

URBAN AG NEWS

THE CLIMATE MANAGEMENT ISSUE

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GROWING IN THE BAHAMAS ISN'T ALWAYS PARADISE

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URBAN AG NEWS



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Urban Ag News actively seeks to become a connector for niche agricultural industries, **bringing together growers with growers, growers with manufacturers, growers with suppliers and growers with consumers.**

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Photo courtesy of Lucayan Tropical Produce



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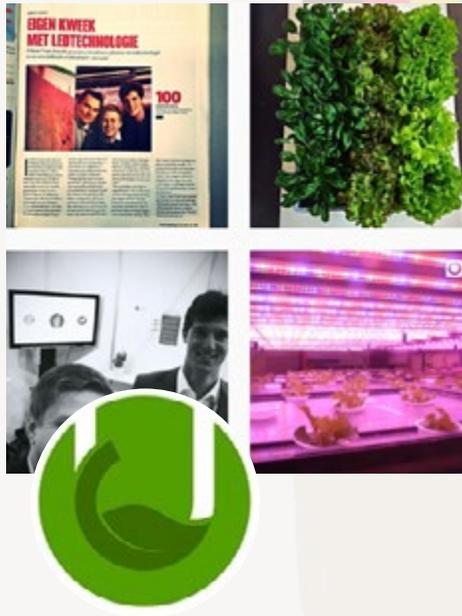
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JOINING FORCES IN AG TECH & CONTROLLED ENVIRONMENT AGRICULTURE

BY JIM PANTALEO

It was a privilege and an honor to be part of the organizing team and also to moderate the “East Meets West” conference held at the California Agriculture Center last month in Salinas, California. The first event of its kind brought together seven member-companies from the JPFA (Japan Plant Factory Association) led by association President and Professor Emeritus from Japan’s Chiba University, Dr. Toyoki Kozai. Known as the “Father of the Japanese Plant Factory,” or what westerners call indoor vertical farms (food production using only artificial lights) he was assisted by Eri Hayashi who assembled actual operators of plant factories and representatives from companies with expertise in lighting, engineering and construction, irrigation, and software.

With a full audience in attendance, California growers, academics and various Ag-related companies were strongly represented. The event began with a warm welcome from the current Salinas mayor, Joe Gunter, followed by Dennis Donohue, lead for the Western Growers Association’s Center for Innovation and Technology. Mayor Gunter presented Dr. Kozai with a bottle of local wine while Dennis, a former mayor of Salinas, noted the ties between Salinas and Japan were strong and long-standing. I was to learn the following day during the greenhouse tour that beginning in the 1920’s many of Salinas’ early greenhouses were constructed and operated by Japanese immigrants. In fact, a number of those early greenhouses remain in place today

while the early operators and their descendants are long gone.

The Japanese company representatives competently presented entirely in English, something I found to be deeply courageous as well as a respectful gesture to the assembled audience. During the question and answer period following each presentation, company representatives were adroitly assisted by Naoko Honda, a local and highly professional translator/interpreter. The presenting companies included:

- KAJIMA
- MIRAI
- KEYSTONE TECHNOLOGY
- PLANTX
- SHINNIOOPU 808 FACTORY
- IKEUCHI USA
- NIHON ADVANCED AGRI

With four networking sessions interspersed throughout the day, like a teacher facing a rowdy class, it was difficult for this moderator to get the buzzing room back to into their seats for the next set of presentations. During the afternoon session, Victor Hernandez from the USDA was introduced and provided a brief overview of the department’s initiatives, programs and Ag resources in their 52 California offices. Chris Higgins, General Manager of Hort Americas and founder of Urban Ag News, spoke of the importance of these types of events with the



goal of incorporating international networking along with a solid dose of science and education. To this end, those on hand included a strong contingent from the University of California, Davis, led by crop ecologist Dr. Heiner Lieth; representatives from Dutch R&D firm, PlantLab; and Dr. Nadia Sabeh, an expert on HVAC in controlled growing environments.

Day one finished with a lively presentation by Dr. Don Wilkerson of iBio CMO.* Not only is his work amazing (think Ebola vaccine) but his down-to-earth nature provokes thought through the use of his unique blend of humor with science.

**iBio CMO has broad capabilities in plant, cell culture and microbial-based expression systems. With these capabilities, iBio CMO maintains the full range of options for biological product development and manufacturing to respond to current unmet patient and global needs.*

Included in my role as part of the organizing team and the event's moderator, I was also the shuttle bus driver for the Japanese delegation. This job gave me the opportunity to get to know the delegation in a more intimate manner. An amazingly kind and inquisitive group, they were impressed by the vastness of the Salinas valley, the number of crops being grown year

round, and all were incredibly eager to connect with US companies.

Day two concluded with a greenhouse tour from Rocket Farms' horticulture expert, Victor Loaiza, who graciously led the delegation through several different sites around the Salinas valley. Impressive in terms of Rocket Farms' scale of greenhouse growing operations (Trader Joe's is a primary customer), the delegation saw first-hand how their technology could in fact help US growers in meeting their current challenges. Supplemental lighting, control systems based on software technology, irrigation systems and automation were all highlighted as a need by Victor.

Stay tuned for more events of this kind – Texas A&M and MIT are possible 2017 sites – and feel free to reach out me, Jim Pantaleo, for an introduction to any members of the JPFA delegation.

Thank you very much!

Dōmo arigatōgozaimashita! 🌱

Jim Pantaleo, Director of Business Development at Urban Ag News, jim@urbanagnews.com



Members of the Japan Plant Factory Association delegation w/event participants



Rocket Farms' Victor Loaiza, Chris Higgins, Eri Hayashi and Dr. Toyoki Kozai



Growing in a “*perfect*” greenhouse climate

By David Kuack

Although it may be difficult to create the perfect greenhouse climate for growing plants, there are variables growers can control to maximize plant growth.



Dr. Nadia Sabeh said carbon dioxide is most useful to plants when there is a lot of light and good temperature and humidity levels or vapor pressure deficit (VPD).

Regardless of the type of crop being grown in a greenhouse, the climate a grower is trying to achieve requires controlling the same variables.

“Greenhouse growers are trying to control temperature, humidity, light level, carbon dioxide, and in some instances, airflow and air distribution,” said mechanical and agricultural engineer Dr. Nadia Sabeh, founder of Dr. Greenhouse. “Depending on the crop, these variables have different set points. They also might have different acceptable maximum and minimum ranges or levels.

“Depending on the crop, these variables can be changed during different times of the day. For instance, a tomato crop wants a daily average temperature around 72°F. If the plants experience high temperatures during the day, if the temperature is able to be cooled down during the night, as long as the average temperature is 72°F, the tomato plants are happy. For lettuce, a grower may not be able to manipulate the day or night temperature to make up for exceeding the maximum temperature that occurs during the day or night. That’s one way these crops differ.”

Sabeh said when it comes to controlling the greenhouse environment growers usually focus first on temperature.

“The first line of defense against warm temperatures is not shading,” she said. “Growers are trying to maximize as much light into the greenhouse as possible. As soon as a shade curtain is closed the solar input is reduced. The first line of defense for cooling a greenhouse is ventilation, either natural or mechanical.

“If ventilation can’t achieve the temperature a growers needs, then some form of cooling is added. Typically cooling is done through evaporative cooling. This could be wet pads and a fan system, high pressure fog or a low pressure misting system in combination with mechanical and natural ventilation. If that doesn’t work, then a shade curtain can be pulled. A shade curtain is usually only drawn for two to four hours during the day. It’s pulled during the peak solar heat gain period. A shade curtain can cut the temperature by 2°F-4°F”

The challenge of reducing humidity

Sabeh said between controlling the greenhouse temperature and humidity, humidity is the more challenging variable, especially if it is for dehumidification.

“If a grower is trying to remove moisture from the greenhouse, that presents a lot of challenges,” she said. “The standard method of removing moisture from the greenhouse



The first line of defense for cooling a greenhouse is ventilation, either natural or mechanical.



Evaporative cooling can be used in dry climates to increase the humidity and lower the temperature in a greenhouse.

is through ventilation. But that assumes that the moisture level or the humidity outside the greenhouse is lower than it is inside the greenhouse.

“If a grower is looking to increase the humidity or humidification, for a greenhouse located in the southwest U.S. where it is very dry, moisture can be added to the greenhouse using evaporative cooling. Another benefit of evaporative cooling is a reduction in the temperature that cools the greenhouse temperature. Evaporative cooling works very well in a dry climate to do both of those things.”

Sabeh said growers in the Midwest and Southeast can experience more challenging climates because they have a high heat solar gain like growers in the Southwest experience, but they also have high humidity levels requiring them to ventilate.

“The climates in the Midwest and Southeast make it very challenging to grow plants in a greenhouse because of the humidity,” Sabeh said. “The only line of defense for growing plants in that kind of climate is ventilation. Growers want to exchange as much air as possible with the outside to remove moisture and solar heat gain during the day. Typically that is inadequate. If the outside temperature

is 90°F and the relative humidity is 90 percent, growers certainly don’t want those conditions in their greenhouses.

“If the temperature and humidity are high, growers don’t have the opportunity to use evaporative cooling because they can’t reduce the temperature enough,” she said. “They can shade the greenhouses, but that only lowers the temperature by 2°F-4°F from outside conditions. If it is 90°F and 90 percent humidity, pulling shade results in 86°F and 90 percent humidity, and that is not going to provide the vapor pressure deficit a grower is trying to achieve.”

Sabeh said growers might consider closing up their greenhouses to avoid bringing in hot, moist air, but that creates additional challenges.

“Closing the greenhouse can cause the greenhouse to heat up from the sun plus the plants are releasing moisture resulting in the greenhouse just getting hotter,” she said. “So far I haven’t really seen anyone come up with a very cost effective method to mitigate that heat and moisture. Certainly a grower could use a refrigerant-based cooling system similar to an air conditioning system that would provide dehumidification. But the size and scale of those systems are cost prohibitive.”

Typically greenhouse cooling is done through evaporative cooling. This could be wet pads and a fan system, high pressure fog or a low pressure misting system in combination with mechanical and natural ventilation.



Maintaining the proper vapor pressure deficit

Sabeh said temperature and humidity are very closely linked through the vapor pressure deficit (VPD).

“As long as a grower is able to control the greenhouse temperature, that usually means he is able to control the humidity level to the point where the vapor pressure deficit is where it should be,” she said. “Even if VPD is not the target that a grower is going for, that is actually the target that he is trying to reach with temperature control with or without humidity control.”

VPD is the difference between the amount of moisture in the air and how much moisture the air can hold when it is saturated.

“There is an optimum level for VPD,” Sabeh said. “For leafy greens and culinary herbs, which prefer a lower VPD, the accepted VPD range is 0.65 to 0.9 kilopascal (kPa) with 0.85 kPa being optimum. Tomatoes, cucumbers and peppers tend to like it drier. The VPD range for tomatoes is 0.9 to 1.2 kPa.

“For leafy greens there is more surface area for moisture to escape the plants. The plants like to be in a more humid space so they don’t release too much moisture too fast.”

Providing adequate airflow

Sabeh said airflow in the greenhouse is really important for breaking up the layer of moisture around the leaf surface of the plants.

“If the leaves are transpiring water, the leaf surface itself is considered saturated,” she said. “The leaf surface is exchanging moisture with the air around it. The more moisture in the air around the leaf surface, the less tendency to transfer moisture from the leaf surface to the air around it.

“This is basically what the vapor pressure deficit is. It is the difference between how much moisture there is at the leaf surface at a given temperature vs. how much moisture there is in the air at that same temperature. If it is within the right range, then the plants are happy because the leaves are freely exchanging moisture with the air. If the vapor pressure deficit is too low that means the air has a lot of moisture in it so there is going to be less transfer of moisture from the leaves to the air. The plants can’t transpire as quickly and nutrients can’t be delivered as quickly to the rest of the plant. If the vapor pressure deficit is too high, the air is really dry, and the plants shut down. As a protection strategy, the plants will close their stomata



Growers want to exchange as much air as possible with the outside to remove moisture and solar heat gain during the day.

so that they don't transpire moisture to the air because it would occur too fast. The loss of water through transpiration would occur faster than the plants could take up water."

Sabeh said horizontal airflow fans are the traditional method for producing airflow and air currents in a greenhouse.

"Horizontal airflow fans are usually suspended from the trusses or the structure of the greenhouse and blow air in a circular pattern over the tops of the plants without actually blowing directly down on the plants," she said. "Just the circulation and motion is enough to create turbulence to cause air mixing around the plants to encourage transpiration and convection.

"By breaking up the little saturation pocket of air around the leaves, it facilitates that moisture transfer from the leaves to the air. Under more humid conditions, as air is blown over the leaf surface, a grower can facilitate

more transpiration from the plants than if no airflow was blowing over it. Airflow is one of those variables not addressed as often as temperature and humidity control. It is sorted of neglected."

With the increasing interest in vertical farms, Sabeh said growers are using large grow racks to try to create temperature and humidity conditions in three dimensions.

"Under these conditions it is very easy for air to get trapped over the center of a rack," she said. "Vertical farmers are really cognitive of airflow because they see these hot spots or these wet spots in the middle of the grow racks so they know they need airflow.

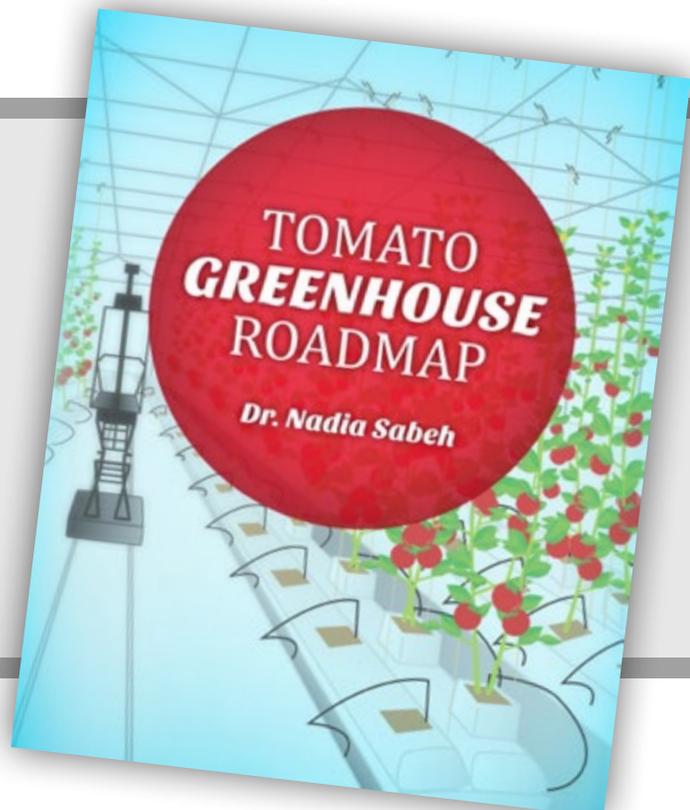
"It is the same situation as if plants are grown in a greenhouse. If more airflow is provided in a greenhouse, more moisture could be removed from the plant surface and help the plant with cooling by convection."

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Maintaining the proper carbon dioxide level

Sabeh said although carbon dioxide is not necessarily impacted by the outdoor climate, greenhouse growers are controlling it relative to the outdoors.

“In a greenhouse where growers are burning fuel to generate carbon dioxide and ventilating at the same time there is a challenge of how much carbon dioxide should be delivered and how is it going to be retained? Is there a way to mitigate the carbon dioxide’s immediate loss to the outside air through greenhouse ventilation?”

“One strategy for not overusing carbon dioxide is to provide plants with a boost from carbon dioxide enrichment. Carbon dioxide can be provided first thing in the morning during first light before the greenhouse vents are open. Basically the plants take a deep breath when the sun starts to come out and the stomata open. The sunlight or the supplemental lights are turned on and the plants take up that carbon dioxide. When a grower starts to ventilate because the moisture has built up overnight or the temperature starts to increase because the sun is rising, enrichment with carbon dioxide can be stopped so that it is not being blown out of the greenhouse through the vents and exhausted by the fans. Some growers use carbon dioxide enrichment all day as long as there is enough light from the sun or from artificial light.”

Sabeh said growers can mitigate the loss of carbon dioxide by trying to deliver it as close to the leaves as possible.

“Some growers use under-floor or under-bench ducts to deliver carbon dioxide,” she said. “Some growers may use PVC tubing or fish tubing to distribute carbon dioxide through the crop and directly to the leaves. This is ideal if a grower can find a way to deliver the carbon dioxide in an effective manner without getting in the way of all of the other equipment and people working in the greenhouse.”

“This is why some people are looking at the potential advantage of growing in vertical farms. There is an enclosed space and in most cases it is being done in buildings that are not leaky. There are some growers who have considered closed greenhouses. The cannabis industry is really interested in this, but the problem is there is an outrageous energy bill to try and close the greenhouse and not use any ventilation or mechanical cooling.”

Relationship between greenhouse climate variables

Sabeh said the optimum level of carbon dioxide varies for each crop. She said 700-1,500 parts per million carbon dioxide is the level that most growers are trying to use.

“Carbon dioxide is most useful to the plants when there is a lot of light and good temperature and humidity levels or a good VPD,” she said. “Carbon dioxide is transferred through the leaf stomata, the same as moisture through transpiration. At the right VPD the stomata are open to the maximum and are letting out moisture and gulping up carbon dioxide.”

“The first thing is having the right VPD to maximize stomata opening. The second thing is photosynthesis, which is driven by light. If the air is being enriched with carbon dioxide, but the light level is very low, much of the carbon dioxide will be wasted. There has to be enough light to facilitate a high enough rate of photosynthesis or the plants can’t use the carbon dioxide. All three of these variables work together. A good VPD is needed for stomata opening. An adequate light level is needed for photosynthesis. And carbon dioxide is needed to maximize the photosynthesis cycle.” 🌱

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<http://www.doctorgreenhouse.com>.

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Tomato crops want a daily average temperature around 72°F. Dr. Nadia Sabeih said if the plants experience high temperatures during the day, but the temperature can be cooled down during the night, as long as the average temperature is 72°F, the tomato plants are happy.



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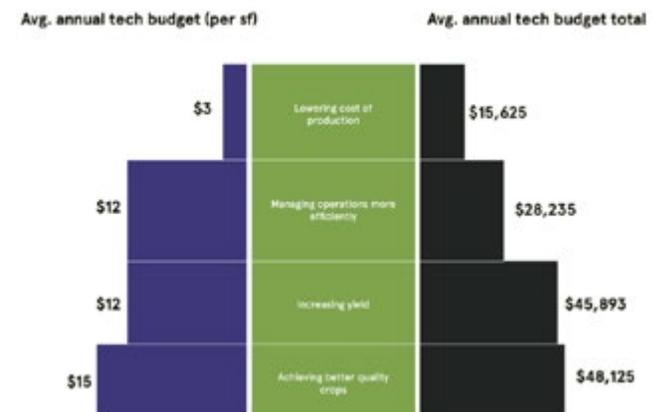
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There are many unknowns and misconceptions about the indoor farming market. We wanted to provide detailed insight into what indoor growers are doing, what they're challenged by, and how they see the indoor farming industry changing over the next few years. So, we teamed up with Cornell University, Urban Ag News, foodshed.io, the Association for Vertical Farming, and FarmersWeb to survey growers from around the world, receiving over 150 responses. Data from the survey is supplemented by research conducted by our team and others (as linked).

Annual technology budgets for production priorities



[Industry Report — Click here](#)



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GENE EDITING YIELDS TOMATOES THAT FLOWER AND RIPEN WEEKS EARLIER

Using CRISPR to expand the geographical range of important food crops – Dec. 2016.

Using a simple and powerful genetic method to tweak genes native to two popular varieties of tomato plants, a team at Cold Spring Harbor Laboratory (CSHL) has devised a rapid method to make them flower and produce ripe fruit more than 2 weeks faster than commercial breeders are currently able to do.

This means more plantings per growing season and thus higher yield. In this case, it also means that the plant can be grown in latitudes more northerly than currently possible – an important attribute as the earth's climate warms.

More info: <http://bit.ly/2h6TcOc>



MEET THE SCIENTISTS BREEDING VEGETABLES FOR OUR CHANGING ENVIRONMENT

by NBC News





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*Although **MightyVine** has only been growing greenhouse tomatoes for a year, its sister companies have enabled its product to be sold to a variety of clients in multiple states.*

By David Kuack

MightyVine has been producing greenhouse tomatoes in Rochelle, Ill., for just over a year. But company chairman Jim Murphy became involved in the distribution and preparation of food before the 15-acre greenhouse operation began producing tomatoes.

“Two and half years before we opened the first 7.5-acre greenhouse we started a company called Local Foods,” Murphy said. “We began to source food from over 200 local farmers within 250 miles of Chicago, including grains, produce, meat and dairy, and delivered it directly to restaurants and small retailers. We were basically a distributor, a for-profit food hub. The restaurants really adopted the concept.

“We have our own 30,000-square-foot retail and wholesale facility on the north side of Chicago. Local Foods is handling the distribution of the tomatoes grown by MightyVine.”

Another sister company of MightyVine is HandCut Foods.

“This company is a full-service food service company that prepares 5,000 meals a day, mostly for private high schools, colleges

and grammar schools,” Murphy said. “The company sources local foods and provides daily from-scratch meals.”

From ethanol to tomatoes

Murphy, who is also CEO of Carbon Green LLC, is chairman of Carbon Green BioEnergy, a 60-million-gallon corn ethanol plant in Lake Odessa, Mich.

“When I first started looking at the greenhouse business, we were interested in trying to use the carbon dioxide and waste heat generated by the ethanol plant,” he said. “We looked into the possibility of locating a greenhouse near the ethanol plant. That’s what initially excited us about the greenhouse operation. But the production of ethanol grew more efficient in the past decade, so there isn’t as much waste heat available. I work with a lot of engineers and technically-educated people who were able to help us evaluate this. In the end, the ethanol plant tie-in was deemed unnecessary. But we loved the idea of a greenhouse supplying fresh local produce year-round to the Chicago market.

“The most difficult thing in terms of starting the greenhouse was finding a good location. We’re risk takers. When we brought the greenhouse online we didn’t have one tomato sold. There were people who were interested in buying our product, but we didn’t have one tomato sold.”

MightyVine partnered with Royal Pride Holland, in Middenmeer, the Netherlands, to construct its state-of-the-art glass greenhouse.

“Our operating Dutch partner has 140 acres of glass greenhouses north of Amsterdam,” Murphy said. “They were instrumental in assisting us to set up our operation in Chicago. The weather conditions between the two locations are similar. We have more extreme cold and a little more heat, but we also have more sunlight.

“We have the North American rights to proprietary seed that the Dutch company uses in Europe, so we are introducing a new



MightyVine has the North American rights to proprietary seed that Royal Pride Holland uses in Europe. MightyVine produces cherry tomatoes on the vine and a high flavor tomato on the vine.

flavor concept to the American market. We produce primarily two varieties year-round: cherry tomatoes on the vine and a high flavor TOV (tomato on the vine).”

Expanding market reach

Murphy chose the Chicago market to grow and market his tomatoes because he is from Chicago and he recognized the untapped potential to sell locally-grown produce there.

“Chicago is a great retail food market and a great restaurant market and there are a lot of young people living in the city,” he said. “We currently sell the majority of the product within the Chicago area. We sell to Whole Foods Market, Jewel and Hy-Vee. The tomatoes are also sold in Milwaukee, Madison, Quad Cities, and across northern, central and southern Illinois.

“We distribute some of the tomatoes ourselves, including to many of the top restaurants in Chicago. We also use a Fortune 500 third-party distributor for two of our larger retailers.”

MightyVine began harvesting tomatoes from its phase two 7.5-acre greenhouse facility in December. Murphy said the company is focused on supplying the Midwest market and is not looking to expand production to other locations outside the area. The company is looking at potentially growing other crops.

Promoting the benefits of locally grown

Murphy said tomatoes being shipped in from Canada are his company’s biggest competition.



Jim Murphy, chairman of MightyVine, said his company's locally-grown tomatoes are on the menus of some of Chicago's top restaurants, including Frontera Mexican, operated by chef Rick Bayless.



MightyVine tomatoes are picked ripe and are in stores the next day.

“The Canadian growers have been at it a long time,” he said. “Many have operations in Mexico, so it can be difficult to know where their product is coming from. Our 15 acres is small in comparison to some of the Canadian tomato operations. They have logistical issues with trying to get their crops picked and out of their facilities. We’re able to get our tomatoes out of the greenhouse in a timely fashion. They don’t sit on site for three to five days.

“We also never sell any tomatoes that we don’t grow. That is an important difference. Most Canadian operations sell tomatoes they don’t grow. They’re more marketers than growers.”

Murphy said picking the tomatoes ripe enables end users to take advantage of the quality and health benefits of tomatoes.

“Our tomatoes are picked ripe and are in the store the day after we harvest them,” he said. “People are eating our tomatoes and getting all of that value from being able to grow the tomatoes all the way through to complete ripeness. There is no cold chain involved because we don’t have to ship our tomatoes a long way.

“People in Chicago know the MightyVine name. MightyVine is on a lot of menus in restaurants and we’ve been very pleased with the support of some of Chicago’s top chefs. Chef Rick Bayless, whose Frontera Mexican restaurants are very successful, loves us. He talks about us all of the time. If you walk through O’Hare Airport you’ll see signs for MightyVine tomatoes. We’re building our brand on quality.” 🍅

For more: MightyVine, (312) 432-6568; <http://www.mightyvine.com>.

David Kuack is a freelance technical writer in Fort Worth, Texas; dkuack@gmail.com.





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Bike Out Hunger - Texas

May 8-13, 2017 - Fredericksburg



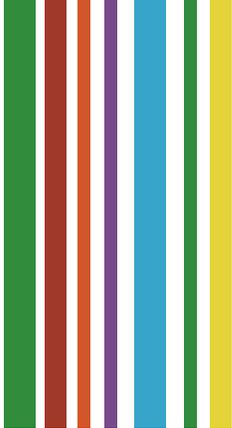
Bike Out Hunger - Texas is a 6-day ride with varying routes, distances and pace groups. We ride to raise awareness and funds to help feed hungry children.

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bikeouthunger.org



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Appetite For Change is a North Minneapolis nonprofit organization that uses food as a tool to build health, wealth and social change.

“Grow Food” is the culminating project of Appetite For Change’s Summer 2016 Youth Employment & Training Program. Urban Youth wanted to share their message - the importance of actively choosing healthy foods - with their peers in a fun, accessible music format. At AFC, we believe that youth are the truth. We hope this song will inspire you to explore new ways to eat, cook and grow food.

Directed By Chancellor Tha Beast in collaboration with Beats & Rhymes.

Learn more about Appetite For Change at: <http://appetiteforchangemn.org>



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**INDUSTRY
NEWS**

LOCAL ROOTS DISCLOSES ITS GLOBAL SUSTAINABLE INDOOR FARMING INITIATIVE

Local Roots Farms, the LA-based indoor farming company respected for its high-quality leafy greens and innovative approach to farming, announced completion of a TerraFarm network, ready for commercial deployment in Q1 2017. After a dramatic increase in demand for their scalable indoor farming solutions, Local Roots will now build indoor farming projects across the country to serve its commercial customers.

[>> Click for more >>](#)



COLORADO AQUAPONICS AND CERES GREENHOUSE SOLUTIONS ANNOUNCE STRATEGIC PARTNERSHIP TO BRING ENERGY-EFFICIENT AQUAPONIC GREENHOUSES TO MARKET

Colorado Aquaponics and Ceres Greenhouse Solutions – two Colorado –based independent businesses – announced that they will partner to create super energy-efficient aquaponic greenhouses. The new greenhouses build off each companies’ years of research and development in their respective industries. Colorado Aquaponics designs high-yield aquaponic systems for small-scale commercial farms. Ceres Greenhouse Solutions creates super energy-efficient greenhouses using passive solar design principles and renewable heating / cooling methods.

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WATER CONSERVATION AND TREATMENT WEBINAR SERIES FOR GREENHOUSE AND NURSERY GROWERS, 2017

Learn about the latest water treatment and conservation research in these free webinars! Researchers from Clean Water3 (cleanwater3.org), a federally-funded research team, are focused on helping growers Reduce, Remediate and Recycle irrigation water. The grant team is managed by Dr. Sarah White at Clemson University and includes many research collaborators across the U.S. We are presenting a series of six webinars hosted by the University of Florida IFAS Center for Public Issues Education. Webinars will be 45 minutes long at 12 noon on consecutive Tuesdays, beginning on January 24.

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HORT AMERICAS NOW OFFERS NEW AND IMPROVED 23MM BATO CLIP

With Bato's company slogan of "Plants, People and Profit" there is no question that professional greenhouse growers focused on vine crops will notice the positive effects. Further, the company has invested in over two years of research and development for the new version of the 23mm Bato Clip with the goal of saving the grower labor costs by speeding up the work process.

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THE CITY OF ATLANTA'S INAUGURAL AGLANTA CONFERENCE WHERE GROWING OPPORTUNITY MEETS THRIVING COMMUNITY

The Aglanta Conference is a gathering to showcase urban and controlled environment agriculture (CEA) innovation in the City of Atlanta. The City of Atlanta has partnered with Blue Planet Consulting to bring together restaurateurs, grocers, architects, entrepreneurs, technologists, business owners, and urban farmers for this premium networking and knowledge sharing opportunity.

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TOUR DE FRESH 2017

The 2017 Tour de Fresh is a three-day bike ride consisting of riders that cover the spectrum of skill levels. From novice to elite riders, the 2017 Tour de Fresh team is committed to training, riding and completing the trek as a unit. That same unity applies to raising funds for Let's Move Salad Bars to Schools and each day, each mile, and each revolution of a bicycle wheel even, will be to better school nutrition and our industry as a whole.

[>> Click for more >>](#)

ALSTROEMERIAS TO FLOWER WITH PHILIPS LED LIGHTS

Philips Lighting (Euronext Amsterdam ticker: LIGHT), a global leader in lighting, today announced that the Dutch alstroemeria grower Hoogenboom Alstroemeria is moving to hybrid lighting in its 1.5-hectare greenhouse with Philips GreenPower LED toplighting. By using Philips GreenPower LED, grower Dick Hoogenboom will shorten growth cycles, increase quantity and quality of yields while reducing energy consumption up to 42 percent.

[>> Click for more >>](#)



BIKE OUT HUNGER

Out Hunger was created to empower you to actively end hunger that exists in your community, city, state and nation. The need for food is one of our base needs (and is something I've personally grown pretty fond of and expect on a regular basis). Unfortunately, not everyone knows when they'll eat next. That's called food insecurity. It's a big problem, but a fixable one if we all work together. I love improving things and this year's ride, we are changing to stay in Fredericksburg the full time, without traveling to other cities and hotels. #unpackonce. The routes will be different each day and will have a shorter (40+/-) or longer (90+/-) daily distance option. Staying in one place makes it easier to participate in all or some days and allows time for work (if you have to) and more relaxation.

[>> Click for more >>](#)

TRULEAF CLOSSES \$8.5-MILLION ROUND OF FINANCING FORMER EXECUTIVE OF SCOTIABANK JOINS TRULEAF BOARD OF DIRECTORS

TruLeaf Sustainable Agriculture Ltd. (TruLeaf), the indoor, multi-level farming company from Bible Hill, Nova Scotia has closed an \$8.5-million equity-finance round. This funding will enable the company to continue its mission of becoming a global leader in vertical farming technology. TruLeaf develops sustainable farming systems that can be built anywhere that enable fresh, nutrient-dense, pesticide-free produce to be grown locally all year round.

[>> Click for more >>](#)

INDUSTRY NEWS

THE AGRICULTURAL MARKETING SERVICE (AMS) NATIONAL ORGANIC PROGRAM (NOP) ANNOUNCES NEW DRAFT GUIDANCE DOCUMENT

The NOP published in the Federal Register today a notice to inform that the draft guidance “Calculating the Percentage of Organic Ingredients in Multi-Ingredient Products (NOP 5037)” will be available for public comment, effective tomorrow, December 6, 2016.

Although the USDA organic regulations establish labeling categories for organic products based on the percentage of organic ingredients in the product, certifying agents have interpreted the requirements for calculating the percent of organic ingredients differently.

[>> Click for more >>](#)

AMS ANNOUNCES FINAL GUIDANCE-CLASSIFICATION OF MATERIALS-MATERIALS FOR ORGANIC CROP PRODUCTION

The Agricultural Marketing Service (AMS) National Organic Program (NOP) is pleased to inform that that following final guidance was announced today in the Federal Register: Classification of Materials and Materials for Organic Crop Production.

As a result of the unique construction of the National List of Allowed and Prohibited Substances (National List), certifiers and growers sometimes have questions about which non-synthetic or natural substances are allowed and which synthetic substances are prohibited.

[>> Click for more >>](#)

HYDROGARDEN HERALDED AS LEADING INNOVATOR IN EEF'S FUTURE MANUFACTURING AWARDS

Coventry-based pioneer of hydroponics, HydroGarden, has been recognised for its innovative vertical-farming system, VydroFarm, in the EEF's Future of Manufacturing Regional Awards 2016.

[>> Click for more >>](#)



PRIVA OPENS NEW BRANCH OFFICE IN AUSTRALIA

In September 2016, Priva opened a new branch office in Victoria, Australia. This is the 18th office of the Dutch family-owned business and will operate as the sales and support office for Australia and New Zealand. With the appointment of Marcus van Heijst as account manager, the company has gained a horticulture expert with over 20 years of local experience. Together with the partners operating on this continent, Priva is investing in additional knowledge and additional service for its local customers.

[>> Click for more >>](#)



USDA OFFICIALS TOUR NEW YORK CITY'S "URBAN AG" SUCCESSSES

The U.S. Department of Agriculture (USDA) Farm Service Agency (FSA) Administrator Val Dolcini and New York State Executive Director, James Barber, traveled to Brooklyn Monday to tour urban agriculture operations that were funded by USDA microloans. As more urban farms start in New York City, consumers can find a wider variety of fresh, locally grown vegetables, year round.

[>> Click for more >>](#)

LED GROW LIGHTS CAN DRASTICALLY SPEED UP FLOWERING

Faster flowering can result in significant savings and better profitability for plant breeders. Various conditions can affect the flowering speed, but the quality of the light spectrum is probably the most important. It is well known that the ratio of red:far red (R:FR) color from the light source, be it sunlight or a lamp acts as a trigger leading to the flowering response in plants.

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Green Sense Radio invites Urban Ag News to talk about the latest in sustainable agriculture

Robert Colangelo, founder and host of the nationally syndicated Green Sense Radio Show, invites Chris Higgins, owner and editor of Urban Ag News, to discuss the hottest topics in innovations in agriculture

- ▶ Organic Foods
- ▶ Capital and Funding in Urban Agriculture
- ▶ Container Farms
- ▶ Getting Salad Bars in Public Schools
- ▶ Growing Green



**GROWING
IN THE
BAHAMAS
ISN'T ALWAYS
PARADISE**

Lucayan Tropical Produce has been growing greenhouse vegetables in The Bahamas for 12 years, but it has taken some adjustments to find the best crops to grow on an island in paradise.

By David Kuack

Since Lucayan Tropical Produce Ltd. began producing greenhouse vegetables in 2004, the company has experienced three major hurricanes, including Hurricane Matthew, this past October. Matthew, which was designated a Category 5 hurricane, had sustained winds as high as 160 mph. The company, which is located on New Providence Island in The Bahamas, operates a 5.5-acre Dalsem glass greenhouse producing cucumbers, lettuce and leafy greens.

While residents and tourists may consider the island to be “paradise,” the climate, cost of electricity and availability of fresh water can make for challenging growing conditions.

“Unlike traditional greenhouse operations we began the company with a concept that included many different types of crops in the same greenhouse,” said company president Cameron Symonette. “We felt that what we gave up on efficiency we would gain back on price. Being on an island, the prices of highly perishable items are generally quite high. We started with five different tomato varieties and three different colored bell peppers in the initial phase of the operation. We had two separate irrigation systems across six irrigation zones.

That set up failed to work for us for a number of reasons; mostly because of the inherent difficulty of managing so many different types of crops from both a production perspective and from a packaging logistics/distribution perspective.

“The peppers weren’t a problem, but for the tomatoes, having different varieties with different requirements meant having to change the irrigation strategies. That was a challenge in our environment with the amount of solar radiation and the temperatures. The monthly average differences between day and night temperatures on a daily basis are not really significant for over 50 percent of the year causing challenges with fruit set and germination. That is the number one reason why we changed our approach. Currently we are producing only cucumbers in the greenhouse.”

The challenges caused by The Bahamas’ solar radiation and high temperatures caused Lucayan Tropical Produce to focus on greenhouse cucumber production.



Best crops for the climate, greenhouse design

While Lucayan Tropical Produce's core crop is cucumbers, the company is also producing lettuces and leafy greens.

"We chose to focus on cucumbers for two reasons," said Symonette. "One, because in our environment we are unable to achieve the yield per square meter that is required for tomato production to be commercially viable. In our environment of a high relative humidity and plenty of sunlight, cucumbers grow well. It was just a better crop for us to grow.

"The second reason is the time between when we plant and harvest the cucumbers is much quicker than it is with tomatoes. Any issues that we might have related to a crop failure or if we need to replace old plants, the time to do that is much faster with cucumbers."

Lucayan Tropical Produce is also producing a variety of lettuces, leafy greens and herbs that it sells domestically.

"Summer temperatures definitely limit the leafy greens we can grow," Symonette said. "We

find the most success growing leafy greens from the beginning of October until the end of May. We currently grow on ebb-and-flow tables, which were originally designed as a propagation area for the crops in the main greenhouse. We didn't have the luxury of being able to buy our starter seedlings from another local grower so we built the propagation area so we could do it ourselves. Over the last two years we have been running trials with a NFT and a pond system to determine what is the best system for trying to extend our growing season into the summer months."

Symonette said the company is also interested in building a controlled environment facility to produce lettuces and leafy greens.

"We want to expand our lettuce and leafy greens production during the first quarter of 2017," he said. "That expansion will take the form of a temperature controlled system with artificial lights. It doesn't mean vertical growing, but it does mean growing under lights. That system would be built inside our packing area."

The company distributes its cucumbers, lettuces and leafy greens through two wholesalers.



Over the last two years Lucayan Tropical Produce has been trialing lettuces and leafy greens in NFT and pond systems to determine the best system to extend growing during summer months.

“Our intention is to sell as much of our product domestically as we can before we export,” Symonette said. “The lettuce and leafy greens are only sold domestically through Bahamas Food Services. Since we’ve started to export the cucumbers, we have been working with Sun Produce in Florida that distributes our product in the United States and Caribbean.

“The market acceptance of our products has been phenomenal. The taste and shelf life are great. We’re focused on supplementing what we grow in the greenhouses with some growing under lights to add product mixes that we couldn’t grow in our environment that would sell well in our market.”

Making improvements

The greenhouse was initially designed with two 250,000-gallon rain water holding tanks so water that falls on the greenhouse roof is collected and used for irrigation.

“Because of the monthly rainfall patterns, we also have a reverse osmosis system installed in the greenhouse that we only use during a six-week window during the year,” Symonette said. “We do not have access to fresh water, which is a problem with agriculture in general in the country. High property prices and no access to water limit potential growing operations.”

The company has made significant improvements to its irrigation systems over the last 10 years.

“We recently upgraded our water purification system to a combination of ozone and UV filtration which is really working,” Symonette said. “It leads to higher oxygen levels, which in turn leads to better root health.

“The second improvement is in employee training, which is a critical component. Because we have been in business for over 10 years, we have team members who are more experienced and have learned the systems we have developed, which has led to a more efficient operation than when we started.”

The company has made significant improvements to its irrigation systems over the last 10 years.



Symonette said the company looked extensively at improving climate management with its current greenhouse but determined it was not possible to improve the climate because the cost of electricity is cost prohibitive.

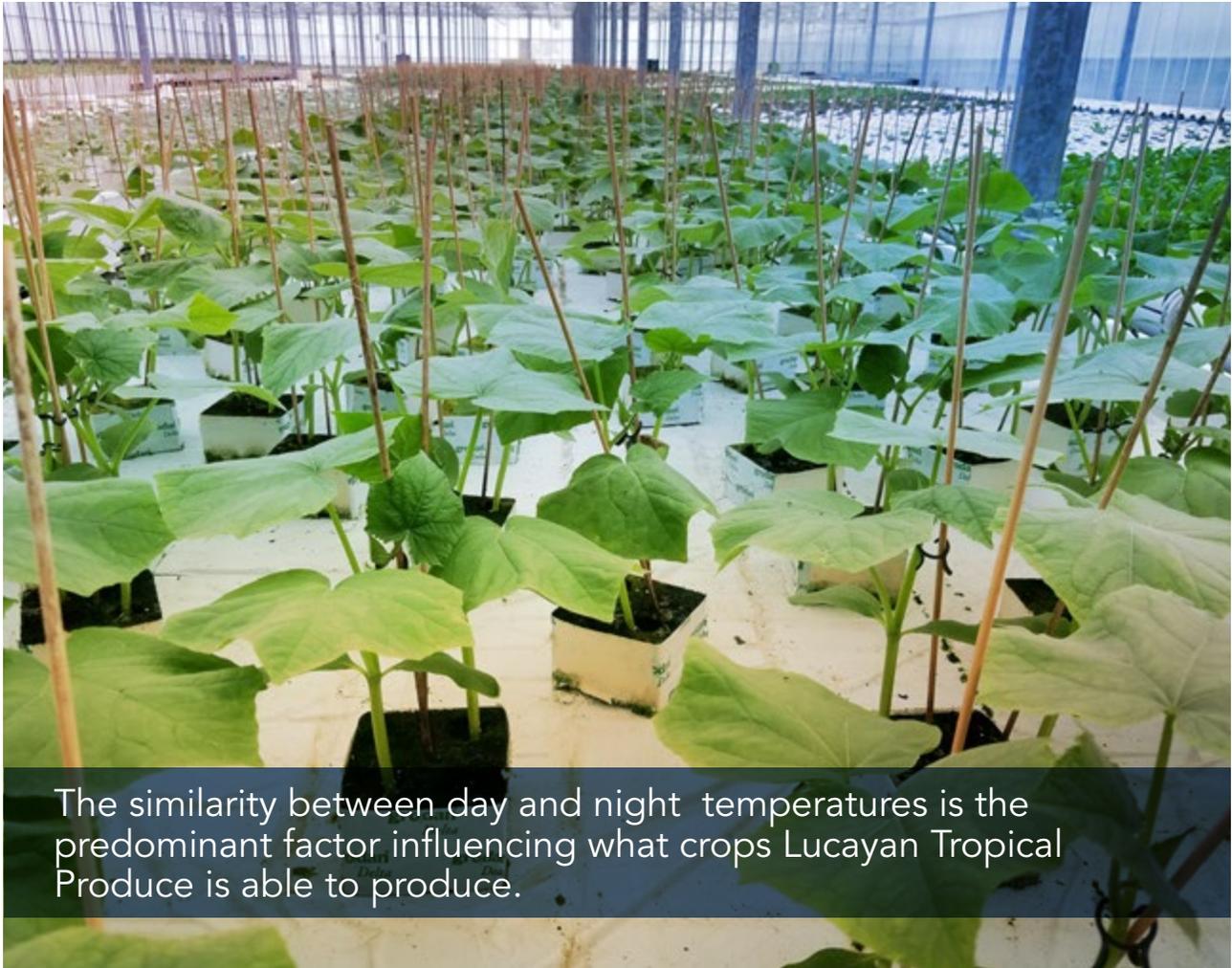
“Any technological solution in an open environment would not increase yields enough to justify the increased costs of electricity,” he said. “The greatest potential opportunity is in an energy-efficient closed growing system for producing leafy greens under lights where the temperature and humidity can be controlled.

“We also have a trial solar panel installation at our facility and are seriously considering expanding that to a size that would run the daytime requirements of the operation.”

Future expansion considerations

Symonette said the biggest issue to maintaining the proper greenhouse climate is the similarity between night and day temperatures.

“That would be the predominant factor, which basically influences what we are able to grow,” he said. “Looking back the greenhouse design focused on protecting the structure from hurricane damage, but ultimately negatively



The similarity between day and night temperatures is the predominant factor influencing what crops Lucayan Tropical Produce is able to produce.

impacted airflow. As we expand greenhouse production we will think about using our growing experience to make some decisions. With the benefit of hindsight and experience, we will make some different choices that will generate greater airflow.”

Symonette said every time the company has experienced a major weather event, such as a hurricane, changes have been made in operations.

“We think about what happened and why it happened and put some thought into how we can prepare in a more sensible way,” he said. “Each storm has brought different learning experiences, but none of those major hurricanes or other weather events has caused

us to change the construction.”

Symonette said the company will look at expanding its greenhouse growing area next year.

“We’re not sure what form that will take,” he said. “There are no government restrictions on making that expansion. The government is very supportive of us and encourages agricultural participation.” 🌱

For more: Lucayan Tropical Produce, (242) 377-0125; info@lucayantropical.com; <http://www.lucayantropical.com>.

David Kuack is a freelance technical writer in Fort Worth, Texas; dkuack@gmail.com.



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HORT AMERICAS BLOG

SUBSTRATE TRIALS LOOK TO ASSIST HYDROPONIC GROWERS AVOID PROPAGATION-RELATED ISSUES

Substrate trials in Hort Americas' research greenhouse are looking at conventional and organic propagation substrates along with different irrigation strategies for producing healthy starter plugs for hydroponic production systems.

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with Dr. Steve Millett

Dr. Alex Krichevsky's

Glow in Dark Plant and the Plant Infirmary

Dr. Alex Krichevsky is an eclectic plant scientist with a penchant for entrepreneurialism. Dr. Alex was born in the Soviet Union and began his formal education in Israel. He immigrated to the United States and after a few stints in academia in New York he found his roots in St. Louis where he created two unique plant centric businesses. The first business he started, now called Gleaux, centers around his invention – the world's first glow in the dark plant.



HOW-TO VIDEOS FROM HORT AMERICAS



GE ARIZE LED Grow Lights Installation at Dallas Grown Greenhouse



Hort Americas Organic Hydroponic Fertilizer Option - Terra Genesis and Terra Bella



WILL HYDROPONIC AND AQUAPONIC PRODUCTION REMAIN ORGANIC?

BY BRIAN FILIPOWICH



National Organic Standards Board signals intent to revoke hydroponic and aquaponic organic certification eligibility.

The National Organic Standards Board (NOSB) met in November to deliberate on whether produce grown in water-based, soilless systems like hydroponics and aquaponics can remain eligible for organic certification. The issue has been percolating since the passage of the 1990 Organic Foods Production Act, as two sides debate what it means to be “organic”. In 2016, there are 52 certified organic hydroponic or aquaponic operations.

NOSB was scheduled to hold a vote to decide if these new growing methods should continue to be eligible for organic certification. Rather than making a decision, NOSB voted to send the issue back to the Crops Subcommittee because more details are needed before a final decision. NOSB did pass a non-binding resolution signaling its intent, which included the following: “The NOSB recognizes that the foundation of organic agriculture is based on a systems approach to producing food in the natural environment, which respects the complex dynamic interaction between soil, water, air, sunlight, plants and animals needed to produce a thriving eco-system.

“In the case of the hydroponic/bioponic/aquaponic issue, it is the consensus of the current members of the NOSB to prohibit hydroponic systems that have an entirely water-based substrate.”

Miles McEvoy, director of the National Organics Program (NOP), noted that even if

the NOSB does vote to exclude hydroponics and aquaponics it will be a long process for the NOP to write and implement the rules. NOSB is an advisory board to the NOP. In fact, the NOSB voted in 2010 to exclude these methods but the NOP did not act. However, observers believe that a second vote would force the NOP to act.

Differing views of organic production

At issue is what consumers expect when they see the organic label. Soil-only organic advocates argue that nurturing a healthy soil ecosystem is intrinsic to the philosophy and substance of organic produce. They also note that their markets for organic produce are being flooded with international hydroponic produce from countries where hydroponics is not organic-eligible. These advocates have been very active and have held large rallies with U.S. Senator Patrick Leahy (D-VT) and other members of Congress.

On the other side, “bioponic” advocates argue that their produce can meet consumers’ organic expectations:

1. Produce without synthetic chemicals and antibiotics.
2. Produce grown sustainably.
3. Produce that relies on biological activity to deliver nutrients to plants rather than inert chemical solutions.

NOP's Hydroponic and Aquaponic Task Force Report coined the phrase "bioponic" to refer to the methods that rely on active bacteria to feed plants in soilless systems. Dr. Sarah Taber, director of food safety for the Aquaponics Association, noted that extensive research has found the same quantity and diversity of bacteria on the roots of bioponic plants as in soil.

Limiting organic production

The original 2010 NOSB recommendation to ban organic hydroponics referred to the practice as "inert", and did not even mention aquaponics. But since then the industries have leapt forward.

Aquaponics has gone mainstream and offers a thriving ecosystem of plants, fish and bacteria.

Hydroponics can employ active biological nutrient sources such as compost tea.

Bioponics gives urban areas the ability to grow organic produce because it does not require soil and can grow plants more densely than in soil. A soil-only organic rule would limit organic production to rural areas with access to plentiful arable land. And, as populations increase and climate change progresses, there will be less arable land for organic production which will drive up prices. Plus, the price premium that the organic label commands is a critical incentive to draw more entrants into these highly sustainable industries.

The next step in the deliberation is the NOSB meeting in April 2017 in Denver, Colo. NOSB will provide detailed meeting materials by March 1 which should provide more clarity about its intent. Written comments and reservations for a three-minute speaking slot are due by March 30. 🌱



For more information:

"What's Organic? A Debate Over Dirt May Boil Down to Turf," New York Times, Nov. 15, 2016.

Aquaponic and Hydroponic Organic Coalition's official comment to NOSB's recommendation to ban organic aquaponics and hydroponics.

Brian Filipowich is director of public policy, Aquaponics Association; (703) 831-3138; info@aquaponicsassociation.org; <http://aquaponicsassociation.org>.



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HORT AMERICAS BLOG

FERTILIZER TRIALS LOOK AT LEAFY GREENS, HERB GROWTH IN HYDROPONIC PRODUCTION SYSTEMS

Early results from fertilizer trials in Hort Americas' research greenhouse show knowing the levels of nutrients in fertilizer solutions can go a long way in avoiding problems with deficiencies and toxicities.

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101 EDUCATIONAL VIDEO SERIES

BY URBAN AG NEWS

PLANT NUTRIENTS 101



Part 1 in the Plant Nutrients 101 educational video series by Urban Ag News. Farmer Tyler and Dr. Don Wilkerson review the essential plant nutrients and discuss the grouping of Primary Macronutrients, Secondary Macronutrients, and Micronutrients.



Part 2 in the Plant Nutrients 101 educational video series by Urban Ag News. Farmer Tyler and Dr. Don Wilkerson define the three states of nutrient concentration: deficient, toxic, and sufficient. Tyler and Don then discuss the process of diagnosing nutrient deficiencies and toxicities.



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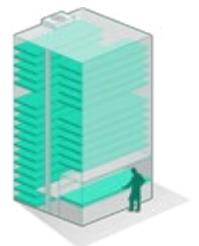
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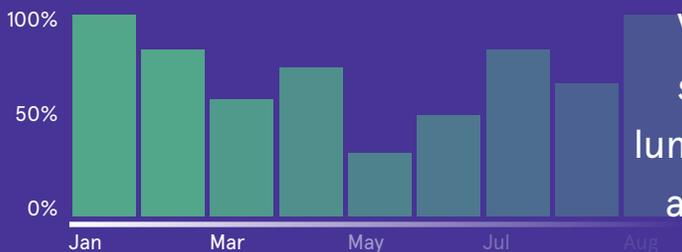
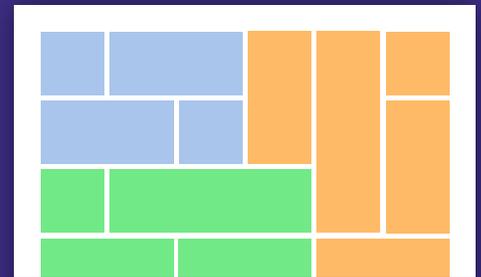
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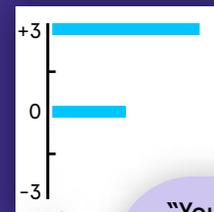
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JAPAN SPECIAL REPORT

JAPAN PLANT FACTORY ASSOCIATION LOOKS AHEAD TO 2017

Through its past and present projects, committee activities and educational events, the Japan Plant Factory Association (JPFA) is working toward the sustainable development of the global plant factory/vertical farm industry.

By Eri Hayashi

Throughout 2016, the Japan Plant Factory Association's cooperation with companies and international institutions has provided the association with the motivation to further foster international collaborations. Looking ahead to 2017, JPFA plans to maintain and reinforce continuing, cooperative and creative relationships with global projects.

Among its multiple activities, JPFA has recently focused on:

1. Joint research projects.
2. Providing educational opportunities with major private sector players and academic researchers.

One of the association's joint research projects has been to organize several committees, including:

- Nutrient Control System Committee
- Closed Greenhouse Committee
- Operational Management of Commercial Plant Factory Committee
- LED Lighting Committee

Some of the outcomes of the LED Lighting Committee have been introduced in this issue of *Urban Ag News* on [Page 73](#).

In addition to providing educational opportunities via JPFA monthly workshops and training sessions, the association also hosted two international conferences in 2016. One was held

in Chiba, Japan, and was organized with [MIT Media Lab Open Agriculture \(OpenAG\)](#). The other conference was held in Salinas, Calif., and was jointly organized with [Urban Ag News](#) as part of a Japanese government project. Through organizing these two events, JPFA leadership learned:

1. The importance of fostering communication among industry and academics internationally.
2. The importance of sharing actual experiences from those people involved in the plant factory business.

At the "East Meets West" conference in Salinas, seven Japanese plant factory-related companies presented their business status. These companies included: KAJIMA, Nihon Advanced Agri, Keystone Technology, PlantX, Shinnippou, MIRAI and IKEUCHI. Experts discussed topics related to design/engineering, software, lighting, environment control, cultivation techniques on high value added plants and PMPs. They shared their experiences of operating commercial plant factories, including how they have managed to reduce labor costs.

Vibrant discussions with conventional farmers in California made us rethink the future of controlled environment agriculture. Also, Dr. Don Wilkerson, senior horticulturist at iBio CMO, gave a stimulating presentation on the potential of plant factories in the field of plant-made pharmaceuticals.

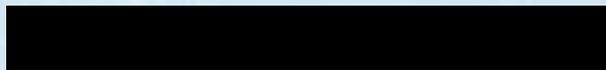
In 2016, it has become even clearer to association leadership that it is crucial for the advancement of the global industry to discuss and learn

from the challenges faced by industry players and the differences in each country along with prosperities in science and academic. JPFA would be happy to devote its efforts to foster international collaborations and joint research projects for the development of the global industry.

Japan Plant Factory Association (JPFA)

Japan Plant Factory Association (JPFA) is a non-profit association devoted to academic and business advancements in the plant factory/vertical farm/controlled environment agriculture (CEA) industry. Around 20 consortium R&D projects are conducted in PFALs and greenhouse facilities onsite at Chiba University and off campus. Monthly workshops, training courses and intensive business session courses are offered every month for professional growers and potential industry entrants. Business and R&D cooperation, consulting services, research activities and other collaborations are always welcomed.

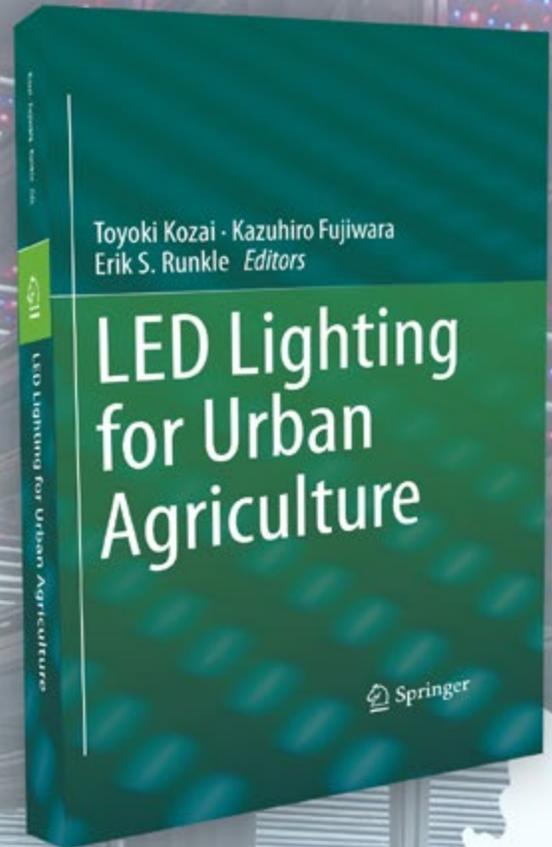
The association also conducts onsite study tours that include lectures and discussions with Dr. Toyoki Kozai, professor emeritus at Chiba University and CEO at JPFA. One of the tours is to JPFA's onsite PFAL equipped with multiple LED lighting. A tour at Kashiwanoha, the agri-smart city outside Tokyo, is scheduled for Feb. 14, 2017, at 1:30 p.m. Reservations are required.



For more: Japan Plant Factory Association,
info.english@npoplantfactory.org;
<http://npoplantfactory.org/english.html>

-Eri Hayashi

Japan Plant Factory Association (JPFA) Director
International Relations & Consulting
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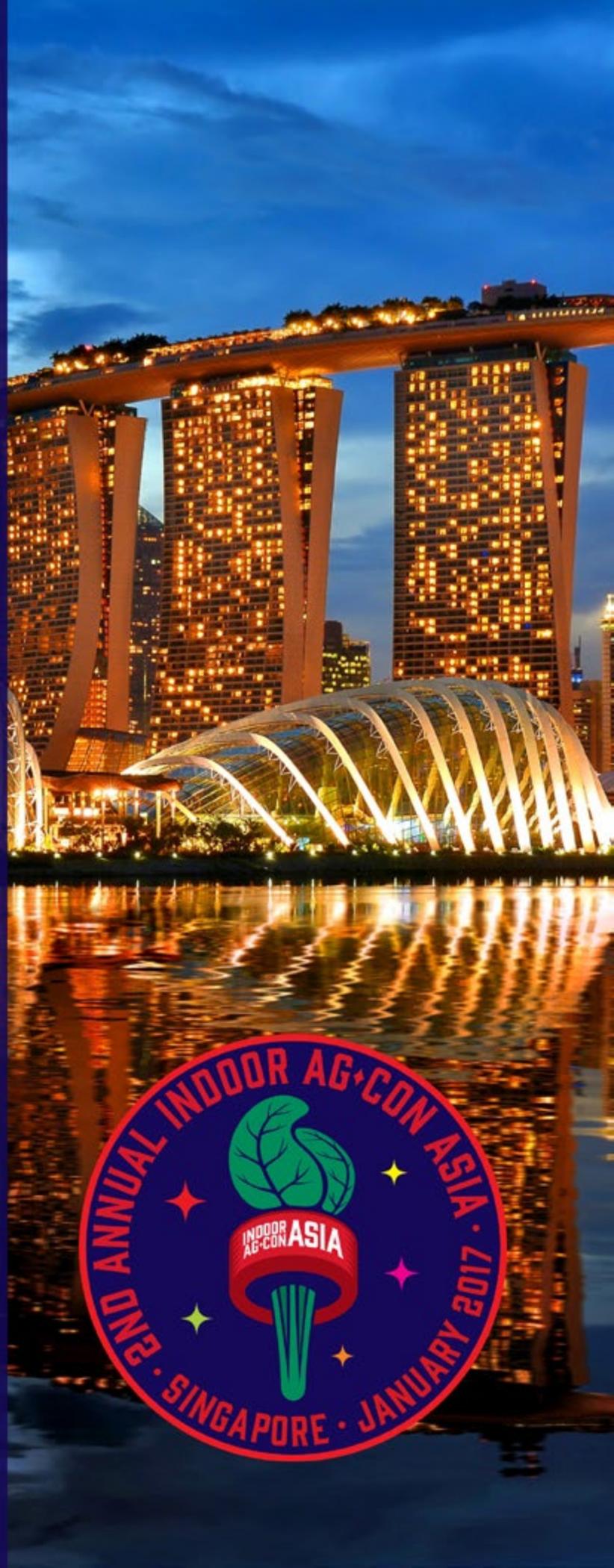
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HOSPITAL FARMS GROW TO HEAL

BY JIM PANTALEO



Su·per·food

Plural: Superfoods - A nutrient-rich food considered to be especially beneficial for health and well-being.

In my six decades on planet Earth, I've never spent a single night in a hospital...with the exception of when I slept on cold linoleum after the birth of my first child back in 1997. So I can credibly say I've never been subjected to hospital food, much maligned what with all of its high sodium and sugar (Jell-O!). Given that a hospital should be a place of healing and recovery, it's no secret that most in the United States are woefully deficient when it comes to the food they serve their patients.

Of course I'm not referring to those patients requiring a special diet or relegated to certain and specific food types. For the majority of "regular eaters" or those who don't require a specialized diet, one would think hospital dietitians, physicians and administrative policy makers would know better in terms of what's being put on the menu. They do know better, and there is no question; dietitians and healthcare professionals are dedicating their lives to making a positive difference in providing healing and wellness options to patients.

In a recent New York City Food Policy Center [newsletter](#) Dr. Robert Graham, founder of [FRESH MED NYC](#), an integrative health practice that emphasizes nutrition along with conventional medicine, said, "During the past four years of the [Healthy Hospital Food Initiative](#), we can applaud some hospitals for thinking differently about the food they offer patients and visitors. Hospitals are beginning to appreciate the old adage of 'food is medicine.'"

There is however another (not so) little secret in today's health care world – cost. Food which is

not generally considered healing or restorative is inexpensive. Food that heals? Not so much. Just imagine being a patient recovering from any general ailment and being served a breakfast which includes a fresh wheat grass-apple-carrot smoothie and an egg white omelet with fresh spinach instead of a "fruit cup" and watered down eggs.

Hospital farms are a unique albeit scarce answer to address the challenge of providing healing and wellness through food. Before I dig deep, let's consider for a moment the proven healing properties of food which can be grown for that which ails us; foods like garlic, turmeric, mushrooms, culinary herbs, micro greens, wheat grass, carrots, sweet potatoes and leafy greens and lettuces. Many of these foods are being successfully grown on available hospital land, within onsite greenhouses or even indoors with the use of LED lighting.

A 2015 study published in [Preventative Medicine Reports](#) found that hospital gardens are not only associated with lower rates of obesity in communities they serve, "they may hold potential to complement other strategies to reduce public health disparities through providing nutrition education, promoting lifestyle physical activity among patients and hospital employees, accelerating healing from injury and disease, and growing food for medically underserved populations."

Still, it's hard to believe that some 42 U.S. hospitals actually host either a McDonald's, Wendy's or Chick-fil-A onsite. This recently prompted the [Physicians Committee for Responsible Medicine](#) to enact the petition "[Make Hospital Patient Rooms Fast Food-Free.](#)" ([source](#))

In Ypsilanti, Michigan the St. Joseph Mercy Ann Arbor Hospital is leading the way and in just 6 years following the first crop planting in 2010 on 10 onsite and available acres, the farm has grown to 25 acres, three hoop houses and four beehives. The Farm at St. Joe's, as it is known,



grows fresh basil, collard greens, spinach, garlic and strawberries all on hospital grounds.

“The farm helps us support a culture of wellness in the hospital,” says director of nutrition and wellness Lisa McDowell. “We can’t grow enough to meet the needs of all of our patients and staff, but we can make an educational statement about the importance of eating a healthy diet.”

As of the writing of this article in Mid December, the weather in Ypsilanti will hit a high of 19 degrees Fahrenheit. This not-so-balmy temperature begs for growing in a controlled, indoor environment not only to supplement greenhouse-grown produce but also to continue to provide jobs and employment for hospital “farm staff” year round.

There is no doubt that engaging in such Ag undertakings represent an investment and hospital budgets are beastly enough; to the point where I was disappointed when doing my research to find there are not a lot of onsite hospital farms in the United States. In fact, I discovered only about a dozen with actual onsite operations. Many hospitals, especially those with significant food and beverage budgets, rely on large food distribution

companies (think SYSCO) to feed patients, staff and hospital visitors (cafeteria). Canned, boxed, processed or ready-to-eat meals are ubiquitous and cost-effective. Fresh, local and possibly even USDA-certified organic options are simply not available or feasible for many hospitals despite the obvious short and long-term benefits.

St. Luke’s University Health Network in Bethlehem, Pennsylvania opened a 10-acre farm in 2015 (onsite at the Anderson campus) which provides over 44,000 pounds of produce per year, all going to patients, cafeterias and farmers markets (source). In partnering with the Rodale Institute, pioneers in organic farming through research and outreach, the Hospital’s Auxiliary raised \$125,000 used for farm start-up costs. The result is the St. Luke’s Rodale Institute Organic Farm. The farm’s success also begat a 1,200 square foot hoop house to help extend the growing season, an additional 1.5 acres added in 2016, and a renewed Food Revolution movement at the hospital.

In a recent phone interview with Scott Kelly, Assistant Director for Public Affairs and Brand Communication, Kaiser Permanente of Orange County noted that land, especially in Orange County, is at a premium. Scott further shared there is no current onsite farming or growing program within the Kaiser Permanente organization. In Southern California, there is only one farmer’s market held onsite at Kaiser Permanente Baldwin Park (each Friday rain or shine from 8:30am to 1:30pm).

It should be noted, however, that sourcing the healthy food options Kaiser seeks is making



Farmer Lynn of St. Luke’s Rodale Institute Organic Farm

progress and more attention is being paid to the healthy food issue. One of the keynote speakers at the recent Seedstock Grow Local OC conference at Cal State Fullerton (see my recap of the November event in Urban Ag News) was Kaiser Permanente's Kimi McAdam, Assistant Department Administrator of Food and Nutrition Services. She was practically begging the many growers in the audience to provide Kaiser with local, organic, sustainably grown produce. Her challenge has been ensuring those local growers can provide produce consistently and in volume.

No one disagrees that land in Orange County is limited and expensive. So why not build up? Rooftop gardens and greenhouses are solving land constraints in urban areas and at hospitals as well. The Sky Farm at Eskenazi Health in Indianapolis, Indiana boasts 5,000 square feet of growing space atop a seven-story building where fresh kale, tomatoes, carrots, beets, turnips, arugula, spinach, lettuce blends and cut flowers among other items are harvested. During its first year in operation, Sky Farm produced more than 2,200 pounds of fresh produce, all providing a beneficial and hyper-

local food source for the hospital.

To address the universal challenge of where and how to generate the funding required for such an Ag undertaking, including how to run the grow operation, Eskenazi Health partnered with the non-profit Growing Places Indy to create a community-supported, agriculture program-partnership.

Another shining example of a hospital that has met the challenge of constrained land space is Stony Brook Heights Rooftop Farm in Stony Brook, New York. According to their Facebook page:

"Stony Brook Heights is a rooftop farm located at the Health Science Center of Stony Brook Medicine. With the conjoined efforts of students, staff, Sustainability Studies Program interns, the Nutrition Division of the Department of Family Medicine and Dietetic interns, we were able to turn previously unkempt roof space into a fully functional rooftop farm. All of the produce is grown organically from seed or from seedlings either raised at the campus greenhouse or provided by our associates...To date, we have produced hundreds of pounds of food, all of which is provided to university hospital patients."



Stony Brook Heights Roof Top Farm

Eskanazi Health and Stony Brook Medicine are unlikely players in such an important movement. Their rooftop gardens are an example of what others can achieve while remaining steadfast in providing healing and wellness to patients through healthy food. In Fact, The New York Times reports that Stony Brook's head chef has banished bacon, soda, and hot dogs from the hospital altogether.

So what, or better who, really is driving this movement? According to Foodservice Director Magazine nearly half of hospital operators have made upgrades or changes to their menus as a result of HCAHPS surveys. The HCAHPS acronym stands for Hospital Consumer Assessment of Healthcare Providers and Systems and is a standardized survey of hospital patients, capturing their individual perspectives on hospital care for the purpose of providing the public with comparable information on hospital quality. According to the survey, some 70 percent of hospitals with budgets of \$5 million or more expect to source more local foods, versus 34 percent with budgets under \$200,000.

Percentages and Types of Food Hospitals Source Locally:

- 51% - Produce
- 49% - Dairy
- 35% - Baked Goods
- 22% - Meats
- 16% - Beverages
- 9% - Seafood

In my view, if one considers the above statistics, where 49% of locally sourced produce and 91% of locally sourced seafood (barring landlocked states) cannot be provided to hospitals on a local level, there exists a challenge...and an opportunity. Even if one considers lakes, rivers, waterways and tributaries as a fish/protein option, then certainly this great nation can find smart food options. We can and should

do better. The patient lying in that hospital bed depends upon us. We can heal ourselves with the food we consume. Our goal of healing and wellness should focus on and source locally grown, organic and sustainable food.

If I have learned anything from writing and researching this article, it is that there are options and opportunities. Hospitals, our places of healing, can grow hyper-local food while employing local people and creating healthy food options for patients, hospital employees and visitors and encourage a healing and restorative culinary experience for those who are trying to just get out of the hospital and get back to their lives. Why can't we provide food that heals?

We can build roof top greenhouses and gardens on hospital campuses which can yield thousands of pounds of produce on a yearly basis. This would save space and land and resources. We can build smart farms in the Midwest and in the frigid winter-time environs of the North East to mitigate food miles and lack of fresh options. This would create an entirely new food paradigm which is not weather-dependant. We can remove the processed, high sodium, high sugar and empty-caloric food options that exist in our current health care experience.

Let's say NO to Jello-O! NO to powdered eggs! And let's say NO to boxed, canned or ready-to-eat meals! Let us seek to provide a healing and restorative experience through the fresh and whole foods we provide to those who are attempting to heal. It can be done. 🌱

Jim Pantaleo, Director of Business Development at Urban Ag News, jim@urbanagnews.com



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ICCEA 2017 *focuses on* **BUILDING a SUCCESSFUL CONTROLLED ENVIRONMENT AGRICULTURE BUSINESS**

By David Proenza

International Congress on Controlled Environment Agriculture president David Proenza said the congress' second conference will look at issues that are important in developing a successful controlled environment agriculture business.

Planning for the second International Congress on Controlled Environment Agriculture, known as ICCEA 2017, is well underway. I would like to send an official invite to all those interested in attending or exhibiting at ICCEA 2017 conference scheduled for May 17-19.

We are extremely excited to bring the agricultural industry another informative and educational conference which will again be held in the Republic of Panama, a dynamic Central American nation known as the "Hub of the Americas." Panama's geographical location is strategically located between North and South America, has a dollar-based economy, a stable democratic government, a robust economy and a business-friendly atmosphere. All of these things make Panama an ideal location for this exciting agricultural event.

ICCEA 2017 theme

The theme for this year's conference is: Using science and the market to build a successful controlled environment agriculture business. Building on the resounding success of ICCEA 2015, the 348 attendees and 24 exhibitors

completely surpassed the goals established by the conference organizing committee.

This year we started earlier to plan the conference. We are working hard to make the conference better and employing more key personnel to manage the growth of ICCEA 2017. We are expecting over 600 attendees and 60 exhibitors at this year's conference.

If you attended ICCEA 2015, you witnessed first-hand the overwhelming positive remarks from attendees and exhibitors. I can assure you that ICCEA 2017 will surpass all expectations in every way and be even better.

Speakers focus on incorporating science, technology

This one-of-a-kind, educational and knowledge-based conference offers the opportunity to hear from internationally acclaimed panelists and well-known, respected speakers who will focus on incorporating science and technology. The primary goal of this year's conference is to assist in the building of successful controlled environment agriculture businesses.

Topics at this year's conference include:

- * Crop production: Strawberries, leafy greens, microgreens and others.
- * The biggest costs facing farms: Labor, climate and light management.
- * Issues creating the most confusion: Water, nutrients, pest management and air flow.
- * Economic models: How to financially manage your operation and seek investors.

Featured speaker

Back by popular demand, the first day's keynote speaker will be Dr. Toyoki Kozai, professor emeritus at Chiba University in Japan. He is also CEO of the Japan Plant Factory Association.

Dr. Kozai is known as the "Father of the Japanese Plant Factory." He will speak about his experiences and philosophies in key areas of controlled

environment agriculture, what he refers to as The Six Pillars, with an emphasis on LED lighting and applied solutions.

Business opportunities

Latin America is increasingly adopting the use of CEA in various forms and if you are interested in entering the Latin American market, Panama is the place to begin your expansion. With a vast and diverse marketplace of nearly 980 million people, Panamanians have a saying, "Panama is the bridge of the world and the heart of the universe." And they are right. Come visit and experience the excitement for yourself!

If you are interested in promoting your company and its products and services, our dedicated executives have developed a wide range of conference sponsorship packages to help your company promote your products and services, as well as to position your brand to a larger, more global audience.

On behalf of the conference organizing committee, we look forward to personally meeting you in Panama to discuss the exciting times ahead for the CEA industry and your business, whether it is a vertical farm or greenhouse.

[ICCEA 2017 will connect you to the world!](#) 🌱

David Proenza

President, Foundation for the Development of Controlled Environment Agriculture



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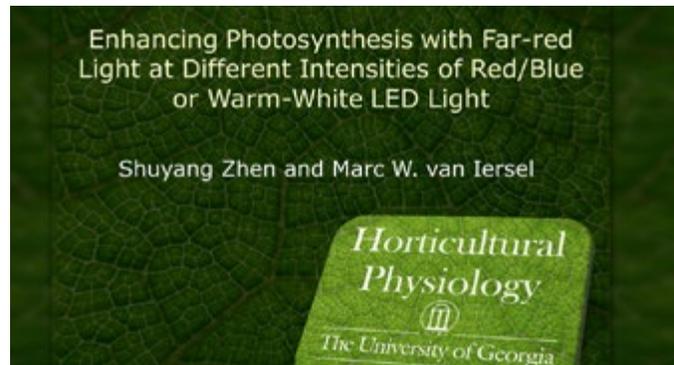


Enhancing Photosynthesis with Far-red Light at Different Intensities of Red/Blue or Warm White LED Light

By Shuyang Zhen and Marc W. van Iersel (the University of Georgia)

Abstract

Light emitting diodes (LEDs) are increasingly used for supplemental lighting to increase photosynthesis or as the sole lighting source for indoor production of high value crops. To achieve maximum photosynthetic efficiency, light needs to provide a balanced excitation of photosystems I and II, which have different absorption and action spectra. Using lettuce (*Lactuca sativa*) as a model system, we found that far-red light (peak at 735 nm) has a synergistic effect on the light reactions of photosynthesis, when combined with red and blue (peaks at 453 and 638 nm) or warm white (peaks at 453 and 599 nm) LED light with a photosynthetic photon flux density (PPFD) of 50 to 750 $\mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$. The quantum efficiency of photosystem II (ΦPSII) increased within 10 – 15 s after adding far-red light, with an average increase of 6 – 7% under red/blue and 3 – 4% under warm white LEDs. Similar or greater increases in ΦPSII were observed 20 min after adding far-red light. This longer-term effect of far-red light on ΦPSII was accompanied by a reduction in non-photochemical quenching of chlorophyll fluorescence, indicating that far-red light reduced the dissipation of absorbed light as heat. Net photosynthetic rate (P_n) was also enhanced by far-red light: For each 1% increase in PPFD provided by the far-red light, P_n increased by an average of 4% and 3% under the red/blue and warm white light, respectively. Under shorter wavelength light (< 680 nm), photosystem I (PSI) tends to be under-excited relative to PSII. As light with wavelengths > 680 nm largely excites PSI, but not PSII, the addition of far-red light may enhance photosynthesis by balancing the excitation energy between the two photosystems and ensure that they operate at matching rates. Our findings suggest that adding far-red light to lighting sources containing little or no far-red can improve the efficiency of photosynthetic lighting over a wide range of light intensities.



Shuyang Zhen (Ph.D. candidate) and Dr. Marc W. van Iersel (Professor) work at the Department of Horticulture at the University of Georgia.

Source: American Society for Horticultural Science

<https://ashs.confex.com/ashs/2016/webprogramarchives/Paper23961.html>

Harbick, Kale and Louis D. Albright (2016).

Comparison of energy consumption: greenhouses and plant factories

[Acta Hortic. 1134, 285–292. doi: 10.17660/ActaHortic.2016.1134.38](#)

Annual energy consumption and carbon footprints are compared in simulation for two controlled environments: plant factory and traditional greenhouse. Energy consumed for heating, ventilating, and air conditioning (HVAC) as well as supplemental lighting are included in the models. In the greenhouse case, supplemental lighting is controlled to a consistent daily light integral (DLI) of Photosynthetically Active Radiation (PAR) using Light and Shade System Implementation (LASSI). In the plant factory model, lighting power is sized according to photoperiod and DLI requirements. Building HVAC loads and system responses are computed using the ASHRAE heat balance method with a one hour time-step. Both environments are simulated in four different climates using Typical Meteorological Year (TMY) data sets. In each simulation, energy consumption and carbon footprints are shown to be significantly higher in the plant factory environment compared to the greenhouse.



PROPOSED STANDARDS DEVELOPED FOR LED LIGHTING

By E. Goto, K. Fujiwara and T. Kozai

Japan Plant Factory Association's committee on LED lighting has developed proposed standards of terminology, measurement methods and specifications of LED properties.

In 2015, the Japan Plant Factory Association (JPFA) established a committee on LED (light emitting diode) lighting for plant factories with artificial light (PFAL). The committee was chaired by Eiji Goto at Chiba University. Recently, the committee proposed tentative standards of terminology, measurement methods and specifications of LED properties. The proposal was presented on Sept. 12, 2016, at the annual meeting of the Japanese Society of Agricultural, Biological and Environmental Engineers and Scientists. This article is a summary of the proposal written in Japanese and a brief introduction of a related book recently published (Kozai et al., 2016).

Table 1 shows fundamental quantities in radiometry, photometry and photonometry and their international system of units (SI). The definition and meaning of each term is explained in more detail in Fujiwara (2016).

Table 2 shows radiometry and photometry of photosynthetic radiation or photosynthetically

active radiation (PAR) and photosynthetic photon (wavelength 400-700 nanometers). Note the difference in meaning and unit between PPF and PPFD.

Table 3 shows the properties of a LED lighting system, consisting of a lamp, package and peripherals, to be released by LED manufacturing companies. Table 3 is useful to evaluate a commercial LED lighting system and compare lighting systems when a user designs a new light environment using LED systems.

Spectral distribution (spectral radiant/luminous flux distribution) is measured by a spectroradiometer or a total luminous flux measurement system. Angular distribution of luminous intensity (luminous intensity distribution) is measured by a goniophotometric measurement system. PAR energy efficiency is calculated by dividing the photosynthetic radiation energy flux by effective power consumption. The radiation flux is calculated using the data measured by a total luminous flux measurement system. The effective power consumption measured by a power meter should include electric power consumed by a lighting unit, a power supply and an instrument to control the quantity or quality of light, such as a timer, a dimmer, or a computer-programmed control system. Details about the measurement methods are given in Goto (2016).

It should be noted that the light environment over plant canopies in cultivation space of

Table 1. Fundamental quantities in radiometry, photometry, and photonometry and their SI units (Fujiwara, 2016).

Radiometry (energy basis)	Radiant intensity [W sr ⁻¹]	Radiant flux [(W sr ⁻¹) sr] = [W]	Radiant energy [W s] = [J]	Irradiance [W m ⁻²]
Photometry (luminosity basis)	Luminous intensity [cd]	Luminous flux [cd sr] = [lm]	Quantity of light [lm s]	of Illuminance [lm m ⁻²] = [lx]
Photonometry (photon basis)	Photon intensity [mol s ⁻¹ sr ⁻¹]	Photon flux [(mol s ⁻¹ sr ⁻¹) sr] = [mol s ⁻¹]	Photon number [(mol s ⁻¹) s] = [mol]	Photon flux density (Photon irradiance) [(mol s ⁻¹) m ⁻²] = [mol m ⁻² s ⁻¹]
Relations	A	A•sr = B	A•sr•s = B•s	A•sr•m ⁻² = B•m ⁻²

Notes: sr, Watt, J, cd, lm and lx denote, respectively, steradian (solid angle), J s⁻¹, Joule, candela, lumen and lux.

Table 2. Radiometry and photometry of photosynthetic radiation (or photosynthetically active radiation, PAR) and photosynthetic photon (wavelength: 400-700 nanometers) (Fujiwara, 2016).

	Intensity	Flux	Quantity	Flux density
Radiometry	Photosynthetic radiant intensity [W sr ⁻¹]	Photosynthetic radiant flux [W]	Photosynthetic radiant energy [J]	Photosynthetic irradiance or photosynthetic radiant flux density [W m ⁻²]
Photonometry	Photosynthetic photon intensity [mol s ⁻¹ sr ⁻¹]	Photosynthetic photon flux (PPF) [mol s ⁻¹]	Photosynthetic photon number [mol]	Photosynthetic photon flux density (PPFD) [mol m ⁻² s ⁻¹]
Relations	A	A•sr = B	A•sr•s = B•s	A•sr•m ⁻² = B m ⁻²

Notes: sr, Watt, and J denote, respectively, steradian (solid angle), Watt (= J s⁻¹), and Joule.

PFAL is significantly affected not only by the radiometric or photonmetric properties of LED lighting systems and their layouts, but also by their characteristics of cultivation space and plant canopy (Kozai and Zhang, 2016). Simulated results of light environment as affected by the photonmetric properties of LED lighting systems, cultivation space and plant canopy are given in Akiyama and Kozai (2016).

Eiji Goto, Kazuhiro Fujiwara and Toyoki Kozai are committee members of LED lighting for PFAL. The LED grow lights committee consists of 15 committee members including academic experts/researchers, major LED lighting companies and related firms.

References

Guideline for presenting LED grow lights properties. Committee on LED lighting for plant factories with artificial light. Abstract book for annual meeting of the Japanese Society of Agricultural, Biological and Environmental Engineers and Scientists. 48-49 (in Japanese); E. Goto, 2016.

LED lighting for Urban Agriculture. Chapter 4 by T. Kozai and G. Zhang (49-46), Chapter 7 by T. Akiyama and T. Kozai (91-112), Chapter 26 by K. Fujiwara (367-376), Chapter 27 by K. Fujiwara (377-393), and Chapter 28 by E. Goto (395-402), 454 pp.; T. Kozai, K. Fujiwara and E. Runkle (eds.) 2106.

Table 3. Characteristics of LED lamp and LED lighting system (consisting of lamps and luminaire), to be released by LED manufacturing companies, which are required for lighting design of PFAL (after Goto, 2016).

Item	Unit	Example value
Temperature of ambient air	°C	25
Power		
Voltage	V	200
Current	A	0.16
Effective power consumption	W	32.0
Light characteristics		
Spectral distribution (300-800 nm) as a dataset	$\mu\text{mol m}^{-2} \text{s}^{-1} \text{nm}^{-1}$	
(red/blue ratio, red/far-red ratio, %UV)		
Angular distribution curves perpendicular to and parallel to LED tube, as a dataset	$\text{mol s}^{-1} \text{rad}^{-1}$	
Photosynthetic photon flux (PPF)	$\mu\text{mol s}^{-1}$	48.0
Photosynthetically active radiant flux	W (=J s ⁻¹)	8.0
Luminous flux	lm	450
Color temperature	K	3,000
Color rendering index	Ra	87.0
Efficiency/efficacy		
Photosynthetic radiation energy efficiency (also called PAR energy efficiency)	J J ⁻¹	0.25
Photosynthetic photon number efficacy	$\mu\text{mol J}^{-1}$	1.50
Luminous efficacy	lm W ⁻¹	150
Maintainability: Product age (lifetime) of 10 percent decrease in PPF (h), product age of malfunction (h), and waterproof and dustproof characteristics.		
Thermal characteristics: Lamp or package surface temperature – PPF curve		
Luminaire: The entire electrical light fitting, including all the components needed to mount, operate and prevent it from causing glare (Fujiwara, 2016).		
Size, shape and weight: Drawing and weight of package, and drawing of LED lamp.		

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