Calif.

THE **EXPERTS**

Robert Eddy

Former Greenhouse Manager at Purdue University for 20 years, Eddy was responsible for hundreds of controlled environment agriculture studies involving flowering, food and medicinal species in both greenhouses and indoor grow rooms. His greenhouse optimization protocols have been downloaded over 60,000 times in 52 countries. He served on design teams for Purdue's automated plant imaging center; an underground growth room in a limestone mine; a tiered grow room, and multiple campus greenhouses. As founder of CEA Consultancy LLC, he has consulted for Dow AgroSciences, Novozymes, BrightFarms, AeroFarms and other hydroponic and cannabis operations. He has written sustainable, science-based cultivation plans for cannabis licenses awarded in Missouri and West Virginia and serves as national Director of Agriculture for Rookwood Holdings, LLC.

Consider Nursery Retrofits

Michelle Hackett: "For us, in Monterey County, Calif., we've transitioned a lot of greenhouse nurseries that were prior used for plants like roses, poinsettias, succulents, various crops of that nature. … A lot of these old wooden structures were not necessarily [built] to grow high-quality cannabis; however, they were very useful to us for nursery mother plants. Some of the main things that contributed to us retrofitting our greenhouses were **raising the roofs so that we had more climate control and atmospheric manipulation of the greenhouse**. We are using all-natural light. We don't use any third-party or supplemental lighting in our particular greenhouse, though many of the cultivators in our area do. But in a greenhouse facility style, you have to think of all the ways in which you can maximize your plants without having the luxury of complete temperature control manipulation."

METRICS

2.

Take Note of the Variables **You Can Manipulate Immediately**

Michelle Hackett: "There are certain things that we are able to adjust fairly quickly. Having the pots for your greenhouse either on the ground or on a racking or table system—**that's something you can manipulate very quickly.** Whereas something like a power upgrade for putting in lights is a much longer process."

3.

Don’t Reinvent **the Wheel**

Michelle Hackett: “At Riverview, we always have the philosophy: Turn something old into something useful and new. We’re not reinventing the wheel in cannabis cultivation. **A lot of what we know in ag and plant science can be used in today’s technology of cannabis**.”

Robert Eddy: “In a lot of ways, cannabis reminds me of cut flower production. The photoperiod control is a lot like poinsettia production.”

Know Your Compass Coordinates—and Know Your Building Materials

Robert Eddy: "With greenhouses, you tend to want to orient them **north-south if you want uniform light or east-west if you want the most light**. But the thing about cannabis is that if you've got opaque side walls and you've got light-diffusing panels or polycarbonate up there, the whole orientation with the sun begins to be not so important."

Dr. Nadia Sabeh: "One of the big things with greenhouses is, from an environmental management perspective, you're much more exposed to the weather—to what the sunlight condition are, to the temperature and humidity, to the wind direction and to how you orient your greenhouse."

5.

ENERGY

Don’t Overlook Your Utilities

Dr. Nadia Sabeh: “With greenhouses, we tend to think of them as being energy-efficient. **But you still need to heat a greenhouse or power the lights or power the curtains**.”

REGULATIONS

6.

Read Your **State's Fine Print**

Dr. Nadia Sabeh: "If you do decide to air-condition a greenhouse, it now becomes a commercial building—at least in California. That sets off a whole bunch of different codes and regulations that you have to follow and meet and show compliance [with]. **If you do a traditional greenhouse that's just vented with evaporative cooling, you would be considered a utility building**, which is an agricultural structure, and all of the sudden many of the regulations disappear—and you can almost do what you want, as long as you stay within the definition of what an agricultural structure would be."

7.

REGULATIONS

Be Aware of Local Codes When Retrofitting

Michelle Hackett: "We've gone back and forth with what the county has wanted from us, … and every single time [regulators visit the greenhouse,] there seems to be a new challenge around the bend. Monterey County was big on stipulated agreements for drying. That's not necessarily your greenhouse facility, but for many of us that are cultivating, we are vertical. So, where does that product go after the life cycle of completing a harvest? Well, they don't want us to dry in the greenhouse, so for some of us who didn't have state-of-the-art dry spaces, we really didn't have an option. There were areas on our property where we could makeshift a dry space; however, that would never be compliant. So, all of us are in these stipulated agreements, which is basically us paying to use our own facility to dry our own product—even though it will never be compliant [without those stipulated agreements]. **A lot of us are building new structures from the ground up to be able to properly dry and hang our product, and that is a very, very long process**."

Get Out Ahead of Supply Chain Challenges

Michelle Hackett: "**The No. 1 bottleneck we see is raw materials**. Every single cost-of-good has gone up, from lumber to coco to the ingredients we mix to make our own fertilizers. And the lead times are significantly further out, as well. We've just seen a huge increase in costs across the board."

Robert Eddy: "We're just adding three months to construction time. Whereas a greenhouse should take nine to 12 months to build, now we're saying 12 to 15. And we're kind of banking on it costing 20% more, but who knows? But that's what we're inching toward. Every week it's something else that you didn't think of."

9.

AUTOMATION

Find Ways to **Automate**

Robert Eddy: “I’d like to automate, because I feel like it makes the job more exciting. Automating the watering is the best example. Watering plants is just so boring. You can get into a haze that can be relaxing sometimes, but it’s just so boring for the employee. Once you automate it, then you’re teaching the employee how to build those systems and how to monitor those systems. Then you start teaching that employee how to program those systems. … **Now, you’re building in some real skills and hopefully making a job a little more exciting**.”

Recapture Your Water

Michelle Hackett: “Both of our farms have their own water wells, so that’s where our water is actually coming from. But that’s a natural resource, so we’re very lucky. With that being said, we still want to be eco-conscious and we want to be sure that we’re making the most out of our natural resources. **Recapturing water and using it again**—that’s a huge impact that we’ve been able to have on our natural environment. It’s just allowing us to use less water and then repurposing water that’s already been used. And there are many functions on the farm where we can use that water again.”

BONUS: THINKING AHEAD

“If You Could Have a Greenhouse Anywhere, Where Would You Put It?”

Robert Eddy: Great question. Not in Indiana, where I currently live. The challenge is the evaporative pads don’t work—or they do work, but not as well as they would in the Southwest. But the high temperatures scare me, as well, like in Las Vegas. If I could find somewhere in between, I don’t know what that would be—perhaps Colorado. One thing I would point out: Indiana has a lot of water, a lot of fairly good-quality water. It’s alkaline, but you can clean that up. The more and more I look at what’s happening right now, the more it scares me—the thought of putting a greenhouse in an area where the citizens need the water more than my greenhouse does.”