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It's *showtime!*

So, here's a confession: This will be the first year I've attended AmeriCanHort's Cultivate show in Columbus. But I've got a good reason for that. The July show arrives at the end of my first year editing and reporting stories related to the industry in *Greenhouse Management* magazine and our sister digital publication, *Garden Center* magazine.

Around here, Cultivate is something of a legendary pilgrimage, and it acts as an inflection point in our editorial year. Largely because of the show, our July issue is packed. We have the New Annual Varieties guide, the State of Growing Media Report and a few more special additions that you'll be able to find in your mailbox and on the show floor. It's a lot of work, but it is a labor of love. For us, attending Cultivate is a dive into the best of the horticulture industry as much as it is a celebration of providing the best coverage of the industry possible.

I love that Cultivate occurs in the middle of the year, just a tad past the summer solstice. This is a time when those who grow appreciate what's taken root and start looking for the harvest to come. In some ways, the gathering in Columbus is the perfect reflection of that tradition translated to business. The vendors, speakers and events provide that sense of potential that you see in your greenhouses. The sessions and exhibits show the hard work that's already been done. When we walk away from the show floor or the meeting room, we carry that potential and have the opportunity to harvest success when we put the ideas into practice or put the materials into production.

To say that I'm excited to attend Cultivate for the first time is something of an understatement. I've been looking forward to it all spring. And yes, I know it may be overwhelming, and even exhausting, but I'm excited to meet many of the folks I've interviewed for stories over the last year and make a bunch of new connections.

I am an incredibly curious person. I grab on to any chance I have to learn something new. So, this is my request for you: Do not hesitate to reach out or pull me aside if you see me at the show. I want to know what's new with you and what you have in the works. I want to learn about the innovations you've developed for the horticulture industry and try out the cool things you're making. It is, after all, what I'm there for.

If you'll be in Columbus and want to chat, send me an email, and we'll get coordinated. It's time for us to shine. It's showtime.

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Fertilizing FOLIAGE

Understand the key differences and similarities between feeding foliage and flowering crops.

With the increasing popularity in foliage crops, have you reconsidered your fertilization approach? While there are certainly similarities to well-established practices in floriculture crop production, there are some key differences as well. Let's take a look at how to adjust more traditional flowering crops' fertilization plan to better suit containerized foliage plants.

One of the most fundamental questions is how much fertilizer, or what concentration, should be applied to foliage plants. Before we highlight how foliage crops differ from flowering ones, let's at look how they are similar.



Designing fertilization programs for foliage plants can draw on some fundamentals of flowering plant production.

The range in nutrient requirements across foliage plant species is like the variation in floriculture species — crops range from low to moderate to high nutrient requirements. Now, setting species-specific requirements aside, foliage crops are generally provided with more fertilizer than flowering crops. But it can also be common to reduce fertilizer concentrations for floriculture crops to avoid unwanted or excessive vegetative growth before the crops are finished, as flowers are developing.

For foliage crops, they are not considered "finished" when flowering occurs; rather, foliage plants are considered "finished" when the plant size is appropriately balanced for the container. Since we do not need to promote both vegetative (foliage) and reproductive (flowers) growth, we do not need to use as much nutrient restriction as may be used for containerized flowering plants.

This is not to say that foliage plants should be provided with excess nutrients and finished plants have soft and stretched growth. Simply, the same restrictions don't need to be exercised for flowering plants to balance vegetative growth while flowers are developing.

Fertilizer concentrations should also be adjusted to the amount of light the plants are receiving, or daily light integral. Of course, light will vary over

PHOTO © SYARGEENKA | ADOBESTOCK

the course of the year in the greenhouse with the change in seasons. However, light may be manipulated for acclimating foliage plants for subsequent retail and consumer environments. In some instances, foliage plants are grown under high light intensities, and acclimation to less-intense light can improve their postharvest performance. When light is reduced, fertilizer should also be reduced. Conversely, if foliage plants are placed under higher light intensities, increase fertilizer concentrations.

When light is reduced, fertilizer should also be reduced. If foliage plants are placed under higher light intensities, increase fertilizer concentrations.

In addition to the concentration of nutrients, we also want to consider the ratio of elements to one another. For flowering plants, it is common to have a nitrogen (N) to potassium (K) ratio of 1:1. For foliage plants, this can decrease. Using a higher proportion of nitrogen is desirable to promote the vegetative growth of foliage plants. Phosphorous can promote flowering (up to a point), as well as stem elongation. But with foliage plants, neither of those characteristics is desirable. For most foliage plants, there is no reason to promote flowering, much less enhance it with additional phosphorous. Additionally, while we want to promote vegetative growth for foliage plants to reduce the time it takes for the plants to be finished and reach a saleable size, we don't want to achieve that with excessive stem elongation. While an N:P:K ratio of 2:1:2 or 3:1:3 is common for floriculture crops, an analysis like 3:1:2 can be good for foliage crops.



In addition to the N:P:K ratio, don't forget about the ratio of micronutrients to macronutrients. For example, fertilizers with the name "Peat Lite" indicate that micronutrients are approximately double of those found in the original (non-Peat Lite) formulations. These formulations with a higher concentration of micronutrients per unit of nitrogen are useful for foliage crops that are inefficient at taking up micronutrients or simply have a higher requirement for them.

Finally, the type of nitrogen used for fertilizing foliage plants is essential, particularly in terms of their effect on substrate pH. Fertilizers with more nitrate (NO_3^-) raise substrate pH, whereas a greater proportion of ammonium (NH_4^+) or urea (which is quickly converted to NH_4^+) decreases substrate pH. The use of potentially basic or acidic fertilizers to steer substrate pH is used in both flowering and foliage crops. But other factors related to foliage crop production can influence fertilizer selection.

It can be common for air temperatures to be warmer for foliage plant production compared to floriculture crops. This is not necessarily because foliage plants are any more "tropical" or heat-tolerant (but in some cases they may be). Rather, the warmer temperatures increase developmental rates and reduce time to finishing. Although flower quality can decline with warmer temperatures, this is not a problem for foliage plants. Under cooler production temperatures, nitrate is useful when nitrifying bacteria are less active and ammonium toxicity can be a risk. With foliage crops, the warmer production temperatures make ammoniacal nitrogen sources, including NO_4^- and urea, very useful for production.

Designing fertilization programs for your foliage plants can draw on some fundamentals of flowering plant production. However, using some of the finer points of foliage plant production to further fine-tune your foliage fertilization programs can help reduce production time and increase the bottom line. GM



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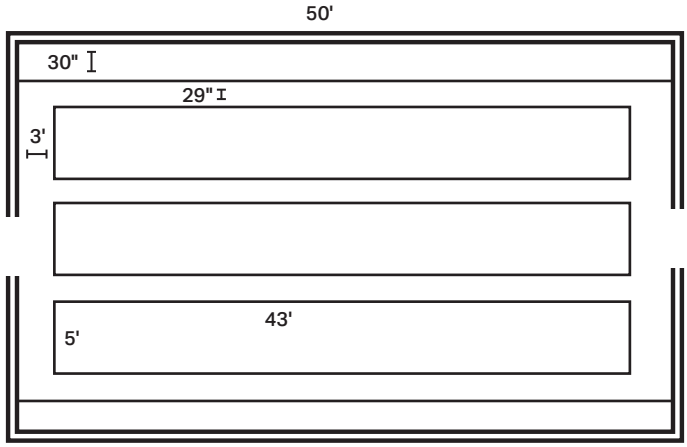
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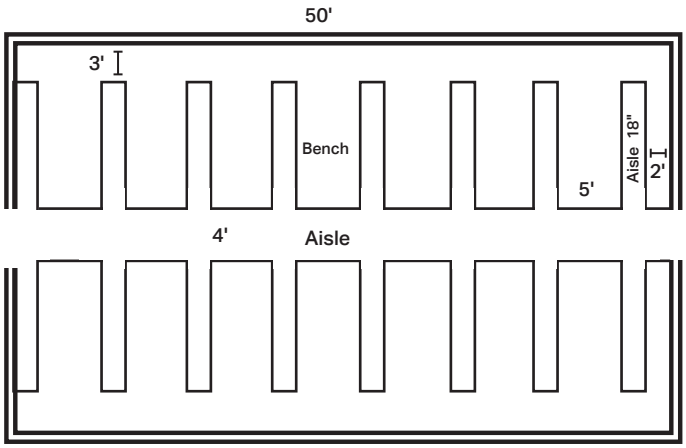


Square foot considerations

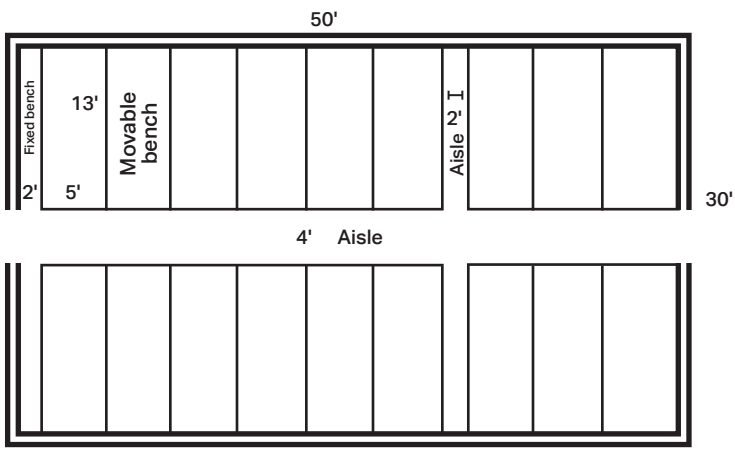
10 tips for increasing production space without adding greenhouses.



A. Longitudinal bench layout – 59% growing area



B. Peninsula bench layout – 69% growing area



C. Movable bench layout – 81% growing area

Growing space is expensive.

One excellent way to reduce production cost per plant is to make better use of greenhouse space. The cost of providing heating and cooling is the same, whether you utilize 50% of the space or 100%. Every square foot that has plants means additional dollars of income. The following are 10 ways in which growing area can be increased.

1. Peninsula benches

Conventional lengthwise benches typically cover about 60% of the floor area. The remaining 40% is for aisles to access the plants. Changing to a peninsula arrangement that places the benches perpendicular to the sidewall with 18-inch work aisles between and one 3-foot to 5-foot main aisle down the center will increase growing space by at least 10%. This system also provides easier access for moving plants with carts or conveyors.

2. Movable benches

With this method, up to 90% of the total greenhouse area can be covered with benches. Two types of systems are common. The simplest is to install the benches that remain in the greenhouse but move sideways on rollers placed over a support frame. By moving the benches, a single work aisle can be located wherever it is needed. The steel rollers create very little friction, and a 100-foot bench can usually be pushed by hand.

A more efficient system from a labor standpoint is the movable tray system. Modular trays, usually 6 feet wide by 8 to 20 feet long, are moved to and from the growing area on rails, carts or conveyors. Transplanting, loading and unloading trays are done in a headhouse area, where everything is more convenient.

3. Roll-out benches

You can double growing space by placing one layer of plants on a heated floor and a second layer 20 to 30 inches above the floor on a pipe support system. During the day, the trays are rolled outside the greenhouse onto a matching pipe network. Both crops receive full sunlight. At night, they are rolled

PHOTOS BY JOHN BARTOK JR.

back into the greenhouse. This system can be adapted to both hoophouses and gutter-connected ranges. The system is good for hardening off bedding plants during the spring and for potted plant production during the fall.

4. Floor production

It is a common practice to leave only one narrow aisle down the center of the greenhouse. Space utilization is almost 100%. This low-cost system can be improved with heated floors and boom watering. Access is only needed to observe the plants. When shipping time arrives, a work aisle can be created by removing the plants out of the center of the greenhouse first.

Flooded floors: A modification to the above system being adopted by larger growers is the flooded floor system. Although the concrete floors, pumps, tanks and controls cost more, plant production is very uniform due to the even watering. Handling of the plants is best accomplished with a gantry that straddles the width of the bay or with a fork truck.

5. Racks

If you are growing hanging baskets or larger potted plants, an A-frame rack system can double your growing space. Racks are especially effective where foliage plants are grown, creating conditions similar to a forest canopy. They can be built with 2-by-4 lumber and fence pipe or with heavy steel rods. Racks can be made movable but are usually fixed to the floor or overhead trusses. If you are going to suspend the racks, be sure that the greenhouse frame is strong enough.

6. Hanging baskets

Many growers place containers over part of their growing area to increase space utilization. In taller greenhouses, two or three tiers of baskets may be suspended. These baskets are fitted with an automatic watering system, and the spacing depends upon the light requirements of the crop on the floor or benches beneath.

A more efficient system is the hanging basket conveyor, which is attached to the overhead trusses in the greenhouse. Plants spaced as close as 8 inches apart are supported by a conveyor that moves them past work and watering stations. The savings in labor of having plants brought to an aisle for placement, inspection and shipping can offset the cost of the system.

7. Under bench production

A few growers utilize the space under benches as a production area. It works well for crops like groundcovers. By adding LED strip fixtures, other low-light crops can be grown. But note

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that watering is more difficult, and there could be increased disease problems.

8. Utilize aisles and walkways

I have been in many greenhouses where wide aisles were installed to allow for customers during the busy retail sales period. In gutter-connected houses, these are sometimes 10 to 12 feet wide. An aisle this wide is seldom needed except during shipping time, and some of this space could be filled with plants on the floor, benches or racks.

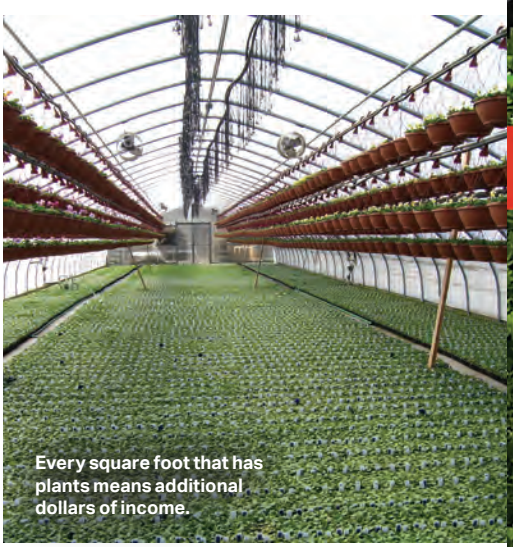
9. Movable greenhouses

A trend by growers using high tunnels for vegetable production is to install low-cost movable greenhouses. One area is used for early season production of greens. When the weather warms up, the greenhouse is moved to the adjacent area for warm season crops, such as tomatoes and cucumbers. The greenhouse frame runs on rails or skids and is moved with a tractor or winches. These structures may also have applications for protection of perennials and herbs during the winter and for cool temperature production during the winter.

10. Removable hoophouses

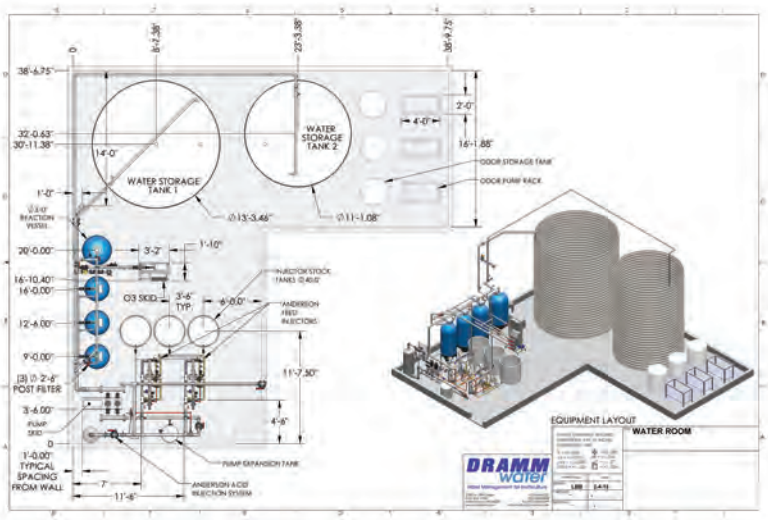
The space allowed for snow accumulation between free-standing greenhouses could be set up with hoops that are covered with plastic after the threat of snow is over. This space is the most valuable during late spring just before shipping season begins, when the conventional greenhouse space is overflowing and there is a need to harden off plants. A little heat could be added, possibly from the adjacent greenhouse.

Today, as energy costs increase, good growing space utilization is important. Making use of some of the above systems, keeping growing space full and providing optimum environment control can help to produce plants at the lowest cost. GM



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By Brooke Bilyj

Garden ready

Meet the Chicago Botanic Garden's new ornamental plant breeder: Justin Lombardoni, Ph.D.

Growing up on an eighth of an acre in New Jersey, Justin Lombardoni wasn't surrounded by plants at an early age like many aspiring young horticulturalists. It wasn't until middle school, when he stumbled upon a neighbor's seed catalog, that he discovered his fascination with flora. Before long, he was starting his own seeds and germinating all sorts of annuals and perennials to fill his small yard with as many plants as possible.

By the time he got to high school, Lombardoni knew he wanted to pursue a horticulture career. He earned a bachelor's degree in plant science from Cornell University in 2016, followed by a doctorate in plant breeding and genomics from Rutgers University in 2022.

"While I was in grad school, I was so focused on lab work that I hardly ever got to work with plants," says Lombardoni, who currently serves as president of the northern region of the American Society for Horticultural Science. Then, fresh out of grad school, he landed his dream job at the Chicago Botanic Garden as an ornamental plant breeder. Now, after nearly a decade of lab work dealing with hazelnut genetics, Lombardoni is happy to be surrounded by flowering plants again.



Justin Lombardoni earned a doctorate in plant breeding and genomics from Rutgers University in 2022.

Breeding desirable traits

Lombardoni relies on traditional breeding methods at the Chicago Botanic Garden, where he hand-crosses plants when possible



Lombardoni hand-crosses plants when possible and sometimes resorts to open pollination.



To supplement traditional breeding methods, Lombardoni is also experimenting with chemical mutagenesis to introduce new variations into the program.

PHOTOS SUBMITTED BY JUSTIN LOMBARDONI

and sometimes resorts to open pollination. To supplement these traditional breeding methods, Lombardoni is also experimenting with chemical mutagenesis to introduce new variations into the program, which works exclusively with herbaceous perennials.

"The goals of the breeding program are fairly traditional, as well," he says. "We're looking for any desirable traits that differentiate a selection from cultivars that are already on the market — whether that's a different size or growing habit; a cool leaf variegation; larger, more abundant flowers; or, of course, new flower colors worthy of new cultivars."

Most importantly, new plants must demonstrate winter hardiness and adaptability to survive the harsh seasons of Midwestern gardens. To that end, Lombardoni partners closely with the botanic garden's Plant Evaluation Program, which formally studies new cultivars. Plants that pass evaluation are ultimately released through the Chicagoland Grows Plant Introduction Program, a unique partnership among the Chicago Botanic Garden (which develops herbaceous perennials), the nearby Morton Arboretum (which focuses on woody ornamentals) and the Ornamental Growers Association of Northern Illinois.

"This is the only breeding program at a botanic garden that I know of in the country," Lombardoni says. "Some may have someone who dabbles in breeding, but we have a breeder and an introduction program with consistent introductions, so we're kind of unique."

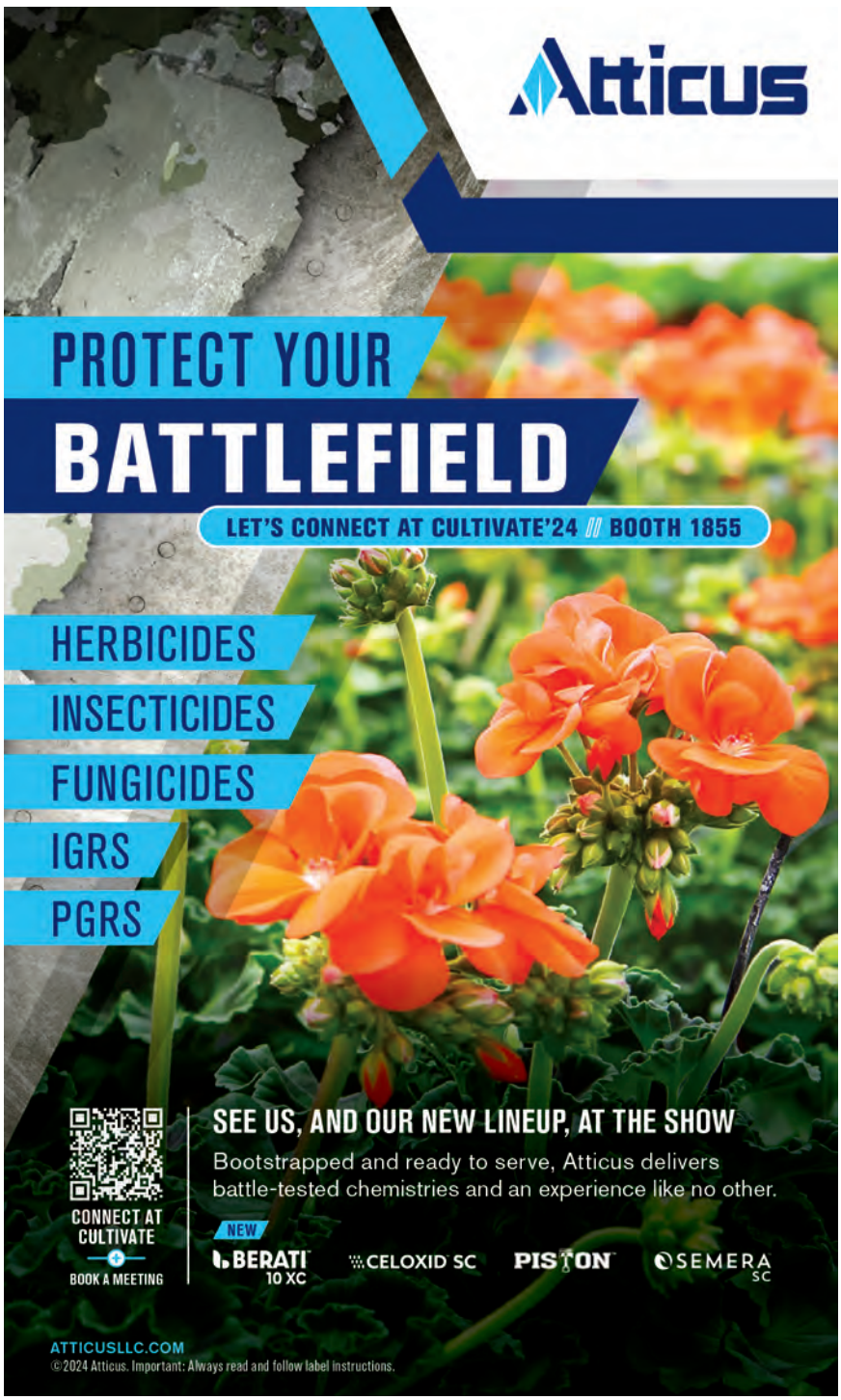


Lombardoni says his goal is to "introduce cultivars from less prominent genera to increase the variety of what we see in a typical garden."



Finding a new focus

Since stepping into his role in May 2022, Lombardoni has continued some of the work started by the garden's previous breeder involving genera such as *Amsonia* (bluestar), *Panicum* (switchgrass), *Vernonia* (ironweed) and *Baptisia* (blue wild indigo). He has already helped introduce several of his predecessor's cultivars, including the supersized Amsonia 'Blue Behemoth' and the late-blooming Baptisia 'Last Dance'.



Because it can take several years to get from an initial cross to an introduction, Lombardoni is still finding his own focus within the breeding program. For example, he made his first *Panicum* cross in late 2022. The seed was stratified and germinated in the greenhouse the following spring, and by the summer of 2023 — one year after the initial cross — Lombardoni started making selections. "I eliminate, on average, about half of the progeny at that point," he says. "One of the best traits a breeder can have is the ability to cull and get rid of things."

After overwintering, he planted his surviving selections in the program's outdoor breeding beds, which cover a quarter-acre in total. He'll continue to observe his crosses over the next year and make another round of selections in 2025. "You're continually culling a few more each year, and then once you're sure it's hardy enough to overwinter, you need to give it a few years of propagating to make sure that each one looks uniform," he says. "It's a long-term process."

Introducing new varieties

While the specifics of his breeding focus are still taking shape, Lombardoni says his goal is to "introduce cultivars from less prominent genera to increase the variety of what we see in a typical garden."

Of course, that focus comes with frustrations — like the mechanics of actually making crosses manually, which can be tedious and time-consuming. Plus, because he's working with less common genera, the lack of genetic research can be another challenge.

But those hurdles can't hold Lombardoni back from "the excitement of breeding something new, something attractive enough for someone to choose for their garden," he says. "Of the thousands of cultivars that are available across different genera and species, the possibility of somebody choosing your cultivar is really exciting, and that's what drives me." GM

Brooke Bilyj owns and operates Bantamedia, a national award-winning content, PR and SEO firm based in Cleveland. She is a frequent contributor to GIE Media's horticulture publications.

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- It has disease-resistant, lush foliage that stays clean late in the season, providing wonderful contrast to the blooms.
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There has been a lot of breeding work done with this species, so the team at Bailey – brand owner of First Editions® – worked for years to make sure that they weren't just putting out another hydrangea, but a better hydrangea.

Starting in 2016, the Bailey team, led by Debbie Lonnee, began work with long-standing partner Dr. David Zlesak to develop a new hydrangea that solved the problems for customers all along the supply chain. The breeding project had an initial focus of breeding a better production plant, making sure that growers could have a stronger, healthier product from the beginning. The team acknowledged that if a new introduction isn't grower friendly, it's not going anywhere.

Parallel to the grower focus was making sure that once FlowerFull™ left the nursery it had staying power on a retail shelf and in the landscape. All those boxes must be checked before any real consideration for introduction. As all the breeding program's accessions were evaluated, FlowerFull™ instantly rose to the top as a high performer and not only checked the boxes but filled them in completely.

And that's where the broader team came into play. Not only did the Bailey team receive plants across the country for production and in-ground trials, but additional secure trial partners and First Editions® brand licensees received samples for their own testing. It's this broader network that either helps affirm the breeding trial's positive results or raises concern and slows down the consideration process.

As trial feedback returned, the Bailey team saw that FlowerFull™ continued to prove that it was a rock star plant across the board, even at the Bailey Innovations™ breeding facility in Athens, Georgia. Getting the thumbs up from growers across the country gave confidence that FlowerFull™ was a great national performer, backed by regional data. So, it was a go!

As FlowerFull™ makes it to the market in 2025, it stands to follow in the footsteps of major First Editions® introductions that disrupted crowded categories like Eclipse® Bigleaf Hydrangea, Little Hottie® Panicle Hydrangea, Crimson Fire™ Fringe Flower, and Cinnamon Girl® Distylium. The excitement from trial partners and those with a sneak peek are a strong precursor for what impact FlowerFull™ will have with this gorgeous native selection.

Plants will be available for sale in Fall 2024 from First Editions® Shrubs & Trees brand licensees across North America. For more information, please visit **baileynurseries.com/new-varieties**.



Scan the QR code to see FlowerFull™ standing tall during a windy storm and being shaken in a production greenhouse.

A knack for *nurturing*

Spring Creek Growers weaves authenticity into its **teams, products, messages** and **customer relationships.**

By Kelli Rodda | Photography by Nathan Lindstrom

When Lauren Kirchner, president of Spring Creek Growers, surveys the greenhouses full of plants or the delivery trucks leaving the South Texas facility, she sees much more than just carts full of merchandise. She sees a creation that "enriches people's lives."

Spring Creek Growers operates just shy of 52 weeks a year, shipping annuals (their biggest crop), herbs, vegetable starters, garden mums, poinsettias and some perennials. Their biggest customer is H-E-B, a rapidly expanding Texas-based grocery chain, followed closely by SiteOne Landscape Supply.

"When I say we're enriching and changing people's lives, there's so much involved in that idea," Lauren explains. "Some of it is from the customers who walk into an H-E-B store and find a fun, inspirational product they can plant, eat or use as decoration. It's also the way our products set the tone for a place of residence, whether that's an individual home or a multifamily setting. When a commercial landscaper walks into a distributor like SiteOne, the products we're growing can create the overall vibe for a home or a neighborhood. The plants we're shipping out of our facility are creating a nice space for someone. They're impactful."

Lauren's dad and Spring Creek founder, Bob Jones, initially forged the relationship with H-E-B, and Lauren has enjoyed reinforcing that partnership. The grocer is big on promoting local suppliers throughout its stores, and Spring Creek tags and signs overflow with that locally grown message. Lauren and her team write all their own tag copy and create the signage on the H-E-B carts. The design and the message have to meet certain criteria: It has to be fun, creative and positive, and it has to be accessible. That last objective is vital because marketing and product development are no longer focused on appealing to only women.

"We now need to appeal to a wider audience. Yes, a woman around my age and demographic is still considered a sweet spot — at least in terms of the propensity to make a purchase — but now we have more men as primary buyers of green industry products," she adds. "And the younger generations are really interested in growing and harvesting their own food. I'm always thinking about motivating factors during a shopping experience."

Some of the brands Spring Creek has introduced at H-E-B include Groovy Flower Power, a line of plants designed for easy and fun mixed containers; Bloom Republic – A Texas Collection, which includes heat-loving annuals and perennials; and Green Street Botanicals, a line of easy-care indoor/outdoor plants.

Spring Creek's latest program at H-E-B came from her brother Evan Jones' hobby and some family entertainment.

[continued on pg. 26]



Lauren Kirchner did not grow up in the greenhouse industry. Her dad started Spring Creek Growers the year she started Baylor University. Lauren says her "outsider's" view has been beneficial to the company.

School is in session





After the COVID-19 shutdowns, the elementary school Lauren's boys attend resumed extracurricular clubs. When Lauren accompanied her boys to the program signups, she was stoked to see a poster for Garden Club. She offered to help — after all, she was the perfect candidate.

"What I didn't know was that I'd basically end up funding the whole thing and bringing everything," she says with a chuckle. "Two or three meetings into it, the sponsor teacher asked, 'You got this?' and I said, 'Yeah, I've got this.' I'm forever grateful that she started a garden club. This has become the absolute light of my life."

The original founder of the club moved to another school district, and a new teacher, whom Lauren calls "a living angel," became the sponsor. The club has grown significantly, with 86 kids signing up this year.

"It's kind of a big deal," Lauren says proudly.

Lauren creates the curriculum every week and brings all the supplies.

"I try to find things I think the kids are going to be interested in. They don't want to fill out a worksheet. They don't want to color parts of the plant. They do that at school. They're coming to Garden Club to get their hands dirty and to actually connect with nature," she explains. "Most weeks, we put our hands up in the air for a photo that shows how dirty our hands got. We're not afraid of dirt, and we're not afraid of bugs."

Garden Club includes kindergarteners through fourth-grade students. It's the only club at the school where kindergarteners can participate, and that age group makes up most of the club.

"There's a lot of teaching going on. There's a lot of teamwork going on. There's a lot of responsibility going on," she says. "It is truly magical, and I never want to stop doing it. I love it so much."

Lauren says she tries to give them a level of responsibility they may not get elsewhere.

"We're planting some really deeply rooted seeds here. It's just so joyful," she adds.

For the final week of Garden Club, the students learned about predatory insects.

"Luckily and embarrassingly enough, I had some pepper plants here at the nursery covered in aphids. So, I decided we're going to make lemonade out of these lemons. I grabbed them and decided to do a ladybug release.

"We're releasing bags of ladybugs, and they're just screaming with joy," she recalls. "They got to actually see the ladybugs eating the aphids on these plants, up close and personal. It was so cool."

Her youngest son has two more years of elementary school, and Lauren will continue to lead Garden Club. Then, she hopes to pass the torch to someone just as passionate about horticulture education. She also has bigger plans.

"This is obviously a passion project of mine, and what I'd like to do is see what other resources I can tap — whether it's H-E-B or Tomball [Independent School District] or whomever — and see how we can replicate this magic to more schools," she explains. "How can I standardize and formalize this process so it can be replicated to other schools and other experiences?"

Besides sharing the love of horticulture with elementary students now, she's also looking way into the future with this project.

"I'm manufacturing my own employees now. I'm starting at kindergarten, and I'll see some of them come and work in the industry. I'm going to have to wait a minute, but they're coming."



PHOTOS COURTESY OF LAUREN KIRCHNER

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(L-R) Melissa McCoury, Evan Jones, Lauren Kirchner, Kailey Swanberg and Miguel Esquivel make up part of the management team. Jones and Kirchner are siblings and recently took over the business from their parents.

[continued from pg. 22]

"A few years ago, my brother started a hobby vineyard growing Blanc du Bois grapes, and we started a family harvest tradition. Every year, we wake up at 5 a.m., get kolaches and harvest the grapes. It has to be done really quickly before sunrise, because that's when the sugar content of the grape changes," she says.

And for the first time this year, the greenhouse is selling Blanc du Bois grapes in a 3-gallon pot with a trellis in H-E-B stores complete with the Texas Roots tagline.

"It's very special to us, and that's the kind of storytelling H-E-B fosters," she adds.

New visions

The past 12 to 18 months have marked a pivotal point for Spring Creek Growers. Lauren and Evan's parents, Bob and Carla Jones, just retired. The succession plan was developed about two years ago. Lauren is president and Evan is chief of operations, and the siblings now own a part of the business. Bob founded the greenhouse in 2004, the year Lauren left to attend Baylor University. The siblings didn't grow up in the greenhouse business. However, their family owns a Christmas tree farm that's been in her mom's family for many years. But Evan wanted to return to the family business, while Lauren was

[continued on pg. 30]







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The silver lining in the storm

The fortitude of the Spring Creek Growers team was tested May 16, 2024, when a derecho — a widespread, long-lived wind storm associated with a band of rapidly moving showers or thunderstorms, according to the National Weather Service — hit its Waller location. One greenhouse was destroyed and other parts of the business were damaged, but thankfully, no one was injured.

Earlier that day, it was business as usual, and Spring Creek President Lauren Kirchner was tending to some business at her desk. She routinely keeps the weather radar on, and this day was no exception.

"I watched the storm all day. Boxes of severe weather warnings were all around us on the radar," she says.

She told Spring Creek supervisor Miguel Esquivel that she planned to send everyone home at 4:30. Most of the crew left, while Lauren, Miguel, the distribution manager, two spray techs and a maintenance staff member were still at the greenhouse.

The storm was bearing down on the property, and Lauren needed to get home to her husband and young children. When she walked out of the office, the sky was tinted green, and everything was completely still.

"It was dead calm, and not a single bird or anything was making a sound," she describes.

She began to outrun the storm in her car and stayed on the phone with Miguel as long as cell service remained.

"All I could think about was my family at home and the safety of my employees," she recalls.

When Lauren arrived home — it's about a 25-minute drive from Spring Creek — the power was out, but her family was safe.

"Trees were blowing one way, and rain was coming from the other way. It ended about 20 minutes later," she says.

She kept checking for cell service, and when it finally came back, she got a call from her brother, Evan.

"We lost C-range," he told her. "We lost it."

Lauren remained calm and asked about the crew. Everyone was OK.

She learned that not everyone was able to take cover in the warehouse. The spray techs ended up throwing their equipment down and ducking into the chemical room in D-range, which is only 30 feet from the greenhouse that was destroyed in the storm.

"They had a brush with death," Lauren solemnly recalls.

PHOTOS COURTESY OF LAUREN KIRCHNER









At that point, she loaded up her children and husband to drive back.

When they pulled onto the property, she could see C-range leveled and piled on top of the plant material inside. But the generator was powering the facilities, and she continued to rejoice that no one was injured. "As devastating as it was initially, I was still so filled with gratitude because it could have been so much worse," she explains.

The team assessed the other greenhouses, making sure they were safe to enter. "We started with safety protocols — what can we do safely, and do we have the tools we need? We did a lot of 'if this-then this' scenarios," she says.

They cut up the felled greenhouse and retrieved the salvageable plant material, which consisted primarily of 12-inch pentas and some 4-inch flats of other plants.

"Because we were so aggressive in getting C-range off of the plant material, we salvaged 50 or 60% of the plants," she says. "I even tunneled in there and handed plants assembly-line style out of that mess."

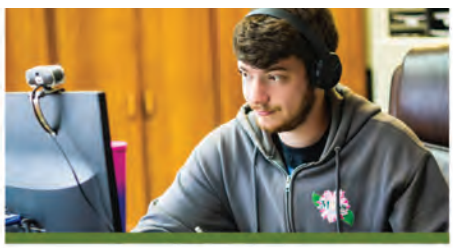
Besides C-range, there was still a fair amount of damage across the property. But they only lost three days of shipping. She contacted customers and sent three email updates to keep everyone informed of the cleanup process and any delivery delays. "All of our customers were so gracious and so understanding," she says.

The company didn't have a formal disaster plan.

"[After the storm] I was making it up as I went along," she says. "But I feel good about the way we approached everything. I wanted to get back on track safely, efficiently and effectively."

By June 1, construction crews were already on site ready to rebuild C-range. Some of the takeaways from this experience include being "acutely aware of the how we approach repairs and construction, including the materials to use," she explains. "We're also looking at increasing our insurance coverage and deciding how much premiums we're willing to bear for all the 'what ifs.'"







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[continued from pg. 26]

more interested in corporate America, a path she found was not meant for her.

"Mine and Evan's relationship very much complements the business," she says.

It took about a year to figure out what everybody wanted in the succession plan, which she says was a challenging process.

"Besides the family dynamic, you have to think about as an individual and ask, 'What do I want? What do I want for my spouse? What do I want for our children? What do we want the future to look like?' We're going to be different people in 15 years, so that was a challenge.

"It took a lot of deep, reflective thought, and things didn't start coming together until about a year ago. But we're very secure in the plan we've laid out."

The family took a decompression time of sorts before making a formal announcement.

"We knew that with a formal announcement would come questions, and we wanted to be prepared to answer those questions. We owed it to our employees — and to everybody who has faith in us — full transparency," she says.

Lauren and Evan also took that time to analyze how their roles would change and how to build their individualized teams.

"Overall, it's been really positive, and it feels very natural for the company in terms of evolving," she adds. "It's pivotal, too, for our management team, who've been here 10-plus years. We're basically all in our early- to mid-thirties, and we've come into these senior roles. Actually, we've grown into them."

One of Lauren's key goals is to become an employer of choice.

"It's so important, especially after the tremendous growth we've experienced in the last five years," she says. "We've done a good job of doing more with less human capital, and now we're busting at the seams from a square footage perspective and from a time availability and time management perspective."

Evan and Lauren are exploring how to use technology to become more efficient, as well as the scope of work.

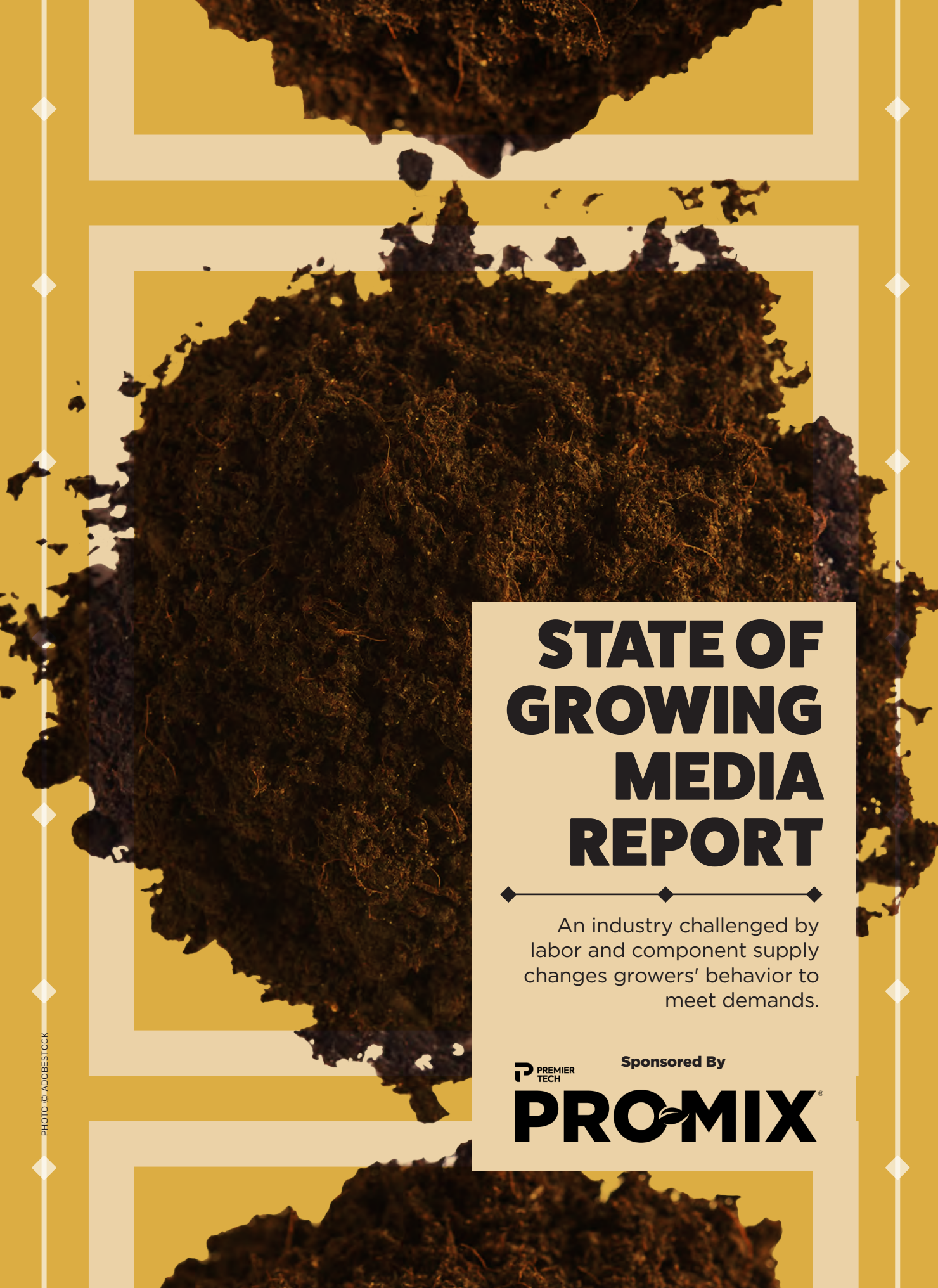
"We're analyzing — especially during springtime — a work-life balance and how can we get better at becoming an employer of choice," she says. "There's such deep personal reflection in everything that we do." GM

Kelli Rodda is editorial director of *Greenhouse Management* **magazine. Contact her at krodda@gie.net.**

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STATE OF GROWING MEDIA REPORT

An industry challenged by labor and component supply changes growers' behavior to meet demands.

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SEEKING SUBSTRATE

Growers are struggling with the availability of their chosen growing media, and it's changing behaviors in the industry.

By Patrick Alan Coleman

The term "growing media" doesn't mean the same thing to every grower. Depending on the operation and the material being produced, it's necessary for the components that make up a grower's substrate to change and shift. But what happens when the common backbone of nearly all growing media starts to become difficult to source?

"We're relying on peat, and there is no better growing media out there than peat," says Jeb Fields, Louisiana State University AgCenter associate professor and extension specialist. "But there's only so much peat that can come out of the ground, especially here in North America."

Fields explains that several factors have limited the peat supply: longer rainy seasons in the north, increased demand as new industries like cannabis and CEA production boom and strict control by North American governments and associations. That limited supply has led to the big changes we've seen in this year's State of Growing Media Report.

More growers than ever are concerned about the availability of their growing media. And even though scarcity adds stress to growers, it also drives changes in behavior that may turn out to be beneficial in the long run.

More respondents in 2024 said that they were purchasing standard mixes from manufacturers and using a combination of in-house blends and manufactured mixes. Meanwhile, there was a reported drop in those purchasing custom mixes or mixing their own.

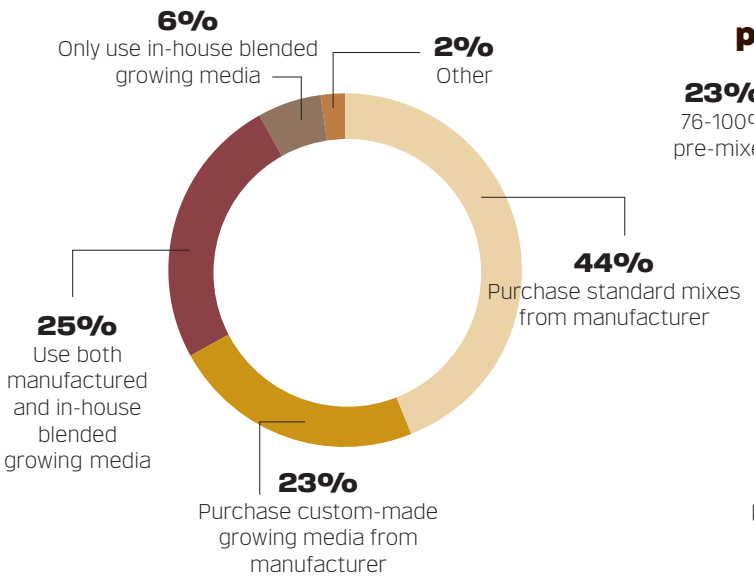
"I think this is out of necessity. During shortages, we buy more of the premium products because those are more available," says Fields.

Fields offers that he's spoken with growers who have mixing lines that haven't been used at all this year. "They say, 'What we could buy was already pre-made.' So there's no point in running them."

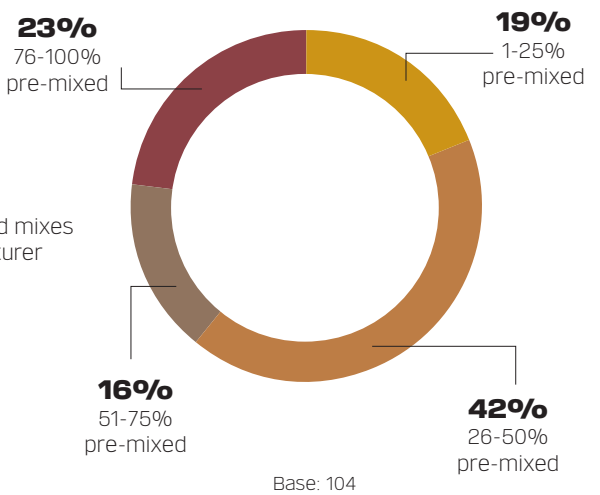
But there are still mixing lines in use, according to the data. Of those who do mix their own, more respondents made that choice based on better control over the mix and the need for a variety of mixes to fit their crops rather than those who did so to keep costs low. And while consistency and quality of pre-mixed media lead purchasing decisions, convenience and cost round out the top three reasons for buying from manufacturers.

About this survey: *Greenhouse Management* surveyed North American greenhouse growers in May 2024. Unless otherwise noted, data is based on 177 participants who reported they own and/or operate a commercial greenhouse that grows ornamental and vegetable/herb crops for the wholesale trade or for their own retail operation. Not all answers add up to 100% due to rounding.

How is your growing media manufactured?



If applicable, what percentage of your growing media is pre-mixed vs. blending your own?



Base: 104

If applicable, why do you buy pre-mixed growing media?

37%	28%	16%	11%	3%	6%
Consistency and quality	Convenience	Cost effective	Lack of equipment	Lack of expertise	Lack of labor

If applicable, why do you blend growing media in-house?

37%
I prefer the control of mixing my own product

35%
I require several mixes for different crops

28%
Cost savings

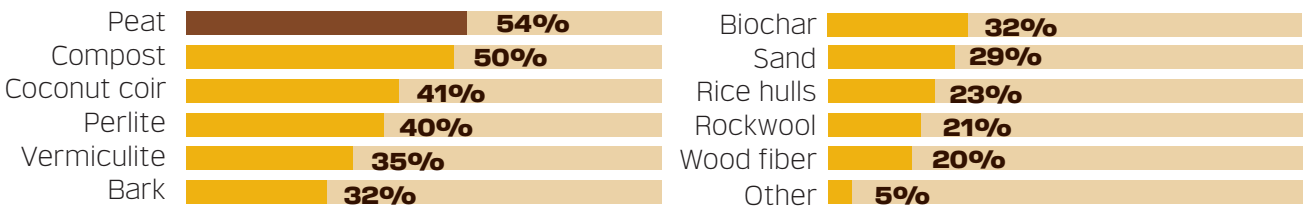
How many different growing mixes do you use during a typical growing season?

44%	43%	11%	2%
1-2	3-4	5-6	More than 6

Over the years, the number of growing mixes used during a growing season has remained stable, with most growers using fewer than four mixes.

Which components are important to have in your growing media mixes?

(Check all that apply.)



Among desired ingredients in mixes, peat continues to reign supreme. But compared to 2023, compost, coconut coir, bark and biochar have had a surge in popularity. The rise of these ingredients may also be linked to the scarcity of peat. That's particularly true for coconut coir.

"I think coconut coir is probably the closest thing we have to peat in terms of its physical properties," says Fields. "If you were going to do a one-to-one replacement, I couldn't think of another material on the planet that is as abundant as it is that would do as good."

Because of its peat-like qualities, coconut coir is starting to become available through the major distributors. Those distributors have also picked up ingredients like bark and biochar. So, it's possible that the data is reflecting desire following availability.

"The big players are using it and pushing it and putting it in their products, and it all comes back to peat," Fields explains. He says that there simply isn't enough pure peat to meet the demand, so big suppliers are supplementing their growing media supply. "They're doing the research on biochar; they're bringing in the coconut coir; they're bringing in the bark fines; and they're blending it and sending it out."

How important is it to have a substrate that helps reduce and/or conserve water?

57%
Very important

34% **Important**

8% **Somewhat important**

2% **Not at all important**

Some of the changes in substrate composition are likely changing irrigation practices. In 2024, 20% more respondents than in 2023 noted that water conservation was an important quality for their growing mixes.

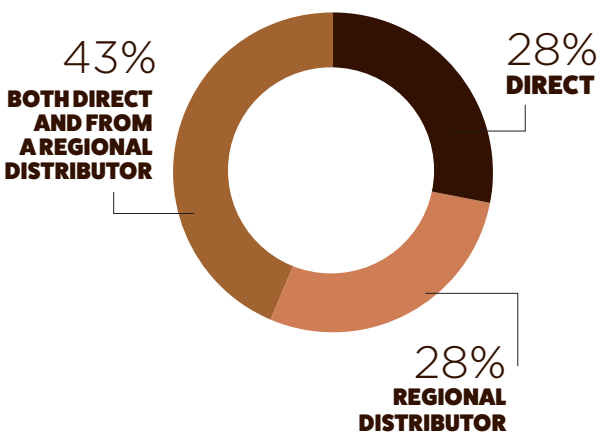
"If you're going to change your substrate, everything else needs to go with it," says Fields. "I think that's great that people are talking about it, because if you don't change anything, you're going to be using more water resources than you need to. They're all interconnected, and that's something you really need to think about. If you change one thing, you need to change your interconnected practices."

Rank the most important attributes you look for when selecting your substrate.

(Importance ranked most to least based on average of responses.)

1. Availability
2. Consistency
3. Cost
4. Performance
5. Sustainability
6. Technical Support

Do you buy direct from the manufacturer, from a regional distributor or both?



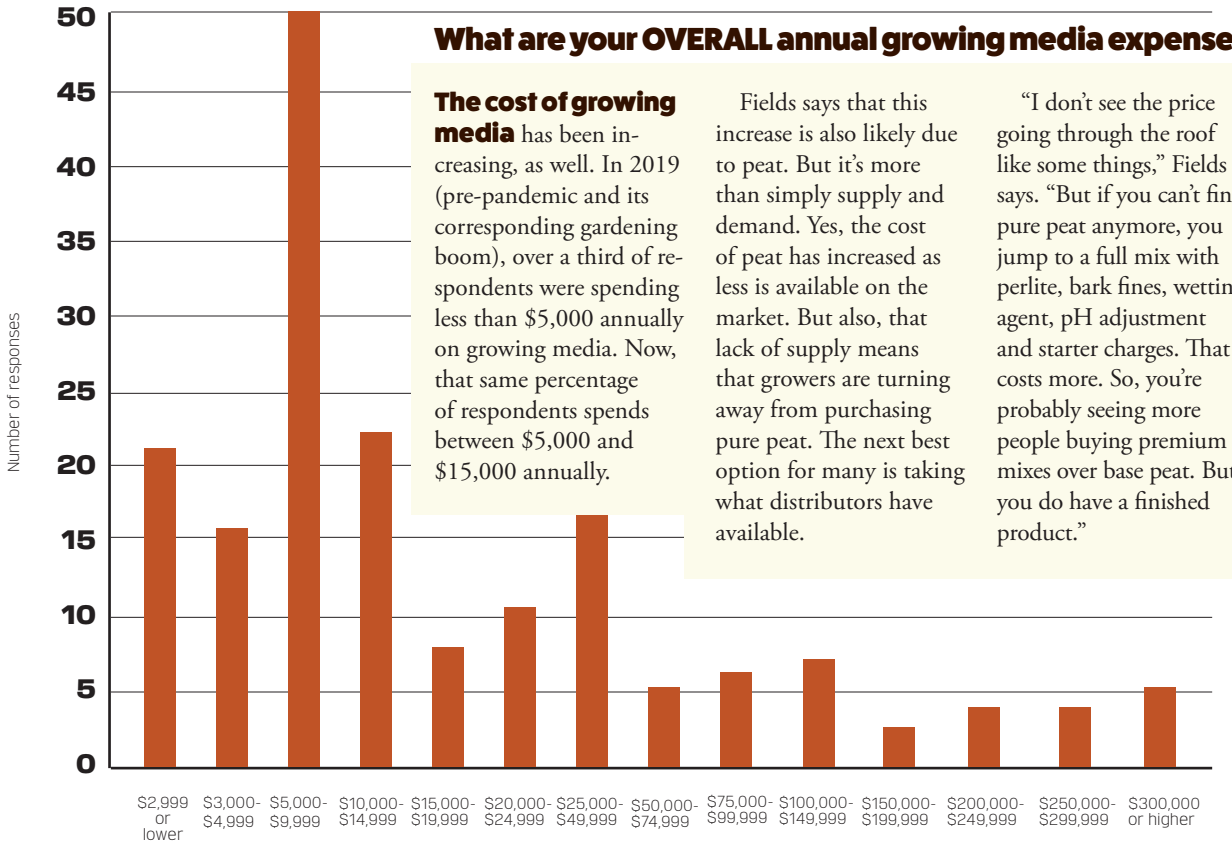
Changes in desired ingredients are likely a necessity during a period of scarcity. The issue is so pressing that nearly three-quarters of respondents have changed their growing media formulation in the last two years because of lack of availability.

It's clear that in 2024, respondents are feeling a supply crunch. The most important attribute in a substrate is availability, followed by consistency and cost. Performance, which was the most sought-after quality in 2023, fell to fourth, above sustainability and technical support.

Likely due to factors of availability, growers are using a mix of sources rather than only buying direct from a manufacturer or regional distributor. In fact, the number of growers using this tactic has doubled since 2023, and the number of those reporting buying direct from distributors has halved.

Grower warehouse inventory is also growing scarcer. In the last year, there was a 20% drop in those holding extra substrate inventory and an equivalent increase in those taking just-in-time delivery.

What are your OVERALL annual growing media expenses?



The cost of growing media has been increasing, as well. In 2019 (pre-pandemic and its corresponding gardening boom), over a third of respondents were spending less than $5,000 annually on growing media. Now, that same percentage of respondents spends between $5,000 and $15,000 annually.

Fields says that this increase is also likely due to peat. But it's more than simply supply and demand. Yes, the cost of peat has increased as less is available on the market. But also, that lack of supply means that growers are turning away from purchasing pure peat. The next best option for many is taking what distributors have available.

"I don't see the price going through the roof like some things," Fields says. "But if you can't find pure peat anymore, you jump to a full mix with perlite, bark fines, wetting agent, pH adjustment and starter charges. That costs more. So, you're probably seeing more people buying premium mixes over base peat. But you do have a finished product."

What are the biggest challenges you face regarding growing mixes?

(Check all that apply.)

47% Shipping/ freight costs

43% Availability from manufacturer or distributor

27% Consistency from load to load

27% Storage

26% Fluctuating prices

26% Lack of plant performance

18% Package size

8% No issues

2% Other

Other answers included: Media freezes in winter, bales are too heavy, not enough options.

Have you changed your growing media formulation during the last two years because of availability issues?

71% yes | 27% no

In terms of your growing media inventory management, do you tend to place just-in-time orders or warehouse extra inventory?

69% Just-in-time orders | 31% Warehouse extra inventory

Do you currently use an automated pot and/or flat filler?

71% yes | 29% no

If you answered no, do you intend to purchase or lease an automated pot and/or flat filler in the next 12 to 24 months? Base: 104

46% yes | 54% no

Over the years, this report has seen an increasing adoption of pot-filling machinery. In 2024, nearly three-quarters of respondents say they have pot fillers. And of those who do not have the automation, half say they will invest in the next 24 months.

"If you talk to any grower, the biggest issue is labor," says Fields. "That's it. It takes a lot of energy to fill pots. Potting is a high-labor activity that is relatively easily automated. It's one of the easiest places to save labor."

How important is it to have a growing media that has a positive environmental story?

41% Extremely important

36% Very important

16% Somewhat important

6% Not so important

1% Not at all important

While it may be hard to find the right substrate and the cost can be difficult to manage, Fields says that it's actually a very exciting time for growers and growing media.

"I tell people we're currently in like a substrate renaissance," Fields says. "We're getting better as an industry. We're getting stronger. We're growing more efficiently, and we're producing more. And I really think in the next five to 10 years, there's going to be a lot more changes that we're going get in the efficiency and producibility of plants that are better through better substrate management and practices."

Patrick Alan Coleman is editor of Greenhouse Management magazine. Contact him at **pcoleman@gie.net**.

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* Suppresses root diseases caused by specific pathogens (such as *Fusarium, Pythium* and *Rhizoctonia*), and also suppresses fungus gnats and thrips.



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THE BASICS OF BIOCHAR

From nutrient holding capacity to stability, see how biochar fits into your specific growing media and production needs.

By Dr. Brian E. Jackson

Growing media (substrates) have been in the news a lot over the past year, mostly covering the usage and availability of peat as well as peat alternative substrate materials that are being investigated and adopted by growers. While these conversations are timely and warranted, there are other sectors and types of growing media, namely bark substrates, that are also evolving in their uses and formulations for many traditional and "new" specialty crops produced in soilless container systems.

Biochar and wood fiber are two substrate components (**Figure 1**) that are seeing more use in bark mixes for the ornamental nursery industry, as well as many soft fruit production systems. These two materials are probably not new to most folks at this point, as they have been heavily researched and publicized over the past decade, but there remain a lot of questions as to "why, when and how" they may be advantageous to use in bark mixes. There are numerous reasons why growers may choose to modify their growing media, and those reasons can vary from grower to grower. Some reasons include:

- unstable or unreliable supply chain of existing substrates;
- recent cost increases;
- preference to use more local/regional substrate materials;
- more stable substrates for long-term crop production;
- use of more sustainable/renewable substrate materials;
- better nutrient and water use efficiency;
- new/modified substrate that better performs in the specific growing system and irrigation delivery system they have;
- new or modified mixes that improve or increase shelf life (wilting) of plants in garden centers, etc.



Figure 1: Particle sizes (grades) of pine bark, biochar and wood fiber substrate components.

The buzz about biochar's use in soil and in soilless substrates seems to be at an all-time high. The body of scientific data (globally) on the many potential benefits and uses of biochar (and similar materials) is quite staggering. While most of the research and commercial use is on field soil application, it cannot be overstated how much work, by so many, has been done to investigate its potential in growing media.

One of the main over-arching benefits of making and

PHOTOS COURTESY OF BRIAN JACKSON



Figure 2: Biochar products can be made from many organic materials in any range of particle sizes.

using biochar is the ability to sequester (lock up) carbon, thereby not allowing it to be released in the atmosphere — a key element of global warming and climate change. Another tremendous advantage is that biochar can be made from almost any organic biomass/waste material, thereby removing it from waste streams. A quick review of the published literature from the past eight years found more than 70 unique organic biomass materials have been made via pyrolysis, gasification, flash carbonization, torrefaction or other thermochemical techniques.

It is well known that the type, quality, sourcing and consistency of the feedstock material used to make biochar, as well as the process used to make it, all contribute to the quality and consistency of the biochar end-product. The most touted benefits of biochar's use in substrates, other than sequestering carbon, are its stability (does not degrade for a very long time), remediation of toxic pollutants, high porosity, high cation exchange capacity (nutrient holding) and reusability. Some readers may remember the use of bark ash in mixes, which I suppose could be considered the precursor to biochar today, even though they are not the same materials but do have some similar properties and benefits.

While our understanding of the science behind biochar and its benefits continues to improve, one of the most impressive advancements in the past two to three years (in my opinion) is the efforts made by so many to improve the process of making the material(s). For many years early in the exploration of biochar, I and many others often referred to biochar as being a verb (process) more than a noun (product) due to the variability in the materials from batch to batch or across production systems. Variability in the chemical and physical properties of any substrate component can greatly limit its adoption and use — and of course price.

Today in the U.S., there are numerous companies specializing in the production and sale of biochar for agriculture. My lab has worked with several of these companies and their products, and we have seen the vast improvement in the quality and consistency of the materials now being made. This is in part due to new processing technologies as well as investments by some in multi-million-dollar machines to make the material. The range of biochar products available on the market today is impressive and continues to grow (**Figure 2**).

The addition of biochar to bark (pine in the eastern U.S. and Douglas fir in the west) substrates has some potential advantages. First, the high CEC of biochar can aid in nutrient retention and reduced nutrient leaching in outdoor container production systems. Some research suggests the inherent nutrients in biochar are also beneficial to crops and can reduce certain fertilizer applications, but this is variable and unreliably consistent to be the main reason for adding biochar. The second benefit — with more likely potential — is the use of biochar in bark mixes for large containers for crops that will be grown or kept in pots for multiple years. Due to the resilient biostability of biochar and its resistance to degradation, it can greatly aid in the long-term structure (water, air and drainage) of substrates for longer than bark alone.

The biggest limitation or hesitation to using biochar that I see and hear from growers and substrate manufacturers is the cost. As mentioned earlier, there must be a beneficial reason to the grower for using new substrates or substrate components. Most reasons can fall into one of two categories: lower costs of a substrate to save money on the front end, or some proven value-added benefit to production costs (i.e. water or fertilizer savings) and/or improvement of plant growth/performance/shelf life of crops. I do believe that commercial biochar costs will eventually get to a place where growers are more inclined to adopt it on a wider scale, but until then, the availability and economics of bark substrates currently compared to biochar make it a difficult decision for many, unless of course someone makes their own or finds a local source that is reliable and economical.

Wood substrates, now widely accepted as a component

that is here to stay, have experienced steady increases in their development, commercialization and use across North America and around the world. Some may remember when conversations about the use of processed pine trees as a substrate began in the U.S. around 2005. These early research reports and presentations took the main stage at the annual Southern Nursery Association (SNA) meetings, and the public response was, well, let's just say "not overly optimistic" from many folks. Understandably, it has been taught and believed for decades that you can't grow plants in fresh wood. However, with the future supply and availability of pine bark facing an uncertain future at that time, researchers and growers alike were open-minded to new substrates in the event bark was no longer available. In the 20 years since then, wood products have become a mainstay in many substrates produced and sold today.

Nursery growers have been using sawdust and wood shavings as components in their propagation and production mixes for decades, well before any commercial products were on the market. The use of sawdust and shavings continues today by many growers, but now that there are numerous types, sizes and brands of engineered wood fiber on the market, more growers have taken advantage of using them. Thanks to new processing technologies for making wood fiber (mostly borrowed or modified from the pulp and paper industries), we now have wood components with a wide range of particle shapes and sizes: granular small particles that are flowable as well as short fibers that work well to make propagation mixes, thin long fibers that hold lots of water, coarser fibers that have more structure and drainage, etc. (**Figure 3**).

As an indication of the expansion of wood fiber production and use in the U.S., five years ago, there was one main company making and selling wood substrates. Today, there are at least five, with more coming soon. Additionally, many smaller companies and individual growers are making their own wood substrates (mostly with hammer mills). Many more are interested in doing the same, and they have good reason to pursue that. Globally, in 2017, there were fewer than 10 wood substrate processing facilities in the world. Today, there are more than 40, and the number is expanding rapidly.

The addition of wood fiber to bark, depending on the size/type chosen, can either add more drainage and long-term stability to the substrate or add more water-holding capacity. Wood can be used to extend bark supplies, something that is not practiced much today due to the availability of bark in most areas of the country, or be added as a cheaper option in places were wood can be made or sourced cheaper than bark substrates. For most bark substrates for container production, wood products that are coarse enough (in size and structure) to be easily blended with a front-end-loader or existing mixer are likely preferred (materials made with hammer mill or extruder) due to convenience and cost.

Will biochar or wood replace bark substrates? No, I do not believe that will be the case, barring any unforeseen event or situation where bark is not an option. Can they offer options and potential benefits to growers and their crops? Absolutely. Every grower and operation is different, but with more substrate options available, there is more security in the future of substrate supplies.

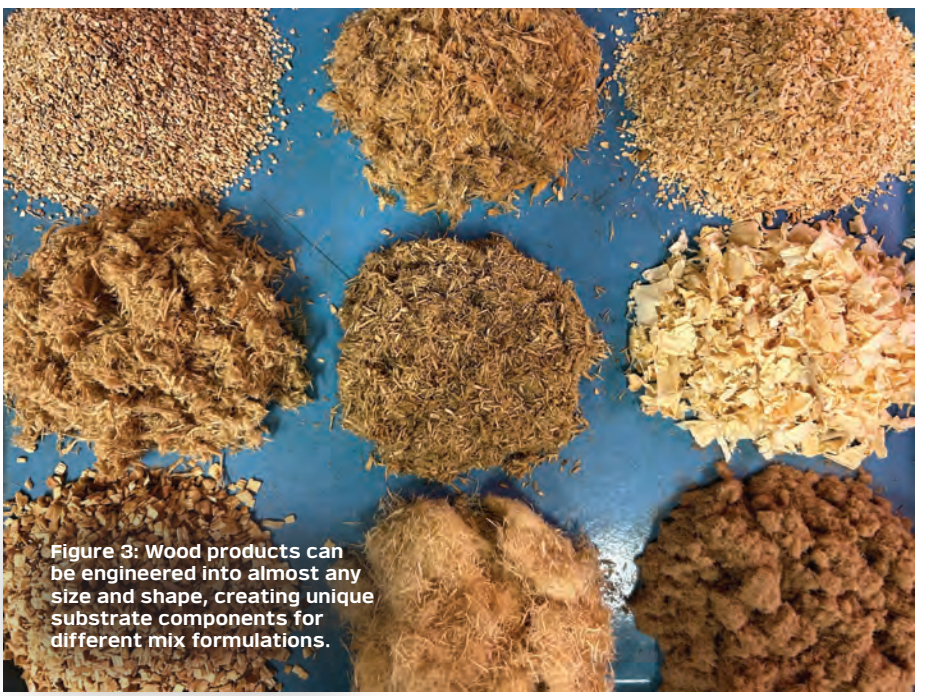


Figure 3: Wood products can be engineered into almost any size and shape, creating unique substrate components for different mix formulations.

Brian Jackson is a professor and director of the Horticultural Substrates Lab at North Carolina State University. Contact him at **Brian_Jackson@ncsu.edu**. Jackson and the Horticultural Substrates Lab do not endorse or sponsor any commercial product.

PRODUCT PROTECTION

Proper growing media storage maximizes shelf life and minimizes production issues.

Compiled by Premier Tech

To achieve the best results with commercially prepared growing media, it is important to maintain proper product storage and inventory rotation. Proper storage will maximize the shelf life of the growing media and minimize the potential for crop difficulties associated with product aging and contaminants. Here are some simple guidelines to follow to achieve the best results from your growing media.

Inside storage

The ideal storage location is inside a building where it will be protected from the elements, including moisture, sunlight and extreme temperatures. Here are some additional recommendations:

- Keep growing media on pallets to avoid contact with the ground.
- Do not store growing media in the same building or near herbicides or other chemicals.
- Control rodent populations, which can damage packaging, burrow into product and contaminate the growing media (i.e. weed seeds and droppings).

Outside storage

Some greenhouse/nursery operations cannot store growing media or media components inside a structure. If product must be stored outside, follow these guidelines:

- Keep growing media on pallets, platform and/or elevated surface to avoid contact with ground and flooded areas.
- Keep vegetation cleared from around the storage area to avoid contamination from weed seed.
- Place traps near storage area to control rodents and other animals from burrowing into the packaging.



PHOTO BY MATT MCCLELLAN

- Cover with opaque plastic or a tarp to minimize sun damage and moisture intrusion from rain and snow.
- Do not spray herbicides or other chemicals on or around the stored growing media or in areas where it may come in contact with spray drift.
- For added protection, do not remove the shrink wrap from the pallets until it is ready for use.

Other best-use practices

- Manage inventory rotation with "first in, first out" by using the oldest material first.
- Check the manufacturing date on the packaging. If coded, contact the manufacturer for assistance. While growing media does not necessarily go bad, the pH, nutrient status and wetting ability can change with age and storage conditions. For best results, use peat-based media within nine months of manufacturing date. For bark-based media, use product within two to six months, depending on manufacturer and product formulation.
- If you carry over product from the previous year and have a question about product age, contact the growing media manufacturer. Most manufacturers will offer to test samples and provide recommendations for use of aged growing media.
- If packaging becomes damaged or torn, seal with tape as soon as possible.
- In winter months, if product arrives frozen or has been stored outside in sub-zero temperatures, you will need to thaw product before use. Move product inside or to a warm area, leaving 6 to 8 inches between pallets to allow for air flow. This will decrease thawing time. Depending on ambient temperature, it can take as long as three to four weeks for product to thaw.
- If stored where weed seed contamination is suspected, minimize potential weed issues by removing shrink wrap outside the greenhouse and wash off bales/bags before moving into potting area.
- Remember to keep accurate account of your inventory of growing media to be sure you have adequate supply during the peak planting seasons.

For more: premiertech.com

PREPARING FOR POTTING AUTOMATION

Growers need to answer some important questions before investing in machines that will save on potting labor.

By Patrick Alan Coleman

Staffing a manual potting line can be a tremendous drain on labor resources. In an era where labor markets are tight and staffing shortages continue to trouble the industry, automating the potting task is an easy target to free up person-power in the greenhouse for other crucial tasks. And our 2024 State of Growing Media Report suggests that's exactly what is happening: More than 70% of respondents reported investing in a potting machine, and half of those who said they do not have one plan on investing in the machinery in the next 12 to 24 months.

But investing in a potting machine isn't an impulse buy. By the time the machinery arrives on site, greenhouse managers need to have answered crucial questions, from how the machine will fit in the footprint of the greenhouse to how it will fit into production processes.

However, some growers don't start with the right questions, according to Clay Starke, owner of Hort Tech Systems, an Oregon horticultural automation dealer. "Generally, they ask how big of a container will it fill, how fast can it fill, how much media can it hold and things like that," Starke says. But he offers a better starting place. "One of the biggest things to consider when you're starting out is how big of a machine do you really need? Can you start off small and expand to a larger machine? Will it be capable of fulfilling your needs in the future?"

Those needs are very important, in Starke's estimation. He notes that coming into a purchase with "maybes" isn't advisable. He also notes that there are plenty of manufacturers who have potting machines on the market. He encourages growers to make comparisons.

"Shop around," Starke says. "Do your homework. Know what your media is going to be and make sure it fits."

Know before you buy

Tennessee-based Pack Manufacturing CEO and President James Brooks has seen a lot of new clients looking to invest in their solutions, which includes pot and tray fillers, mixing equipment and conveyor lines.

"When we have customers that call in, we try to get a full view of everything that they want to do," Brooks says.

And that full view is exhaustive. Information gathering includes a potential client's growing media, pots, growing season, voltage and phase of electricity and water availability. And beyond infrastructure, there are important considerations about processes and logistics, including workflow from soil entering the greenhouse to pots leaving the potting machine to be tagged, planted and moved into production.

Only after the picture is complete does the actual size and type of machine come into consideration, says Brooks. The reason for that is because you want to be able to buy the right machine and mess with it as little as possible. "Once you get the automation, you want to handle



One of the biggest questions to consider before investing in a potting machine and related equipment is determining the size needed.

PHOTOS BY PATRICK ALAN COLEMAN

it as few times as you can. Every time you touch it, you're putting more cost in it," he says.

Top 5 purchase considerations

With everything involved in bringing in a potting machine, it's important to get prepared. Growers should have the crucial questions answered to make purchasing and set up as easy as possible to avoid disruptions in production. These are the top five considerations.

1. Media

Growers should know the base constituents of their growing media, as well as the additives. That's because the media has to move through the equipment efficiently, and not all media moves the same way. "Everything flows differently," says Brooks. "Everything moves differently. Everything comes in different volumes."

2. Pots and containers

The size and type of pot will determine what size machine growers will need. But more than that, it's understanding how those pots are going to be used. For instance, there are machines that have options for more than one hopper and open systems to accommodate bare rooting of plants.

3. Labor considerations

Brooks notes that many growers often want to know how many pots a machine can do in an hour. But the answer is largely dependent on how many people a grower has on hand to run the machine. "You've got to have the right amount of people to get the pots on and off the machine to achieve the speed and volume you want," he says.

4. Voltage and power supply

Any time a greenhouse invests in automation, there will be an increase in electricity costs. Key to that increase is the phase. Single-phase power, which is the most common, will draw more and lead to the largest bills. Those lucky enough to be in industrial zones with three-phase power will see a smaller increase. Those who do not have infrastructure at all will want to have it installed by their power company rather than running machines off a generator, which Brooks calls a "terrible idea."

5. Additional processes and workflow

The last consideration is what will happen to the pots once they have left the potting machine. Different machines will have different options for making the logistical processes after potting easier on growers. It will also help determine the location of the potting machine and if it needs to move or stay stationary.

Brooks notes that investing in a pot filler does not mean the rest of the greenhouse needs to be automated right away. In fact, he suggests that some greenhouses may want to start with soil mixing rather than pot filling. There are solutions that can be operated by minimal staff, which allow batches of soil to be prepared and added to pots on a pot-by-pot basis. "That's much easier than a shovel," Brooks says.

And getting away from the shovels and the people wielding them is exactly the point. But with enough preparation — understanding your infrastructure, determining your needs and aligning growing media to machinery — an investment in automation will relegate shovels to a rarely used corner of your growing facility, where they actually belong.



Growers must make sure current and future needs are considered when making automation purchases.


Purchase considerations include growing media, pots/containers, labor availability, voltage/power supply and additional processes/workflow.

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By Mark Dwyer

paint it black

The dark colors of the gothic trend can be utilized to great effect in the garden at large. Make sure you're offering fitting foliage and flower colors.

What is a "gothic garden," and why should you be interested in examining that style of garden? If you were to speculate on what might be found in a gothic-style garden, the focus on dark plants used as the foundation of a mysterious but engaging space would be entirely accurate but not the complete scene.

Gothic gardens are not a new concept, and while they are a bit of a novelty, they have shifted to the front burner as a garden theme of interest. The Garden Media Group listed gothic gardening as one of its seven garden trends for 2024 and has been promoting the supporting tagline of "Delight in the Dark." I've had some interesting projects over the last 20 years that lend themselves to this theme, including many exciting plants and creative elements that can be extrapolated and utilized in the landscape at large.

Yes, gothic gardens include plants featuring the darkest of foliage along with those that have near-black, maroon or red flowers. We'll get into the plants a bit further in the article, but what is truly exciting is the extremely broad palette of plant candidates that can be sourced and utilized for their rich and deep colorations. While black has been described as the most mournful of colors, I disagree with this implied somberness and feel strongly that dark colors can be utilized to great effect in the garden at large.

Dark colors tend to recede in the landscape, so they are best appreciated from a closer, more intimate distance. This feature is ideal for the gothic garden, which is experienced not only visually but through immersion and exploration (during both the day and night). The breeding of plants with increasingly darker foliage or flowers continues in earnest, so there truly isn't a better time to find, grow and feature these delectably dark treasures.

The gothic period is generally categorized as starting in

PHOTOS COURTESY OF MARK DWYER

the mid-12th century and lasting until the end of the 16th century. A "gothic garden" is not trying to replicate an actual garden of that period but borrows from gothic art and architecture, which is known for height in open spaces, tall arches and slender vertical pillars. One reference regarding gothic gardening states that the goal is to "entwine botanical beauty with foreboding overtones." This doesn't necessarily make a gothic garden a scary or unsettling space but simply an area of mystery, antiquity and serenity. Vertical accents and archways in these garden spaces can define smaller pocket gardens or more private respites in the garden. Stylistically, informal, meandering paths offer the traveler "destination guidance" but also embrace the excitement of "what is yet to come?" The combination of layout, plantings and select features are what blend to create a true gothic garden experience.

When I was director of horticulture at Rotary Botanical Gardens in Janesville,



Dianthus barbatus 'Sooty'



Scabiosa 'Black Knight'



CLOCKWISE FROM LEFT: *Ipomoea batatas* 'Raven'; colocasia 'Black Magic'; coleus 'Midnight Rambler'; *Pseuderanthemum*





Wisconsin, from 1998 until 2019, I was fortunate to have the freedom to select and explore a lot of different color schemes, and we crafted intentional gothic themes in 2007 and 2015. It was an exciting study in finding the darkest foliage plants along with deep, rich flower coloration to create what would become a tapestry featuring a significant depth of exciting, bold, dark colors. While these themes — spread over 4,000 square feet in our entrance garden beds — were well received overall, admittedly, there were some that felt that while beautiful, the combinations appeared a bit too somber (mission accomplished with the foreboding overtones). The gothic theme at the botanic garden was also echoed in other locations around the grounds to connect with that first impression at the main garden entrance. If anything, I knew that visitors would be exposed to the potential of dark foliage and flowers and perhaps come away with an appreciation for their impact and value in compositions.



Keeping in mind the Midwest location of Rotary Botanical Gardens, we intentionally focused on a wide range of seasonal plantings to achieve our gothic garden goals for the growing season. Bold foliage plants with near-black foliage like 'Black Coral' and 'Black Magic' elephant ears (*Colocasia esculenta*), 'New Zealand Purple' castor bean (*Ricinus communis*), 'Australia' canna and VERTIGO elephant grass (*Pennisetum purpureum*) offered stunning textural contributions. Finer textures were offered by 'Summer Chocolate' mimosa trees (*Albizia julibris-*

sin) and a wide range of other selections. Black-foliage sweet potato vines (*Ipomoea batatas*) were common, and our focus included a wide range of the darkest selections of *Alternanthera* sp., *Pseuderanthemum* sp. and near-black coleus varieties like 'Midnight Rambler'. The hit of the entire display was the 500 'Black Pearl' ornamental hot peppers (*Capsicum annuum*), with their black foliage and glossy black fruits maturing to a bright red in late summer. Keep in mind that there are many woody and perennial selections that feature deep maroon and near-black foliage for a similar effect, with the benefit of an extended contribution over the years. I use dark foliage perennials and woody plants for backdrops, visual depth and foils for lighter colors in many landscape situations.

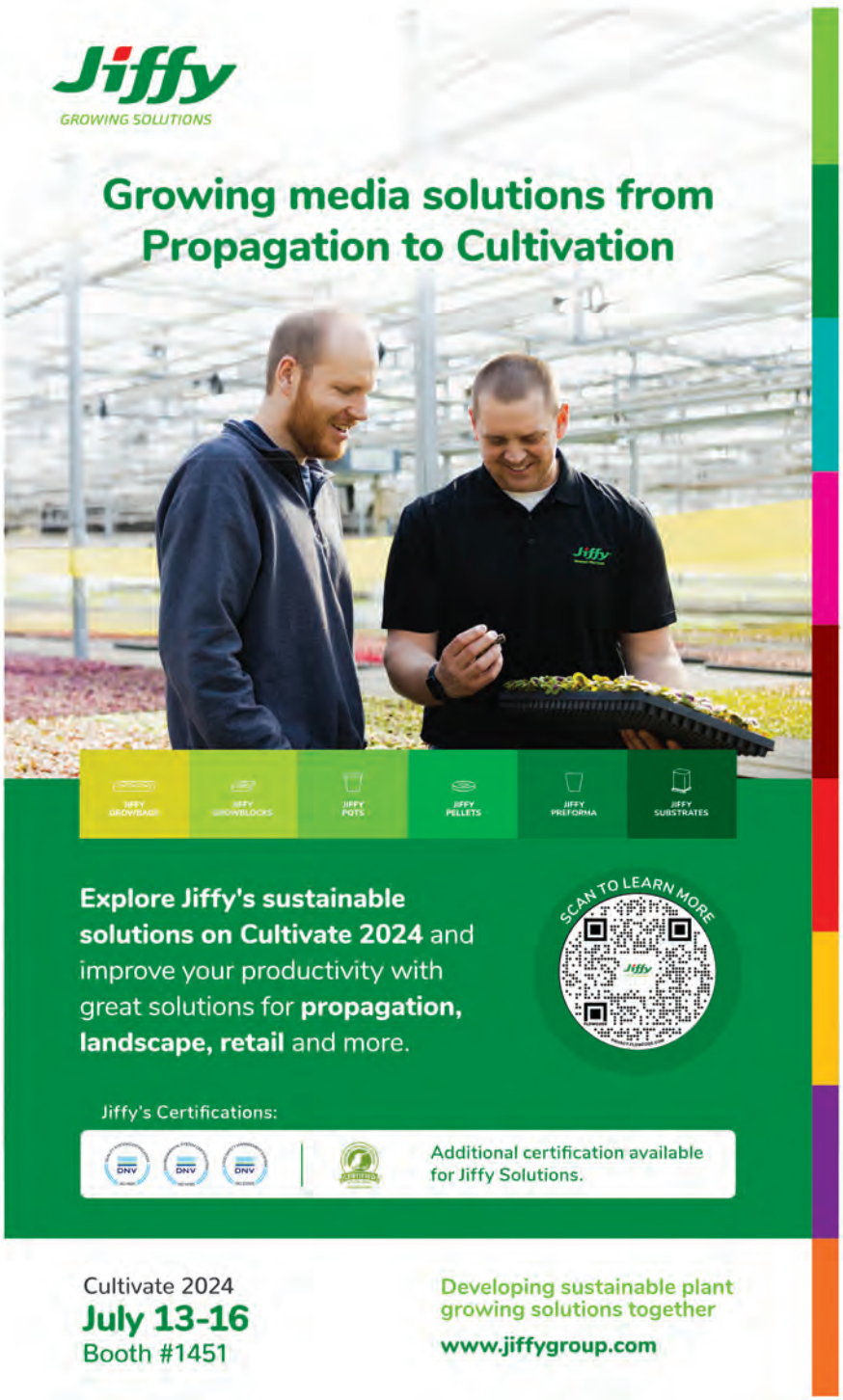


Dahlia 'Bishop of Llandaff'

Thirty years ago, I could list only a couple of plants featuring black flowers. There are now many varieties available for the discerning gardener. Black pansies and petunias are commonly available, and deep maroon and blood red flowering selections of many types of plants



Capsicum 'Black Pearl'





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L-R: heuchera 'Black Pearl' and dahlia 'Black Forest Ruby'

also abound. In both of the gothic garden themes I devised, we used vast amounts of 'China Town' plume celosia (*Celosia plumosa*) and 'Bishop of Llandaff' dahlias. Both selections have the benefit of bright, blood-red flowers and deep maroon foliage. In mixing both dark foliage and flowers, I would say the combination was at least two-thirds foliage impact. There was not a lot of green foliage in the overall composition, as again, dark maroon/black foliage plants are quite available and effective. It's important to mention, though, that just planting dark plants together does not a gothic garden make.

Elements in a gothic garden should also include features

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canna 'Australia'

that contribute to that feeling of antiquity and mystery. Old statuary is fun to incorporate strategically in the garden. Consider a visit to your local antique and second-hand stores, as you might be successful in sourcing some exciting options that can help add that medieval charm in the garden. Imagine a well-placed gargoyle or angel in a prominent spot that becomes a focal point and accent in the space. Or perhaps a partially hidden, broken garden statue that looks like it's been there for hundreds of years can have a subtle spot? A patina of moss on containers, sculptures and other elements can also lend some age to the setting, as can including and featuring "elements of decay," like dead trees or stumps. Wrought iron gates, arches and outdoor lanterns can also add impact and nuance, contribute to the overall scene and help define the space.

The gothic garden style is intentionally dramatic, impactful, memorable, oddly engaging and ultimately a conversation starter. The elements of this garden style are not uncommon, but combining select plants with a layout featuring supportive elements will help successfully "entwine botanical beauty with foreboding overtones." For further inspiration on this topic, the National Garden Bureau has some great information at **ngb.org/goth-garden-ideas**. GM

Mark Dwyer is currently the garden manager for the Edgerton Hospital Healing Garden in Wisconsin. For 21 years, he served as director of horticulture at Rotary Botanical Gardens in Janesville, Wisconsin. He also operates Landscape Prescriptions by MD, a landscape design and consultation business. **mcdwyer@zoho.com**



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EXPERT SOLUTIONS



Janna Beckerman, the newest Green Solutions Team member at Envu, shares the numerous benefits of Marengo® herbicide.

Envu Ornamentals business and its Green Solutions Team (GST) are committed to providing guidance that helps growers save time and money. To continue that pledge, the GST added plant pathologist Janna Beckerman to provide technical support for greenhouse and nursery growers. Beckerman joins Envu after 20 years at Purdue University as a professor and extension specialist. The GST aids growers with all their plant health needs, including weed control and herbicide use.

And *Greenhouse Management* caught up with Beckerman to learn more about how Marengo® herbicide is part of that collection of solutions.

Greenhouse Management: Describe Marengo herbicide and how it's used.

Janna Beckerman: It's interesting that prior to joining Envu in my time as a plant pathologist, I knew about Marengo herbicide. It is definitely an industry standard. It's a selective, preemergence herbicide that can control approximately 100 different weeds. And it can do this in one application, which is just incredible.

And even more interesting, it's doing this with a single molecule, indaziflam, a Group 29 herbicide. It comes in two formulations: liquid (Marengo® SC herbicide) and granular (Marengo® G herbicide). It controls so many different weeds and plays nice with other herbicides — that's a win-win.

It's labeled for use inside the greenhouse, in addition to hoop houses, lathe houses and shade houses. It can be applied to greenhouse floors prior to production, or if you use it during production, apply it underneath the benches. It's also labeled for field-grown, pot-in-pot ornamentals and ornamental production sites.

GM: What are some of the benefits of Marengo herbicide?

JB: One application of Marengo SC herbicide can last up to eight months. If you used Marengo SC herbicide at the 18½- fluid-ounce rate, that would give you season-long control. It's not just an herbicide that controls weeds — it frees up your bandwidth. If you only have to do one application, that's one less thing you have to think about for at least eight months.

Labor is the most important issue that every grower is dealing with now. And this product frees up your labor and allows you to better deploy them for other tasks besides weed management — like disease and insect management!

If you're applying Marengo herbicide in an outdoor production environment, it provides broad-spectrum control of both grassy and broadleaf weeds, even during the rainy season.

It also persists really well, despite the crazy weather we all seem to get.

Lastly, it has no signal word, meaning applicators can enter wearing coveralls, waterproof gloves and shoes with socks, and with a 12-hour reentry interval.

It easily feeds into any weed management and herbicide rotation program. Marengo herbicide gives you so much flexibility with the single molecule and it's persistent.

GM: What stands out to you most about Marengo herbicide?

JB: As a scientist, I'm completely impressed by the fact that Marengo herbicide accomplishes all of this control with a single molecule. And this one molecule provides control of broadleaf weeds, some annual sedges and grasses. It has outstanding crop safety. The fact that it lasts for so long also stands out to me. All these things make it so different compared to other products on the market.

GM: How has Marengo herbicide made a difference for customers?

JB: For growers who have both indoor and outdoor production, Marengo herbicide works for both sites. As I mentioned, it frees up labor to perform other tasks, saving time and money for the grower.

It's effective for a total plant health approach. When you control the weeds, you also control certain insects and some of the diseases they vector.

GM: In which situations would you recommend Marengo herbicide?

JB: I can't think of a situation in which I would not recommend it. If you don't need eight months of control, you can get three or four months of control with the granular formulation or a reduced rate of the flowable. I want growers to see how really cost-effective Marengo herbicide is. Because of its efficacy and persistence, you can focus your labor in other areas around the greenhouse or nursery.

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The CONTAINER CHALLENGE: seeking solutions

PART TWO OF THIS SERIES EXAMINES THE REDESIGN OF HORTICULTURE PLASTICS. WILL THE INDUSTRY ACT BEFORE LEGISLATION IS PASSED?

By Marie Chieppo

Read Chieppo's first article in this series: bit.ly/container-challenge-part-1

PHOTOS © ADOBESTOCK AND PATRICK ALAN COLEMAN





A colleague of mine, who teaches stormwater management, posed a question to the audience about runoff: "Where does the water go? Away, right? Where is away?" Out of sight, out of mind.

In our throwaway economy, "away" is having real-time consequences. As fertilizers flow into ground water, lakes, rivers and seas, we are impacting nature in ways that are difficult to reverse. The "away" for plastic plant containers is largely the landfill, which also has negative impacts on the environment.

The public is advocating for producers to be responsible for products that are costly, if not impossible, to recycle. In 2022, the market research firm IPSOS conducted a global survey about plastics that drew responses from 20,000 people across 28 countries. Findings revealed 85% of those polled felt manufacturers should be held responsible for their plastic waste, and 82% favored products with less plastic packaging. In our industry, we produce a huge volume of plastic products that are typically used once then discarded. We face a public reckoning.

U.S. states are poised to be influential standard setters on the future of Extended Producer Responsibility (EPR) policies and legislation to mitigate the enormous volumes of plastic products by placing the responsibility on producers. In response, industries are redesigning packaging to comply with the myriad requirements. It's an overwhelming problem that requires an industry-wide solution, with products that create circularity, eliminate or reduce toxins and are in compliance with current and future regulations.

In the agricultural world alone, an estimated 12.5 million tons of plastic are used annually. In the latest data I reviewed from 2009 for the report "Plastics Pots and the Green Industry: Production, Use, Disposal and Environmental Impacts" (Association of Professional Landscape Designers 2020), of the four billion container/plant units produced, 1.66 billion pounds of plastic were used.

Our products are now subject to laws and legislation in five states (Minnesota being the most recent) that force the hand of producers to create products and packaging with less virgin oil. EPR legislation places the responsibility for the life of the product into the hands of the producers. The reason is to mitigate what we currently can't recycle and create badly needed recycling infrastructure and capabilities. Truth-in-labeling laws require third-party certification that a product gets recycled and is recyclable. A percentage of post-consumer resin is also being required to offset the amount of virgin oil used in the manufacturing process.

Alternative products

For several years, I've been following innovative packaging in the food and beverage industries. Granted, it is a very different product subject to different requirements, but ideas can be sparked by assessing the innovation of different industries. The first time I came across the brand Boxed Water Is Better, the simplicity and eco-friendly packaging showed me a potential material for horticulture. If the food industry can do it, why can't we?

I wasn't too far off the mark. The Blackmore Company and Lars Peter Jensen created a system using a cardboard-type material rather than plastic as the "container" for plants. Grown in Ellepots with Air Tray technology that provides air pruning, the plant is enclosed in a cardboard sleeve with printing that provides the same information a tag would. Zero plastic stays at the nursery or follows the consumer. Prides Corner Farms in Lebanon, Connecticut, is currently using this system for its American Beauties Native Plants line.

Fiber and bioplastic pots are excellent options. Bioplastic takes approximately three to four years to completely break





Five states have passed legislation that force producers to create products and packaging with less virgin oil. Some horticulture plastics manufacturers have released products made with post-consumer resin and from biodegradable materials.

down, without leaving chemicals behind. Industrial composting speeds up the process significantly. People's increasing awareness about the fate of plastic containers opens them up to accept a product they can either allow to decompose or throw in the trash.

Speaking of fiber, we should consider thinking about the right pot for the right plant. Herbs, annuals and some perennials do not need to be containerized for long. Jasmin Callahan, the owner and propagator of Dragonfly Natives in Dartmouth, Massachusetts, is dedicated to finding suitable plants for fiber containers. A crop of prunella I purchased from her had to wait its turn for planting. Two weeks later, the plant remained healthy, and the roots were being naturally air pruned.

We could standardize the composition of our pots along with the sizes and shapes. For collection and recyclability, it would be a big game-changer. Mixed plastics create additional barriers to the recycling system. Using a type of plastic like HDPE, a stronger material, would increase recyclability even more and possibly increase the likelihood it is reused. Our products could also be redesigned using less material overall.

The HC Companies developed the Low-Profile Tray. It has an ergonomic design that speeds productivity and improves handling. It is manufactured with recycled materials and made from polypropylene, a material that is widely accepted in municipality recycling programs. Florida-based Recede Bioplastics is engineering plastic-like products that are both marine- and soil-biodegradable.



Dragonfly Natives in Dartmouth, Massachusetts, grows and sells plants in fiber containers.

PHOTO © JASMIN CALLAHAN, DRAGONFLY NATIVES

Industry options

According to the Ellen MacArthur Foundation, without fundamental design and innovation changes, about 30% of plastic packing will never be reused or recycled. That's across multiple industries.

States will be looking to incrementally increase the percentage of PCR in materials; therefore, it is in our best interest to produce pots with as much PCR as possible. But concern over the availability of a sufficient supply of PCR is already

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playing out. Several manufacturers have grinding capability to harvest their feedstock. The primary resource for recycling in the eastern U.S. is Michigan-based East Jordan Plastics. With collaboration to create hubs for collection and compaction, we could secure our supply.

As the infrastructure for recycling grows, it's vital we get a seat at the table advocating for machinery that can handle our products. We throw away billions of dollars worth of material every year.

The Horticultural Research Institute's Plastic Task Force is taking a deep dive and accelerating efforts into what our options are for alternative materials, how to increase recyclability, cost, material selection, material compatibility, supply chains, market demand and feasibility. All of these factors impact the reality of the production and sales of our products.

The concern with plastic pots isn't new. Past trials have tried to find answers to alternative materials but with little headway. What's new is the speed at which we need to respond. Regardless of how this issue is resolved, we need to have a systemic approach that works for all growers. In addition, reality requires that we source whatever kind of feedstock needed and know, before producing, how the product will be handled post-use.

To reduce plastic waste and packaging concerns, a comprehensive circular economy approach is needed. We need to eliminate as much virgin plastic as possible and innovate to create pots that are reusable, certified recyclable, compostable or able to be processed in innovative ways.

At the end of the day, our plants need to be attractive and healthy. People do not purchase plants for their containers. Frankly, consumers are increasingly becoming fed up that the onus is on them to find a way to dispose of them. The majority do not have access to the few container manufacturing companies' recycling programs or dedicated recyclers.

A friend and lifelong member of the horticulture community recently commented how wonderful it would be if we could voluntarily make changes rather than wait for the inevitable regulations.

I am not a manufacturer, but an ecological designer who often finds myself explaining costs in a much different scenario. Upfront costs for a landscape that is ultimately self-sustaining are higher than traditional design, but enhancing the landscape's sustainability results in far less spending later. Consumers are begging for more circular systems in their backyard gardens and in the products they purchase to enable those spaces. They want to feel good about what they purchase. A similar significant upfront investment may be what allows us to keep our industry viable and the environment healthy. After all, we are the green industry. GM

Marie Chieppo is principal of EcoPlantPlans, LLC based in Cape Cod, Massachusetts.

For more: healthypotshealthyplanet.org or sustainableplantpots.org.



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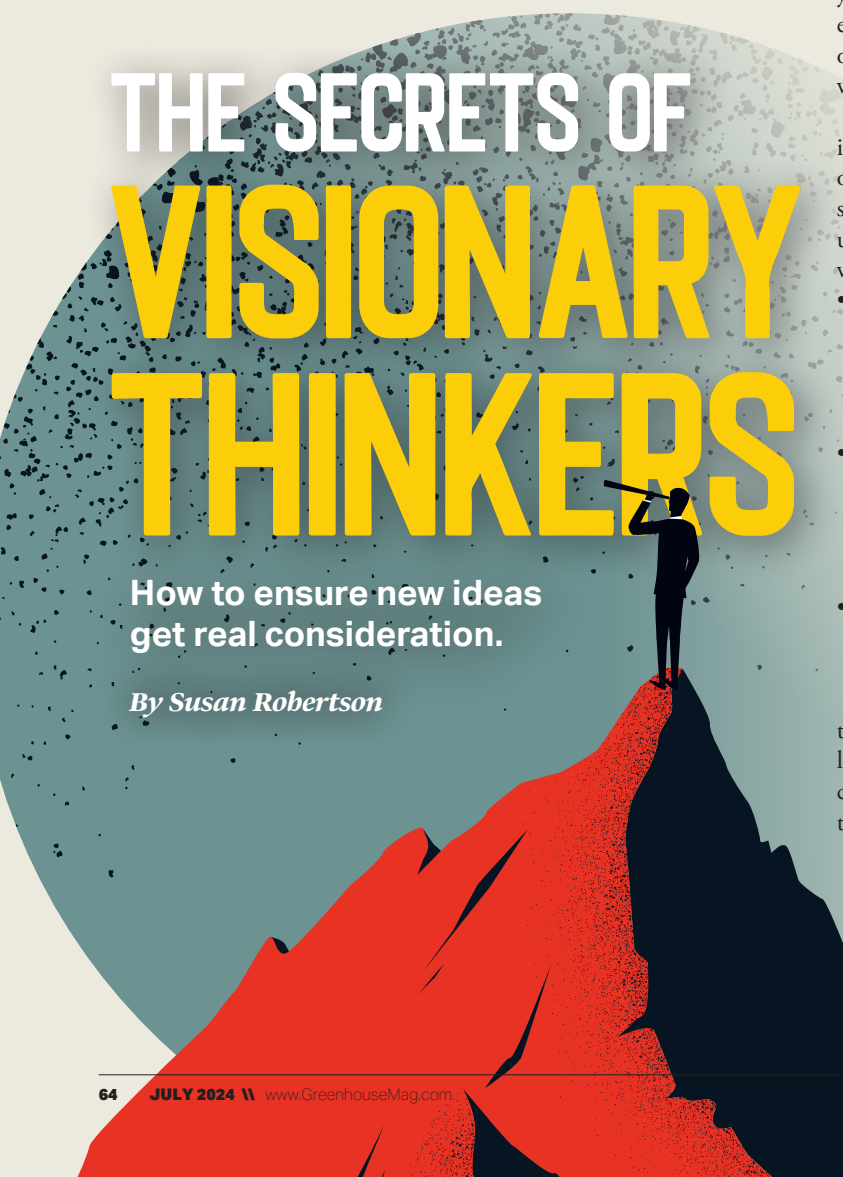
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THE SECRETS OF VISIONARY THINKERS

How to ensure new ideas get real consideration.

By Susan Robertson



When you think of famous visionary leaders, you often think they have something, know something or do something that the rest of us don't have, don't know or can't do. The truth is, *they don't*. The only thing they have is an intuitive understanding of how to open their minds and consider new ideas.

When you're thinking about new ideas, you're often thinking of the divergent phase of the brainstorming process — where you generate many new ideas.

However, the convergent (deciding) phase is equally important — to ensure that those new, fresh and interesting ideas thought of during the divergent phase actually get considered. Due to some basic neuroscience principles, it's all too easy to instantly reject any truly new ideas. The very human tendency is to decide to select the ideas that make you feel the least uncomfortable. In other words, even if you managed to generate some unique and innovative ideas, you're unlikely to decide to use them, unless you do some overt things to help overcome instinctive fears of anything new.

There's an adage that people are resistant to change. There's some truth in that.

But there are many instances where change is embraced with open arms. Events like marriage, the birth of a child, a career change or moving to a new city are all dramatic life changes that are typically welcome. Most people are happy and excited to embark on these new journeys.

So, what is it about other types of changes that make the "people don't like change" adage true? The difference is that with a few exceptions like the above, change is typically assumed to be negative.

To better understand this, think about this hypothetical situation. You're at your desk, doing your work as usual, when your boss walks over and says, "Things are going to change around here." If you're like most people, your instant assumption is not that things are going to get better. You probably assume it's going to be worse, that you will experience some loss of something you currently benefit from. Even if you can acknowledge that the change might be good for the department or the company, your go-to assumption is that things will be somehow worse for you personally.

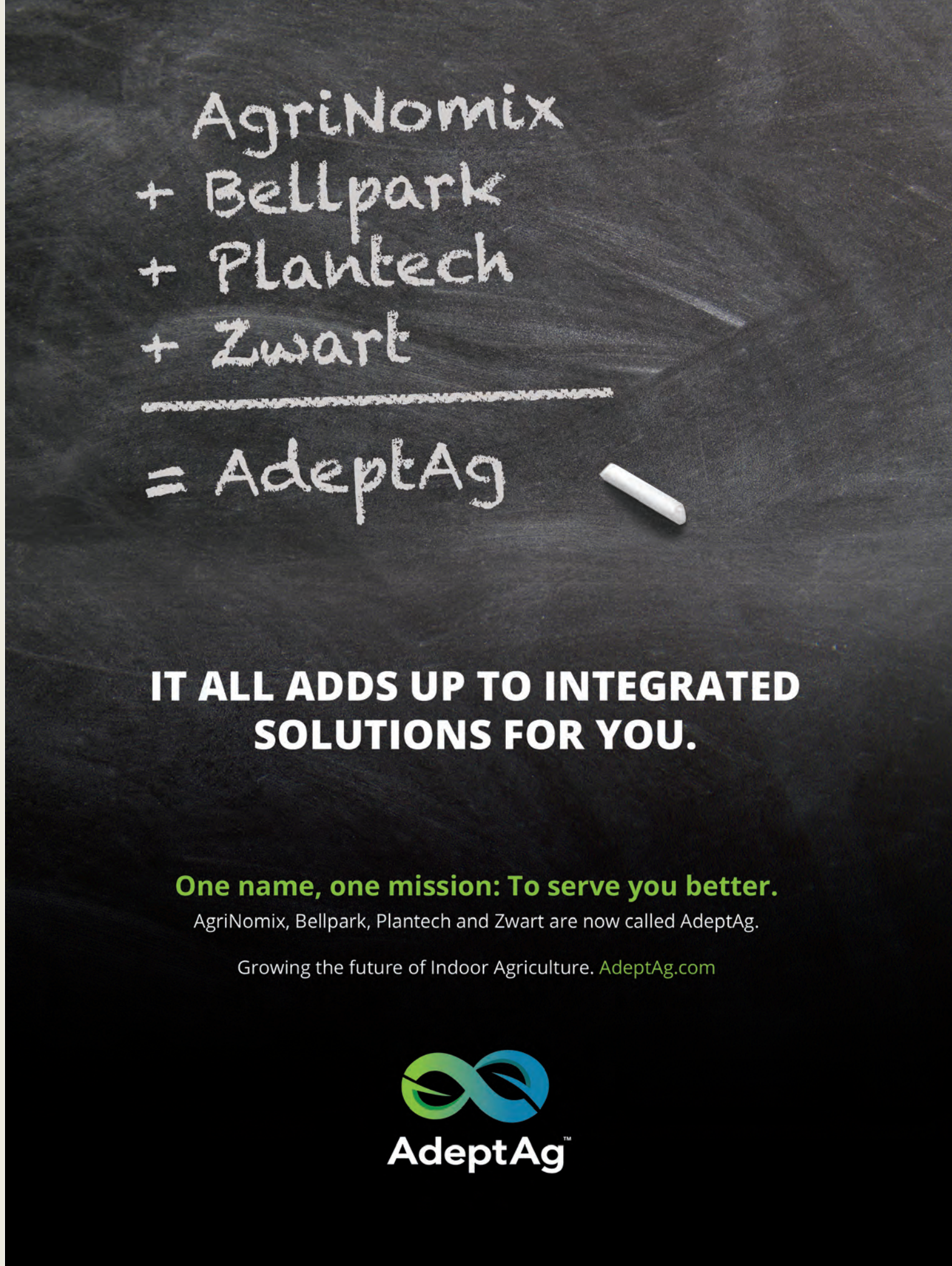
This expectation that change equals loss is, surprisingly, grounded in neuroscience. All humans have a set of cognitive biases: mental shortcuts used for problem-solving and decision-making. There are a few things to understand about cognitive biases before you dive into why they're problematic:

- First, cognitive biases are NOT the same kind of bias related to diversity and inclusion initiatives. That's a completely different concept. Cognitive biases are a neuroscience concept; they have to do with how our brains operate.
- Second, cognitive biases are NOT individual. All humans share the same cognitive biases. It is not as if you have one cognitive bias and somebody else has a different one. All humans share these same mental shortcuts.
- Third, cognitive biases operate subconsciously. You are not aware you're relying on these shortcuts when you are.

When it comes to the convergent phase of creative thinking — when you're voting and deciding from a large list of ideas — the cliché that people don't like change tends to hold true. You tend to shy away from the truly new ideas and only vote for the "safest" ideas.

This tendency is due to a specific cognitive bias called

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the status quo bias.

The status quo bias is the phenomenon described in the hypothetical work scenario — that you instantly and subconsciously presume change to mean loss: specifically, loss to you personally and individually. You assume that the current state of affairs is the best, and anything other than that will be negative.

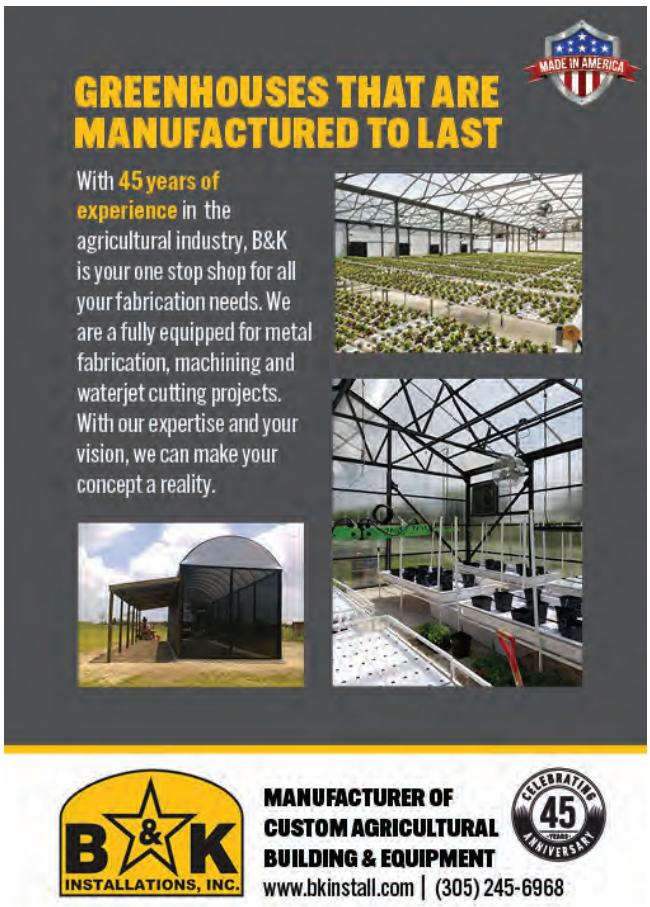
So, when you are looking for new ideas and have generated a list of possibilities, and it is time to choose among them, you tend to choose only the safest, most incremental and least disruptive ideas. In other words, you lean toward the least amount of change possible.

But suppose the situation is something that actually needs real change. In that case, you need to ensure that the team making the decisions doesn't let the status quo bias get in the way of considering a more radical idea, which may be the one that really solves the problem.

Here are some tips to help you get around the status quo bias.

1. Overtly include in your list of criteria that you want ideas that are disruptive, new and will make a significant impact. Clearly stating that as a criterion will make a difference and will remind people that they need to explicitly consider some of the more interesting, unique and potentially harder-to-implement ideas.
2. Require the group to list the potential downsides of changing nothing. Changing nothing is a decision. And unfortunately, it is often the decision that is made by default. You can all too easily "decide to decide later" once you have more information. And you continue that cycle until you miss the window entirely, and it's too late. When a group decides not to decide, they need to consider the true consequences of that decision. There's likely a definitive reason to create change by selecting a more impactful idea. GM

Susan Robertson is a creative thinking expert with more than 20 years of experience speaking with and coaching Fortune 500 companies. As an instructor on applied creativity in the Division of Continuing Education at Harvard University, Robertson brings a scientific foundation to enhancing human creativity.
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Follow the yellow brick road FOR MITE MANAGEMENT

By Juang Horng (J.C.) Chong, Ph.D. – SePRO Technical Development Manager, Ornamental

Late spring and summer seem to be a time when all IPM managers collectively exclaim, "Spider mites and broad mites and eriophyid mites, oh my!" Mite infestations regularly pop up on ornamentals and vegetable crops during this time, sometimes early or later depending on location. Just like the Tin Man, the Scarecrow, the Lion and Toto helped Dorothy go back to Kansas, we have the tools and advice to help you along the journey and get you to the promised land of perfect crops.

Mite populations can cause enormous damage within a short period of time because of their fast development and high reproductive rate. To prevent damage (which is often permanent), these mite populations must be found early with regular scouting. Examine the underside of leaves closely (with a hand lens or a magnifier) for mites and their eggs on plants that show symptoms of infestation or damage. You can also tap a plant gently over a piece of white paper and examine the debris and creatures landing on the white paper for mites. (This method also works for sampling biological control agents.)

The efficacy of cultural control tactics for mite management is rarely documented. We know that certain mite species may perform better under specific conditions. For example, twospotted spider mites thrive under hot, dry conditions, and broad mites seem to prefer high humidity. It's not clear, however, if environmental manipulation can serve as an effective management approach. Mites often benefit from high nitrogen fertility, but there is no science-based fertilization guidance on how to balance the need between plant growth and mite management.

What's known is the importance of sanitation and weed management. Mites are often polyphagous, meaning that they can feed and build up a population on many weed and crop species. Maintaining weed-free production areas eliminates potential sources and refuges of mites. Infested plants should be treated or discarded as soon as possible so that mites do not spread to other plants in the same area. Quarantining new plant materials or treating young plants can help limit the risk of introducing mites into the production area.

Correct mite identification is crucial for selecting the most effective biological control agents or miticides, as not all agents or miticides are effec-



Figure 1. Spider mites cause stippling on leaves.



Figure 2. Broad mites cause distortion of the terminals on ornamental pepper.



Figure 3. Eriophyid mites can vector plant diseases, such as rose rosette disease.

PHOTOS COURTESY OF JC CHONG

Example of rotation programs for various mite groups on ornamental crops.

Mite group	Site	Application 1	Application 2	Application 3	Application 4
Spider mites	Indoor	Akari (21A)	Floramite (20D)	TetraSan (10B)	Sultan (25)
	Outdoor				
Broad mite or cyclamen mite	Indoor	Akari (21A)	Avid (6)	Pylon (13)	Savate (23)
	Outdoor	Akari (21A)	Avid (6)	Savate (23)	Horticultural oil (UC)
Eriophyid mites	Indoor	Akari (21A)	Avid (6)	Pylon (13)	Kontos (23)
	Outdoor	Akari (21A)	Avid (6)	Kontos (23)	Horticultural oil (UC)

tive against every mite species. The three most significant groups affecting indoor and outdoor ornamental crops, as well as greenhouse vegetable crops, are spider mites, tarsonemid (or thread-footed mites) and eriophyid mites. Additionally, flat mites and bulb mites can occasionally pose problems for specific crops.

Spider mites (Tetranychidae) are the most common mite pests in many crops. The twospotted spider mite infests a wide range of plant species, causing stippling, chlorosis, bronzing and webbing on plants. They are typically more active in the summer (and can be active year-round in heated greenhouses), which is why they are often considered a "warm-season" mite species. In contrast, the spruce spider mite and southern red mite are "cool-season" mite species, being more active in the fall and spring. Other spider mite species, such as the Lewis mite on poinsettias, can also cause problems.

The most problematic tarsonemid mite species (Tarsonemidae) are the broad mite and cyclamen mite. We are observing an increased prevalence of broad mite in the past few years, particularly on begonia and (ornamental and culinary) peppers. Tarsonemid mites often feed on the growing tips, which cause cupped or distorted leaves and flowers.

Eriophyid mites (Eriophyidae) are tiny, banana-shaped and have only two pairs of legs (four pairs in spider mites and tarsonemid mites). There are thousands of eriophyid mite species, and each species is host-specific. For example, rose rosette mite only infests roses, and agave mite only feeds on agaves and related species. Depending on their damage on specific hosts, eriophyid mites can also be called rust, rosette, gall and stunt mites. Because of their size, they can hide deep in crevices and leaf folds or whorls, making their contact with miticide solution very difficult.

Many growers manage mite populations successfully with biological control. There are many predatory mites and insects available, but not all of them can manage all mite species; therefore, mite species or family identification is paramount to selecting the right biological control agents. Most predator species, such as *Phytoseiulus persimilis*, the predatory midge, and the predatory beetles, are most effective against spider mites. The predatory mites, *Amblyseius andersoni* and *Neoseiulus californicus*, can feed on other mite species and could be used for managing broad mite and eriophyid mites. Biological control is most effective when used preventively, meaning that you should schedule regular releases of predators from the beginning of a crop.

Similarly, not all miticides are effective against all mite species and life stages. For instance, abamectin is most effective against nymphs and adults, while hexythiazox (a mite growth regulator) is most effective against eggs and nymphs. Bifenazate and cyflumetofen are effective against all life stages but only target spider mites. Some exceptional miticides, such as fenpyroximate (Akari), are effective against all mite species and all life stages on ornamental and vegetable crops. Akari is a miticide for "all mite species, all life stages," which simplifies the development of a spray program. For detailed information on the activity spectrum of various miticides and biological control agents, consult this article: "Phytophagous Mites and Their Management on Ornamental Plants" (**bit.ly/clemson-mites**).

When using miticides, it's important to rotate among different modes of action or IRAC (Insecticide Resistance Action Committee) numbers, as mites are notorious for developing pesticide resistance. To navigate this challenge, think of it as having a diverse cast of characters, each with their unique strengths, just like the Tin Man, the Scarecrow, the Lion and Toto on Dorothy's journey. A successful miticide rotation program should include four or five modes of action. Since each mite generation lasts about one week, you'll need to use a miticide with a different mode of action each time you spray, if you spray once a week. To help you along this path, I have included several example rotation programs in this article, guiding you toward the goal of producing a perfect crop.





A floral map exhibit by Jennifer Designs highlights hyper-local cut flowers, a trend that recognizes the carbon footprint of mass-grown imported flowers.

By Audrey Trevarthan

FLOWER TRENDS IN FULL BLOOM

The Pennsylvania Horticultural Society's Philadelphia Flower Show gives growers insights into industry-driving trends.

From the wholesale grower to the plant and garden retailer, consumer trends are what drive the horticulture business. Staying on top of those trends is crucial to success. And nowhere in the annual horticultural trade show season are those trends more evident than The Pennsylvania Horticultural Society's Philadelphia Flower Show, which in its nearly 200-year history has showcased innovation in flowers, foliage, landscapes and floral design.



Aroids continue their dominance in terms of popularity and desire.



Sculptural elements and mixed media displays are entering the design conversation.

The show grants plant brands, floral designers, garden designers and gardeners a chance to get creative — and to take those creations to the next level. The 2024 theme, "United by Flowers," not only showcased astonishing designs but also offered inspiration to both beginning gardeners and experts.

Over the course of the show, strong ideas and subjects emerged. In houseplants, the much-loved monsteras and philodendrons showed no sign of losing their popular crown, while in flowers, African violets and begonias emerged as favorites. Landscapers demonstrated the movement to rewild mannered spaces, while tech entered the flower world with 3-D printing and mixed-media design.

And while the bold, future-forward displays of the Flower Show may not be ubiquitous in the American garden today, growers need to be prepared, selecting plants that will coexist with the needs of the garden consumer.

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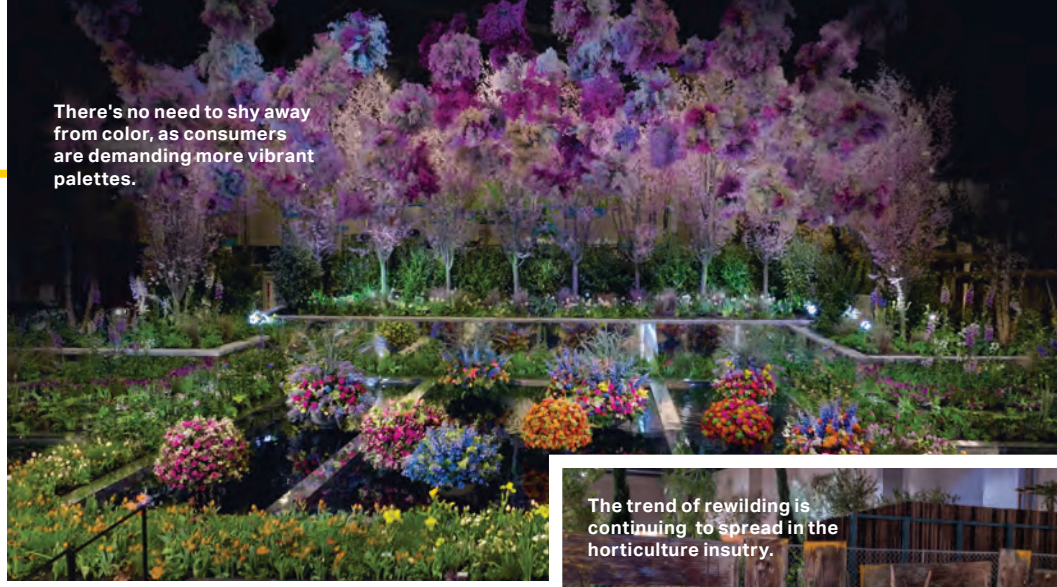
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There's no need to shy away from color, as consumers are demanding more vibrant palettes.



The trend of rewilding is continuing to spread in the horticulture insutry.

"The Philadelphia Flower Show provides a platform for some of the world's most renowned designers and growers to highlight the best and newest ideas in the industry," says Seth Pearsoll, the show's creative director and vice president. "These displays often reflect up-and-coming industry trends that are then incorporated by gardeners, landscapers and florists of all levels around the globe."

Here are the trends to watch for in the coming years:

Aroids all around: Aroids remain a popular houseplant. Philodendron, amorphophallus, monstera and anthurium all took a competitive category at the flower show. This plant family continues to attract interest. Coming in all sizes, aroids are easy to care for, making them a great houseplant.

Going big on begonias: The flower show saw many rare begonias, and all around, begonias were on display this year as they continue to gain more interest. Typically seen in shade gardens, begonias can be very versatile. Their popularity may come from being low maintenance and adding a bold pop of color in many varieties.

Very violet: Gesneriads gained popularity this year, and there were many varieties at the flower show. The usual African violets were accompanied by *Streptocarpus*, *Sinningia*, *Petrocosmea*, *Primulina* and *Kohleria*.

Plants under glass: Terrariums are having a fantastic year as their popularity climbs. They can accommodate many plant groups and allow gardeners to get creative with designs. Eye-catching, low maintenance and approachable for all skill levels, this approach to growing plants suits all types of gardeners.

Going wild: Popular in urban areas, rewilding of land is becoming more popular in the landscape industry. The trend was represented at the show through exhibits, including Kelly Norris' "A Beautiful Disturbance," which showcased a vacant lot overtaken by plants.

Growing local: A floral map exhibit by Jennifer Designs highlighted hyper-local cut flowers, a trend that recognizes the carbon footprint of mass-grown imported flowers. Many cut flowers in the U.S. come from other countries, and buying locally sourced cut flowers can have a variety of positive environmental effects. Locally sourced flowers can also last longer.

Mixing it up: Virtual gardens are growing as the use of mixed media creates an immersive floral experience. Projection and photography are used to create virtual gardens. Incorporating this technology by providing a virtual tour of greenhouses could be a great addition to a website.

Table toppers: Table-top topiaries and arrangements with pops of color and unique takes on their forms were on display at the show. Designers can branch out and explore different colors, shapes and textures for topiaries. Each one can be unique and customized.

Seeing in mono: The use of monotone, bold neon colors and color-blocking has increased across the floral industry. Using only one color — popular choices are neon pink or orange — a bold, eye-catching design is created. In an event setting, promotion or other uses, this is a helpful strategy to stick to a color scheme, take a risk or just have fun with neons.

Statement pieces: This year, large-scale statement floral sculptures and arrangements are preferred over smaller clusters of florals. A large focal point can set the tone of a garden design or event. They can also be used in large business spaces to create a certain mood and complement the plants.

Tootie fruity: Organic materials, like fruits and vegetables, are being incorporated into arrangements to make them appear whimsical. They add variety to the texture, color and shape of the arrangement.

Now in 3-D: Untraditional media to create organic shapes and masses are trending. 3-D printers are a popular way to accomplish this design, which can also incorporate natural materials like moss, grass and foliage. PHS says the idea behind this stems from the "no flower-flower arrangement." Any untraditional medium can be incorporated into an arrangement. Concrete can be used to create shapes that complement the florals.

Amazing anthurium: Anthurium in unique, vibrant colors has been increasingly popular. Using them in a way that is natural and creative can demonstrate a well-done, eye-catching sculpture, arrangement or floral display.

Industry trends remain an important north star for growers. With foresight into what's coming, boosting begonia production or trying tropicals may just boost revenue or add a new source of funds. It's just a matter of seeing the signs and taking a chance. But using the Philadelphia Flower Show as a guide is a good bet. A 195-year track record is hard to beat. GM

Audrey Trevarthan is the GIE Ornamental Group editorial intern. Contact her at **atrevarthan@gie.net**.

2024



GREENHOUSE INSIDER

- *Navigating zoning issues*
- *Crucial upgrades*
- *Seasonal checklist for greenhouse success*

PHOTO © ADOBESTOCK

NATIONAL GREENHOUSE MANUFACTURERS ASSOCIATION
NGMA
MEETING THE CHALLENGES OF TODAY'S HORTICULTURAL INDUSTRY

A WELCOME MESSAGE FROM THE NGMA PRESIDENT



President
Tim Lauer

The National Greenhouse Manufacturers Association represents and advances the interests of the greenhouse industry through education, networking and communication. We are a a professional trade organization for the manufacturers and suppliers of greenhouse structures and greenhouse components. The NGMA supplies the greenhouse users of today with the absolute best there is to offer. Our membership is a gathering of many of the most experienced and knowledgeable people in the industry.

This year provided the NGMA and its membership the opportunity to meet in Clearwater, Florida. The meeting was well attended and allowed for a great exchange of knowledge between the seasoned membership and a contingent of new members and representatives. Discussion focused on concerns with supply chain, proliferation of CEA, industry growth and trends and code concerns about greenhouse efficiency and construction, among many other subjects.

The NGMA has always been poised to meet the challenges brought forth by the horticultural industry. The strength of our organization is the collective knowledge of its membership. We offer a fair and open forum for discussion and networking. I want to personally thank the NGMA membership for their participation and vitality.

I also would like to offer an invitation for those who are interested in NGMA to contact **membership@ngma.com** and visit our website at **ngma.com**. There, NGMA continues to monitor the energy and building codes that will alter our industry. We also produce new and updated "Helpful Hints" documents, found on the website under the Industry Information heading.

Finally, we encourage greenhouse users to please speak to our membership about your greenhouse needs.

Thank you for another year as NGMA president,
Tim Lauer



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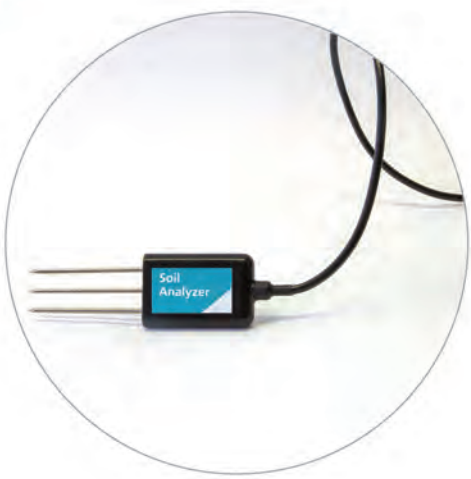
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A LASTING **LEGACY**

Lloyd Traven prioritizes production upgrades as part of Peace Tree Farm's succession plan. **By Kelli Rodda**

LLOYD TRAVEN, founder of Peace Tree Farm in Kintnersville, Pennsylvania, is preparing for his retirement after running the specialized and distinctive operation with his wife Candy for the past 40 years. He's been making some big investments, but not in post-retirement purchases like a boat or a mountain home. Instead, he's been investing in greenhouse upgrades as part of the succession plan when his son Alex takes over the business.

"I've got a five-year plan to retire, then Alex will own a majority stake and take over the business," Traven explains. "Over the last few years, it's been my job to get this company to a place where Alex doesn't have to be frantic about infrastructure or business development, and he can run on this momentum while he gets his feet completely under him and puts his final team together. I'm not in the greenhouse working on production anymore. I'm all about the 30,000-foot view now."

In terms of infrastructure, he's completed an impressive list of upgrades for the 50,000-square-foot greenhouse operation, from computer control systems to LEDs and solar power to a hydrogen peroxide generator.

"We did a top-to-bottom, 100% replacement this year of our Argus environmental control system. We had the oldest fully operational Argus system that they were aware of anywhere. Ours dated back to 1986, and they were stunned that we had the original main controller. All the relays and expansion boards were there," he describes. "We'd expanded it several times over the years, but we had the old legacy software. They were blown away."

Traven and Argus worked together to add more functions to the system, including a boiler alarm, LED lighting and dimming capability, as well as daily light integral programs.

"Now there are a lot of things we added that we didn't have full control over for the last 30 or 40 years," he adds.

Traven also replaced the microclimate heating system in the upper range. The original system was from the 1980s. And they're rebuilding greenhouse benches as an ongoing project.

About four years ago, Traven installed an on-site hydrogen peroxide generation system for disinfection and disease control. The Danish system, HPNow, uses water, oxygen and electricity to produce low-concentration hydrogen peroxide.

"Since we've started using that system, there's no algae problems anymore. We don't have to clean the booms or filters as often as we used to. There are fewer fungus gnats. The benches are cleaner," he explains.



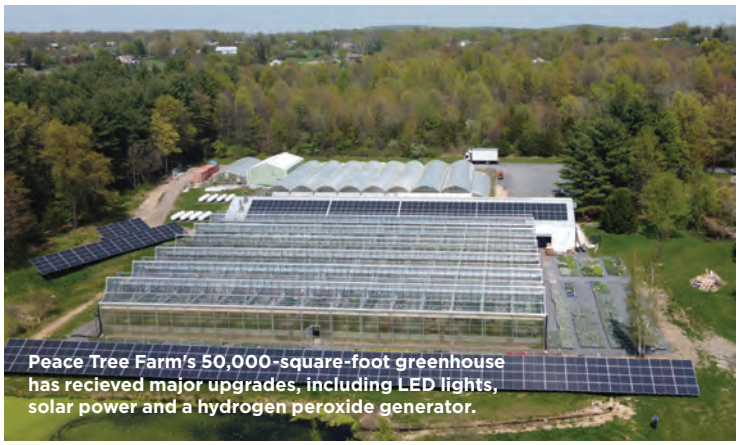
Peace Tree Farm ships live basil to Wegman's supermarket stores in Pennsylvania, New Jersey, New York and parts of Delaware and Maryland, twice a week, 52 weeks a year.

PHOTO COURTESY LLOYD TRAVEN

It's also cut down on pythium issues that used to be common during summer production.

"We would have a period every summer — and we do a lot of lavender propagation in the summer — that once the water temperature in the ebb and flood tanks hit 78 or 80 degrees, we'd have a sudden outbreak of pythium," he says. "And since we're certified organic — we have to grow all the crops organically — we don't have all the chemicals available to us for pythium control. Once

we installed this system, we don't see those issues at that level anymore. It's a really slick system."


Peace Tree Farm's 50,000-square-foot greenhouse has recieved major upgrades, including LED lights, solar power and a hydrogen peroxide generator.

Big on basil

Herbs are big business at Peace Tree Farm, including an exclusive program they developed for Wegmans, a regional supermarket chain. Traven and his team are shipping herbs to the grocer's distribution center for sale in stores throughout Pennsylvania, New Jersey, the New York City metro area and parts of Delaware and Maryland twice a week, 52 weeks a year.

"That's changed everything we do. That's why we keep people 52 weeks a year. We no longer depend on spring sales to keep us going," he says.

The program consists of nine herbs: basil, rosemary, parsley, sage, thyme, dill, mint, cilantro and chai.

Recently, Peace Tree Farm updated its Fluence LED system. Traven says the use of LEDs has positively impacted the herb program. With the help of researchers at Project LAMP (Lighting Approaches to Maximize Profits), he learned the wavelengths of LEDs are important to the physiologic and morphologic growth of the plants.

"We also found out blue light keeps plants shorter. So, if I was growing cut basil, I would want red light, because it makes them get big and long with a lot of mass," he explains. "Well, ours are sold live in a sleeve in the produce department. We needed something that makes them shorter and denser. When we were looking at LEDs, it turns out the Fluence VYPRs we were installing have a very high percentage of blue wavelength.

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When we started lighting with LEDs, there was an instantaneous change in the plant growth."

He's also learned that using photoperiod night interruption and blue light wavelength "can dramatically slow down sporulation of basil downy mildew."

Because of this year-round program, the herbs have to look the same during Christmas week as they look on the Fourth of July.

"Between the Argus control system, the lights, the irrigation, the feed and the disinfection system, we have figured out how to grow this crop so it looks the same year-round," he says.

The Wegmans herb program also precipitated the eventual purchase of a new transplanter and the possibility of buying a new pot dispenser. The automation he currently uses and the machines he's considering directly support the greenhouse production crews.

"We don't have trouble finding people," Traven says. "We pay well; we pay for their medical; we offer profit sharing. And we really try for a 40-hour week, and they get two days a week off." GM

Kelli Rodda is editorial director of ***Greenhouse Management*** magazine. Contact her at **krodda@gie.net**

FOR MORE: PEACETREEFARM.COM

SUN FOR THE SON

Peace Tree Farm recently installed a large solar project, generating 265 kilowatts. Traven estimates some 85% of their electricity is from solar.

They pulled the trigger on this project with the future in mind.

"Realistically, Candy and I knew going into it that we'd get very little benefit from it. This was all for Alex. Now he's got an electricity generator for 20 years," he says.

Electricity costs are going up 22 to 25% each year, and the company has added a lot more equipment that needs electricity to operate.

The Travens used a Rural Energy for America Program (REAP) grant and received a federal investment tax credit to help offset the costs.





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Good to know.

PRIORITIZING **UPGRADES**

Every operation has its own set of needs and challenges, but eventual greenhouse upgrades are necessary to successfully compete in the marketplace.

Compiled from Stuppy Greenhouse and GGS Structures

THE DECISION TO UPGRADE your greenhouse can be daunting, but there are ways to ease the stress and help the process run smoothly.

Plan ahead. Don't wait for a crisis to have an upgrade plan in place. Planning now — even if you don't plan to build for another two or three years — allows you to carefully make all the major decisions. Choose the right time for construction and start budgeting accordingly.

Start with the end goals. Do you want to expand capacity or grow a new crop that requires a different facility than what you have? Is your goal to increase employee safety and productivity by reducing manual labor and adding automation? Do you need improvements in energy efficiency and/or want to introduce more sustainable systems such as rainwater conservation or closed-loop irrigation? If crop quality is a concern, identify what improvements you need, such as lighting, bench heating, watering systems, greenhouse glazing or environmental controls.

Create a partnership. Find a team that will help throughout the entire upgrading process, such as construction, navigating building codes and permitting, irrigation, and heating and lighting systems. That partnership should continue after everything is built and installed.

Fully understand your processes and costs. You may not be able to fix everything by building a new facility, but if every problem area is upfront and on paper, your contractor may find ways to



Don't wait for a crisis to begin upgrades. Plan ahead and create a plan for future projects.

PHOTO © ADOBESTOCK

Greenhouse master plan

Frequently, expansion involves very little planning. Additional structures are added where they are easiest to build without regard to how materials will flow or how the operation, if it continues to expand, will look in five or 10 years. Planning should be part of your expansion process. Develop a master facilities plan to provide a framework for orderly construction and renovation.

Review your business plan

Base the facilities master plan on a sound business plan. What are the short- and long-range goals of your business, and how will expansion help you achieve these?

Any renovation or expansion should be set by the ability of your business to carry the cost. Your business plan and master facilities plan should complement each other by enhancing efficiencies and reducing costs.

Facilities requirements

Based on the goals and objectives of your business, you should establish a list of facilities requirements and a timetable for achievement. The list could include:

- the amount of greenhouse expansion;
- the amount of mechanization or automation you desire;
- most efficient shipping methods;
- type of support facilities;
- what environmental concerns should be considered.

Evaluate the alternatives for each of the above. How will these impact the cost of construction and operation? For example, the more you automate, the lower the labor costs, but the higher the construction costs.

Site evaluation

Start the master plan with a topographic surveyed map of existing facilities. This survey should show:

- land and elevations in 1- or 2-foot intervals;
- road access, utilities and required setback distances;
- soil types, ponds, streams, wetlands and the flow of runoff;

property lines, neighboring structures and anything else that can affect your expansion.

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Existing structures should be evaluated based on functional requirements and cost. Existing buildings that are not very functional or obsolete may hinder development of an efficient operation.

Plan your development

In developing a master plan, it is best to plan on paper, looking at several alternative layouts. The master plan starts with a survey of your existing facilities, evaluates the benefits and constraints of the site and establishes how renovations should be made and where new facilities should be built.

Because materials handling is the largest cost in most greenhouse operations, you should make it a major consideration in the placement of new structures and their relation to the headhouse. The type of plant moving system that is selected is important in relation to the plants you grow, distance moved and elevation differences. Conveyors, carts and pallet trays have advantages and disadvantages that must be evaluated.

The size of individual growing units (greenhouses or number of bays of a gutter-connected house) should be based on the quantity of plants grown and the environment they require. Individual hoop-houses may work well for an operation growing specialty plants that require different temperatures, but larger, gutter-connected greenhouses are generally more efficient for wholesale operations.

Other considerations

Headhouse

If your operation has more than a couple of greenhouses, a headhouse should be a key part of the plan. Besides providing an area for potting, transplanting and shipping, the headhouse is an excellent place for the support facilities needed to run an efficient business. It can also serve to tie the greenhouses together by providing access without having to go outside, an advantage during inclement weather.

Storage

Both inside and outside for materials, supplies, equipment and vehicles.

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We offer a range of state-of-the-art greenhouse structures for every sector of the growing industry, from the largest commercial growers to retail garden centers, educational institutions and research projects. Plus, we offer other critical elements of controlled growing environments such as our exclusive line of Heat2O™ hydronic heat products. Many of our products are engineered and manufactured in-house in the USA, and all are tailored to customers' needs and designed to achieve results.

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Access
Driveways to all buildings should be provided for emergency use. Location and slope are important.

Maintenance shop
An area or building for storage of tools and equipment repair should be provided.

Drainage
A drainage system that will handle the large amounts of water that will come off your greenhouses and driveways is needed. You may have to construct a sedimentation pond.

A master plan can also help in obtaining zoning and wetlands permits. It should be submitted at the first expansion phase.

Source: University of Massachusetts Amherst Extension, ***ag.umass.edu***

incorporate solutions you haven't considered. Where are areas of congestion? Would a rolling bench system work better? Does your current greenhouse allow staging of light and ventilation?

A closer look at some upgrades

To lower costs and increase productivity, many growers consider upgrading irrigation systems as a first step. A fully automated irrigation system will provide more uniform watering and increase plant quality. Such a system allows growers to schedule all of their booms as well as control pH and EC levels. Most new systems have alerts that can be synced to devices, so you're immediately aware if there is a problem with your watering. They're also able to store data, sometimes multiple years worth of information, so you're able to look back at various seasons to make improvements.

Heating is another large but controllable cost in a greenhouse, made only more costly by an inefficient heating system. Older greenhouse heating systems do not provide the same level of efficiency as newer heating systems, resulting in wasted energy that will negatively affect your bottom line.

You may consider purchasing new condensing boilers, which are significantly more efficient than older systems. You may also consider switching to a closed expansion system rather than having open expansion tanks.

Automation can be customized from simple production solutions to a fully integrated system. First, evaluate the time and money spent on everyday tasks in the greenhouse, especially repetitive tasks. Greenhouse automation can be increased as needs and budgets increase. GM

Sources: Stuppy Greenhouse, ***stuppy.com****; GGS Structures,* ***ggs-greenhouse.com***

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ZONING APPROVAL PROCEDURES

Tips for maneuvering through local zoning procedures when you're building new or expanding.

By John W. Bartok Jr.

IF YOU ARE EXPANDING your greenhouse operation or building a new one, you will need zoning approval. In some communities, especially smaller ones, this may be easy to obtain. In others, it may require a considerable expenditure in time and money. It usually depends on how well prepared you are, the complexity of the regulations and the feelings of your neighbors toward your business.

Many people don't think of greenhouses as part of agriculture, but they are usually included under the definition of agriculture in state statutes. This is important, as most communities that don't have a special zone for agriculture attempt to include them under a commercial classification. Considering greenhouses as agricultural may allow them to be built in most zones, including residential.

Applying for a zoning permit

When applying for a zoning permit, do your homework. First, educate the zoning enforcement officer and the zoning commission members about what a greenhouse is and what you grow. You may find that most members have never been in a greenhouse.

Second, provide the information required by the regulations. If you meet the requirements in the regulations, it is very difficult for the commission to deny your application.

Zoning deals with land use: The information that can be required includes a site plan showing the location of the greenhouse on the property and its relation to other structures and property lines. You may also have to address traffic flow, parking, buffers, signs and chemicals to be used and stored. The site plan, generally prepared by a surveyor, should show contours and all physical features, including ponds, streams, wetlands and the flow of runoff.

The present buildings and the proposed new greenhouse should be shown. Including areas of future expansion on the plan has saved some growers considerable time when the next phase of expansion occurs. As commission makeup changes frequently, members may consider subsequent phases as having already been approved in concept by the previous commission.

Don't try to intimidate the commission. These are volunteers that serve the community without pay. They spend their evenings attending meetings to oversee the orderly development of the community. Having served as a member of the local Planning and Zoning Commission for more than 40 years, I have seen many applications presented. Commission members are much more receptive to a proposal that is concise and addresses the issues as they relate to the regulations.



Zoning regulations cover land use. Before construction can start, zoning commission approval is needed.

PHOTOS BY JOHN BARTOK JR.

Hearings

A public hearing may be required to get the permit. At the hearing, interested neighbors may voice concerns that they would like to have addressed. Try to anticipate these questions and have a prepared answer for them. Typical questions raised include:

- How will the proposed greenhouse affect property values?

- Will traffic increase?
- What pesticides will be used, and how persistent are they?
- How will the runoff from the greenhouse and additional parking be handled?
- Will there be noise pollution from fans, trucks, materials, handling equipment, etc.?
- What are the hours of operation?

Approval or denial of your application

If your application is approved, you are ready to apply for a building permit.

If your application is denied by the commission, they should cite the reasons for denial. You can then appeal this in court. The court will review the denial to see if there was an error in the procedure or interpretation of the regulations. Generally, the court will uphold a commission decision if they followed the requirements in their regulations and they made a reasonable judgment.

Where the court will generally find for the applicant is if the commission has violated the procedures. These include failure to post the notices in a timely manner, failure to file for public view, information pertaining to the application, failure of a member with a conflict of interest to disqualify himself or herself and other requirements that have a time period or filing procedure.

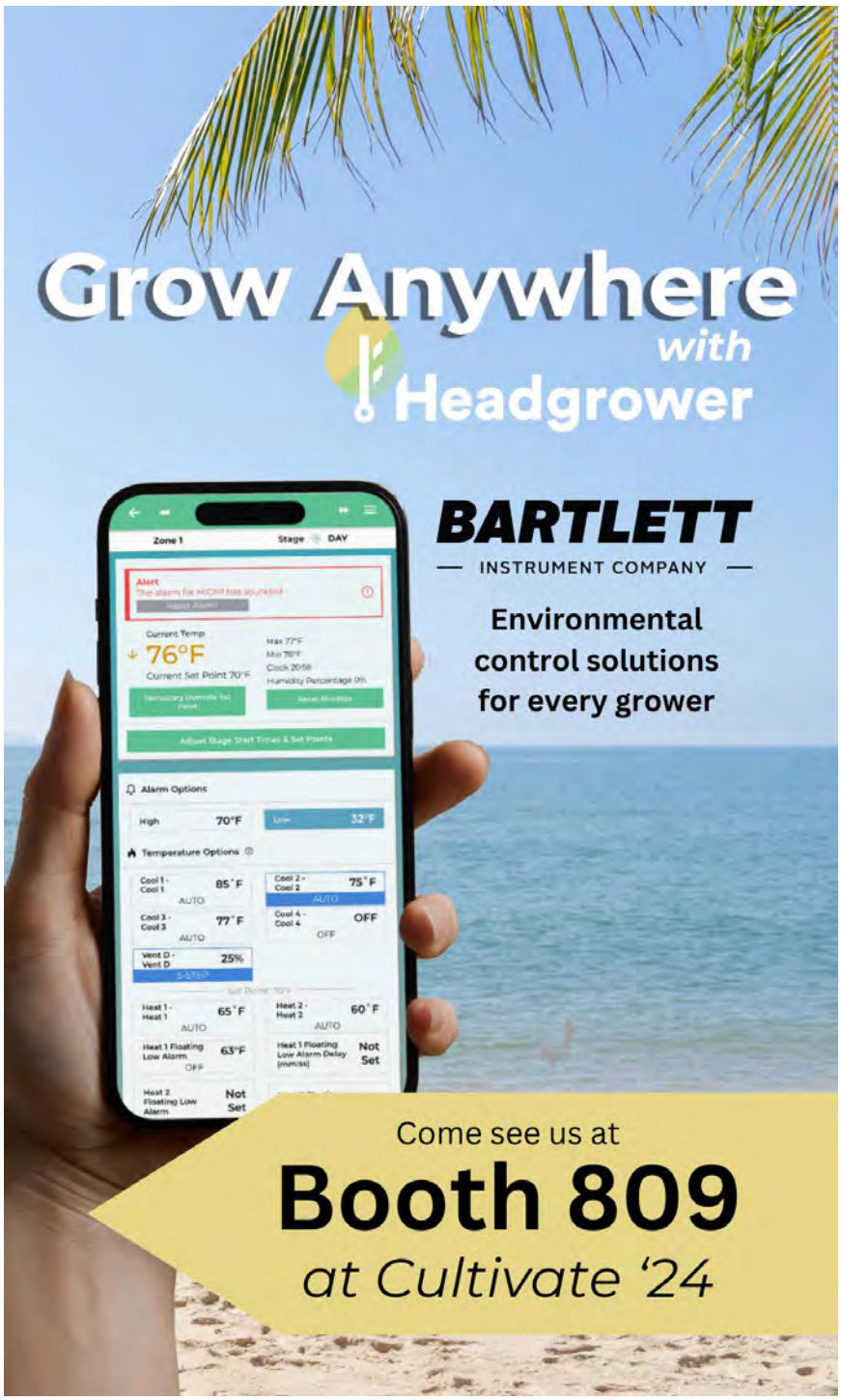
Once the application is processed and the public hearing, if required, completed, the commission has a defined time period in which to act.

Variances

A variance allows you to develop your property in a manner prohibited by the zoning regulations. It allows a "bending of the rules." Hardship has to be shown, and it can't be self-created or financial. Typically, variances may be issued to allow a building to be built closer to a property line than the normal setback, allow a greater percentage of the lot to be covered with greenhouses than is allowed by regulation and the use of land that was too wet for a subdivision to construct a nursery or greenhouse.

Planning and zoning commissions have considerable power and duties to uphold in enforcing regulations related to land use. Working with them can help your project win favorable approval. GM

John Bartok Jr. is an agricultural engineer and emeritus extension professor at the University of Connecticut. Contact him at **jbartok@rcn.com**



REGULAR **CHECKUPS**

Follow a greenhouse maintenance schedule to increase operating efficiencies and improve product yields. **By Zach Bruce**

AS A GREENHOUSE GROWER, you know maintaining and protecting your greenhouse is as important to your bottom line as a good yield. In fact, the two go hand in hand. Proactively maintaining your greenhouse can help reduce equipment failures, increase operating efficiencies and improve product yields.

But greenhouse maintenance is more than just kicking the tires of your operation every once in a while. Your maintenance plan should include routine inspections of your frames, glazing, ventilation, heating and more. If you don't already have a regular maintenance schedule, create one. It's also helpful to keep a repair log and note any potential maintenance issues. Assign the task to an employee who is familiar with your greenhouse and can manage pre-season or multi-annual inspections. The effort could extend the life of your expensive machinery and likely strengthen your business' bottom line.

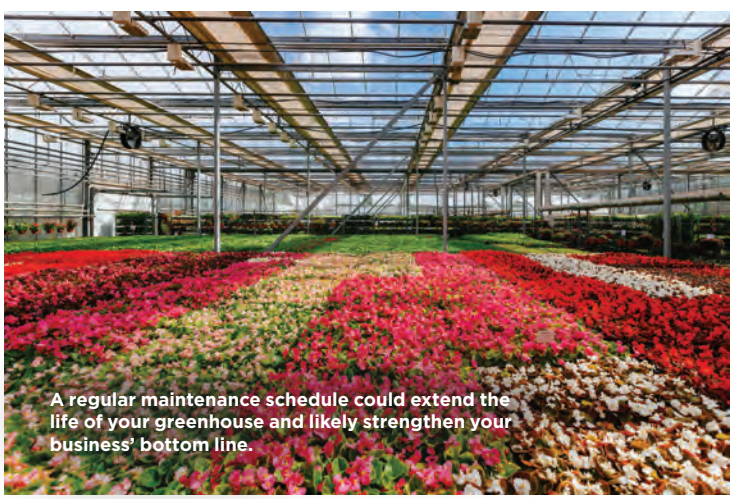
Here's my recommended checklist to get you started.

Paneling and glazing

A variety of greenhouse coverings exist, so be sure your maintenance plan suits your materials. Also, different glazing types — including glass, poly film and polycarbonate —require different maintenance plans. Adjust accordingly.

Do a visual inspection: Look for areas where you need to repair tearing or broken or slipped glass. Make note of any cracked or missing sheets of polycarbonate. Check for loose screws and attachment extrusions.

Check the clips: Ensure all the clips hold the glazing panels in place. You can secure loose glazing clips in place with silicone sealant to provide extra strength against strong winds.



A regular maintenance schedule could extend the life of your greenhouse and likely strengthen your business' bottom line.

Check bar caps: Regularly test your bar caps for tightness if you're using glass panes.

Wash panels: Wash polycarbonate and acrylic panels with a mild detergent and lukewarm water using a soft sponge to remove dirt, smog and debris. Once clean, test and measure the level of lighting.

Address spray-on shading: If you apply shading in the summer, wash it off in the fall. You can remove spray-on shading with a cleaning compound or a commercial shade remover. Spray on the cleaner, let it stand for a few minutes, then thoroughly flush with clean water.

Examine your poly cover: Repair small holes or tears with polyethylene tape. If your poly has stretched or loosened, you can tighten it by removing the lock strip inserts and pulling the plastic taut. Plan to replace plastic that's older than four years. Don't forget to clean and inspect the inflation blower. Set inflation pressure so it's about the same as an inflated balloon.

Minimize heat escape: For an older glass greenhouse with broken or slipped glass, cover it with a layer of film poly to reduce heat loss. For loose poly covering, an air-inflated poly tube located halfway between the ridge and eave will keep the plastic rigid and help shed snow.

Frames

Different frame materials require slightly different checklists. However, daily wear and tear — and severe weather like hail, snow or wind — can weaken any greenhouse frame. Include the following tasks in your maintenance worksheet.

Paint or scrub: For wood frames, save painting or staining for summer. For aluminum frames, address any signs of corrosion or wear and tear.

Examine low areas and corners: Don't forget to look down. Clean any rust or corrosion from bolts and framing materials at ground level. Also check for mold or rot on wood frames.

Replace damaged frame components: If you've discovered damage to any part of your structure's framing or bracing, replace the bent or damaged materials. Even a slight dent or bend can dramatically reduce the strength of some structural components, leading to a higher risk of collapse when tested by wind or weight. Tighten collar tie and truss bolts. Excessive heat and constant wind can loosen these crucial frame mechanisms.

Ventilation and fans

Greenhouse vents play a critical role in creating a safe

PHOTO © ADOBESTOCK

environment for your plants by replenishing CO_2 and removing excess heat and moisture. Exhaust fans work in partnership with your shutters and vents. These tips can help keep your greenhouse grow-ready.

Lubricate vent components: Roof and sidewall vents get a lot of use, so they need continuous attention. Lubricate bearings, racks and pinions, and vent arm hinge points. Also grease the shutter hinge points so they close tight. Don't forget to check the fluid in your gearbox drives.

Fix loose-closing vents: If your vents don't close tight, you can add weather stripping to help stop excess permeation.

Check vent position switches: With automated vents, double-check the minimum and maximum vent positions to ensure they stop at the correct spot.

Check hinges and catches: With manual vents, windows or louvers, test to make sure the hinges and catches work smoothly. Grease the linkages if they don't.

Inspect fan components: Always disconnect power when inspecting your fans. Check for loose or worn belts, clean fan blades and tighten or replace any screws that vibrated loose.

Clean horizontal air flow (HAF) fans: If the fans are hardwired, be sure to follow proper lockout/tagout procedures. Clean the blades and guards. Oil the bearings if they aren't sealed. Clean evaporative cooling pads. Regularly clean and disinfect your cooling pads to enhance airflow and minimize fungus growth.

Heaters and boilers

A functioning and efficient boiler is a crucial part of your greenhouse — and not something you want breaking down in the middle of a cold snap. Your maintenance goal here is to keep your heater running smoothly at all times.

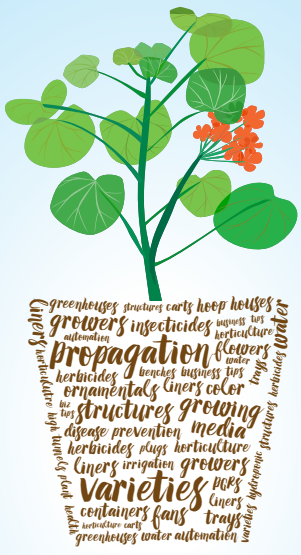
Service all equipment before the heating season begins: It's important to have your heating unit inspected annually by a licensed heating, ventilation and air conditioning (HVAC) company to ensure your heaters and exhaust pipes are clean and in safe operating condition.

Check limit controls: Evaluate for efficiency status:

* High heat
* Fan or blower operation
* Barometric draft control on the flue pipe
* Safety pressure relief valves on boilers

Remove dangerous debris: Blow out burner ports and clean heater of any spider webs, bird/wasp nests or any other debris.

Inspect heat exchangers: Check for leaks and corrosion and clean heat-exchanger surfaces. Vacuum and use a wire brush to clean radiators and fan pipes.



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Check for combustion potential: Look for signs of fuel or gas leaks and reestablish proper clearances of any flammable liquids or combustible materials near heating equipment.

Do a combustion test: Check efficiency, draft and smoke level with a combustion test on the heating unit.

Do a test run: Test your heating systems to ensure they heat your greenhouse as expected. Also test run the back-up generator and check its fuel supply.

Floors and doors

Floors need to allow for good drainage and insulate the greenhouse from cold. Doors need to seal properly for optimal insulation and pest control.

Regularly clean the floor: Use soap and a disinfectant to scrub concrete floors. Remove any dirt, debris and algae, and pay close attention to corners, cracks and areas under benches.

Repair floor cracks: Remove any weeds or debris from cracks and crevices. Repair cracks in concrete with caulk or other repair material. You can repair a cracked concrete foundation wall with an epoxy adhesive.

Consider floor insulation: To avoid heat loss, insulate as deep as the frost line around the perimeter of a heated concrete slab floor. Some growers have even insulated below the slab.

Inspect doors: Add or replace weatherstripping to reduce permeation through small gaps around doors. Use brush-type astragal weatherstripping on sliding doors. Replace worn doors showing large gaps with insulated steel doors and frames.

Pests and disease

Keeping pests and disease at bay in your greenhouse is a vital part of greenhouse maintenance. Common pests in warm, humid conditions include aphids, red spider mites and mealy bugs. Common diseases and conditions include mildew and botrytis. To help keep your yields safe, follow these tips.

Disinfect irrigation and holding tanks: Irrigation lines and holding tanks develop algae and can host thousands of gnats, which are a threat to small roots.

Prevent invasion: Thoroughly inspect your greenhouse for small gaps in the base, frame or glazing panels and properly fill them. Make sure your doors close tightly.

Deep clean: Schedule time to deep clean your greenhouse to help alleviate disease propagation, mold and pests that might otherwise overwinter. GM

Zach Bruce is the safety services manager for Hortica, a brand of the Sentry Insurance Group. **hortica.com**

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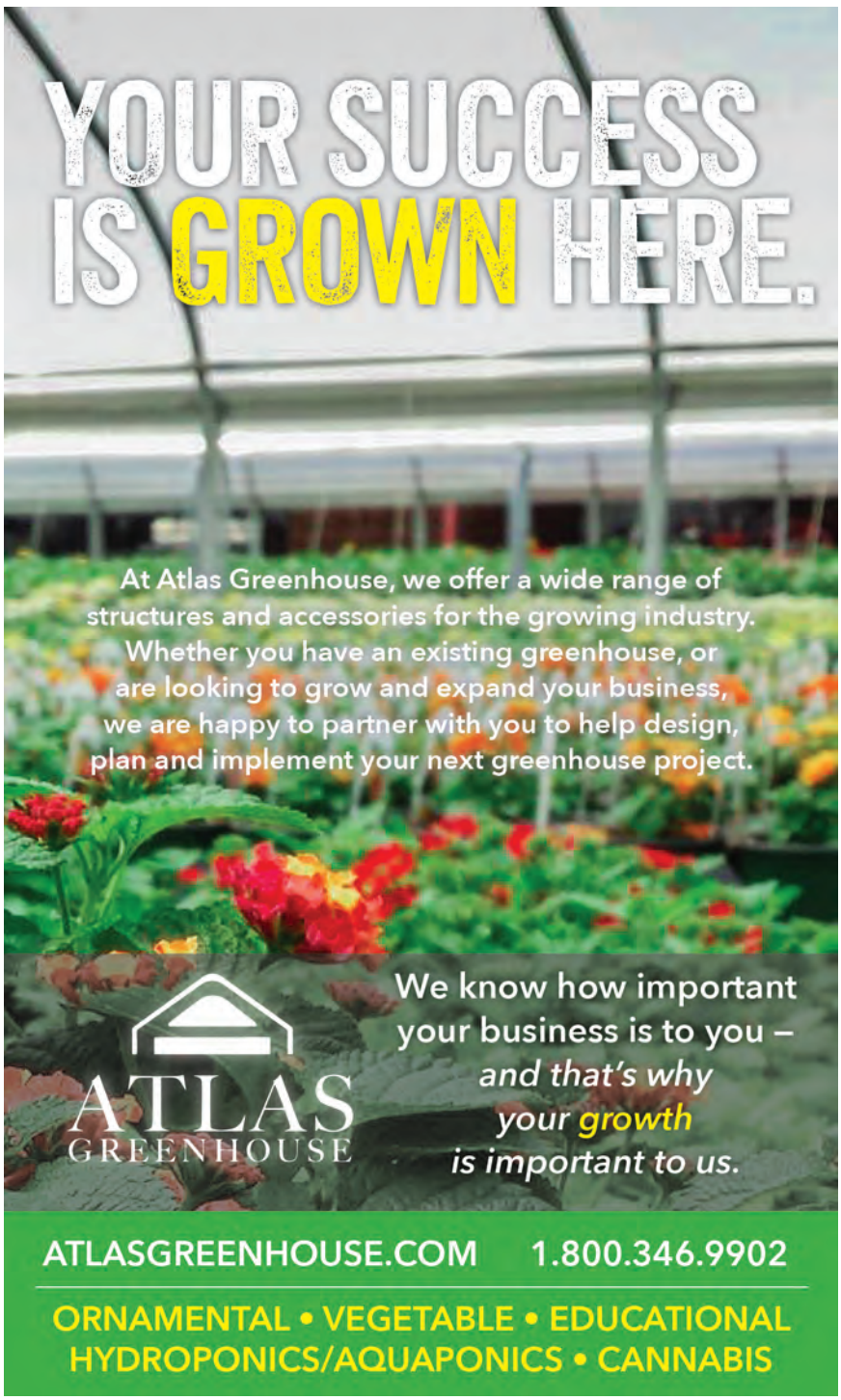
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Thrips can enter greenhouses through migration, or via contaminated cuttings or seedlings.

CHILLI THRIPS

(SCIRTOTHRIPS DORSALIS HOOD*)*

This indiscriminate pest will attack all sorts of ornamental crops. **By Matt McClellan**

Chilli thrips (*Scirtothrips dorsalis*) attack plants with new foliage growth, and deform and at times discolor foliage. Chilli thrips are much smaller than western flower thrips, so they are extremely hard to see when you're scouting.

Brett Alldredge, former pest management supervisor at Greenleaf Nursery in Texas, handled pest and disease control for 450 acres of ornamental crops. In Texas, Alldredge says chilli thrips start in April and continue to be a problem through October, peaking in the hot summer months.

"Those are a real challenge because they fly in waves, and they attack anything that flushes," he says. GM

Matt McClellan is editor of sister publication *Nursery Management*. Contact him at **mmcclellan@gie.net**.

THE FACTS ABOUT CHILLI THRIPS

DESCRIPTION: Chilli thrips are extremely small and difficult to distinguish from other thrips species without the aid of a good hand lens or compound microscope. Adults are pale with dark wings and less than 1 millimeter in length. Immature chilli thrips are also pale in color and resemble the immature stages of many other thrips species.

SYMPTOMS:

- Silvering of the leaf surface
- Linear thickenings of the leaf lamina
- Brown frass markings on the leaves and fruits
- Gray to black markings on fruits often forming a conspicuous ring of scarred tissue around the apex
- Fruit distortion and early senescence of leaves



MANAGEMENT: Treating the soil of infested plants is not effective. Therefore, systemic insecticides should be applied as a foliar spray. Pyrethroid insecticides are not effective against chilli thrips and should not be used, since they are toxic to natural enemies. Soft products, such as insecticidal soaps, appear to suppress chilli thrips populations. To be effective, these products need to be applied on a regular basis. Thrips populations have been shown to increase dramatically once applications have stopped. To prevent insecticide resistance from developing, it is important to rotate insecticides between chemical classes with different modes of action. Predators such as the minute pirate bug, predatory mites and even predatory thrips have shown potential to control chilli thrips.

CHEMICAL CONTROL: No insecticide will provide complete control of thrips. It is important to detect and start management strategies before thrips populations have a chance to increase to moderate or high levels. Use the shortest labeled interval when pest pressure is high and temperatures are warm. Insecticides should be rotated by changing modes of action with each treatment or at most with each generation of thrips, unless the label indicates otherwise.

BIOLOGICAL CONTROL: Biological control programs should begin at the first sign of thrips. Sticky traps may help to detect thrips up to a month before they are seen on plants. Yellow sticky cards or ribbons should be hung just at the tops of plants and examined weekly. Blue sticky cards will sometimes, but not always, catch more thrips than yellow sticky cards. Thrips are the tiniest insects you will find in any numbers on sticky traps. Thrips are found with wings folded, so they appear like tiny brown flecks of peat moss. Some specimens will show hairs on edges of wings when viewed with a hand lens; often their stocky antennae stick out at the front in a V-shape.

Sources: University of Florida IFAS, Texas AgriLife Extension

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MARK LEICHTY is the director of business development at Little Prince of Oregon Nursery near Portland. He is a certified plant geek who enjoys visiting beautiful gardens and garden centers searching for rare and unique plants to satisfy his plant lust. **mark@littleprinceoforegon.com**

PARIS LUQUANENSIS

This rare perennial boasts silvery veins, bright red fruit and a wellness connection.

By Mark Leichty





Left: Ernie and Marietta O'Byrne, owners of Northwest Garden Nursery. Right: *Paris luquanensis* can be propagated by seed or from rhizome divisions.

"We'll always have Paris…"

I have primarily focused on tropical plants over the past two years of writing these Flora Exotica articles. My idea for the column was to educate readers about some of the incredibly beautiful and often rare plants that were emerging into the marketplace in western horticulture. However, there are many rare and beautiful hardy perennials to be coveted by plant nerds such as myself. This article is as much about two rare and beautiful people as it is about a plant. Ernie and Marietta O'Byrne, owners of Northwest Garden Nursery near Eugene, Oregon, are two of the most wonderful people I've ever known. Their book, "A Tapestry Garden," is a horticultural masterpiece decades in the making. They are best known for their Winter Jewels Hellebores collection, which they hybridized over the last 30 years.

Marietta has also been hybridizing other genera, including *Podophyllum*, *Trillium, Paris* and many more. I had never seen Paris before encountering it in the O'Byrne garden. Specifically, *Paris luquanensis* is an exquisite garden gem with lovely silvery veining on dark green leaves. It grows only 5 to 6 inches high, with up to eight leaves arranged around a central axis. A purple stem rises from the central axis of the plant to a flower consisting of a purple ovary surrounded by six bright green leaflets that each have a long, yellow, string-like petal. When pollinated, bright red fruit will form.

P. luquanensis is native to the southern Sichuan and north Central Yunnan provinces in China. It grows in moist shade to partial shade in rich, well-drained soil. It can be propagated by seed or from rhizome divisions. In addition to its value horticulturally, *Paris* has long been used in Chinese medicine to treat liver, ovarian and bladder cancer, as well as Alzheimer's disease.

Paris is a terribly slow grower. It takes years to produce a sellable 4-inch pot. For many large growers who rely on quick turns, that's a dealbreaker, which is why it's most likely found only in specialty nurseries. However, I would happily pay more than I'd care to admit publicly for the opportunity to buy one of these jewels, so there may be a good opportunity here for some skilled niche growers. GM

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Eryngium zabelii Big Blue

This captivating perennial wows for its color and its architectural form.

Big Blue sea holly's spiky features — sharply pointed leaves, bracts and inflorescences — give it an otherworldly feel, but this fascinating perennial even works in traditional garden settings. It has a dip-dyed appearance, as the upper flowers, stems and leaves are deep blue-violet, fading into silvery blue-green, grounded with deep blue-green basal foliage.

The thistle-like, violet-blue flowers bloom from June through August. In the fall and winter, flowers hold their form as a dried seed head. Flowers also attract a variety of bees, butterflies and other pollinators. The plants grow up to 2½ feet tall and feature strong stems.

Both blooming and dried flower heads are ideal as cut flowers. Big Blue sea holly is a drought tolerant plant that prefers well-drained, poor soils. It's hardy in USDA Zones 5-9.

SOURCE:
Oudolf Garden Detroit, oudolfgardendetroit.org

Culture details

Transplants
- Transplant one liner per pot in a standard 1-gallon container.
- Growing media should be porous with good drainage.
- Best if planted in the fall and allowed to bulk before vernalizing in finished pot.

Finished plants
- Keep growing media pH at 5.5-6.5 and EC at 1.5-3.
- Plants should be kept moderately dry and allowed to dry between irrigations.
- While actively growing, apply a constant liquid feed of 100-150 ppm N.
- No growth regulators are required.
- Supplemental lighting is not required.
- Vernalize in finished size pot and allow to flush in natural spring season outdoors.
- Root rot may be a problem if kept too wet.

Cultural information source: Must Have Perennials, ***musthaveperennials.com***



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