

THE  
FUTURE

# S NOW

## HYDROPONICS

BY LEE ALLEN

*Using hydroponics, food is now grown in places not thought possible a short time ago. With demand from a health-conscious generation, improved technology, and a shift in traditional agriculture, a new light is shining on hydroponics. Lee Allen explains what the future may hold for the industry.*



Blame it on Millennials. Not in a negative sense because the trend toward hydroponic food production came about as part of a trend toward food that is locally grown, sustainable, fresh, and full of flavor. Tech-savvy Millennials, who are health and environmentally conscious, and are entering their spending prime, are driving many sectors of the economy, including where food comes from.

Those driving factors on the part of consumers, augmented by a search for innovative ways to increase productivity and sustainability while decreasing energy needs, has made the concept of water culture very attractive in light of climate change and food insecurity issues.

One of the true pioneers in the industry is Dr. Howard Resh, an urban horticulturist known for implementing and managing commercial hydroponic operations worldwide, from Saudi Arabia to Taiwan to the Caribbean.

"It's an exciting time within the industry," Resh says. "Hydroponic culture is being applied under many extreme conditions never even remotely considered before, like a space station under zero gravity or growing fresh salad crops in Antarctica."

Looking ahead, he says, "Look for new crop applications, like eggplant. Grown in the field, it gets bruises and blemishes. Consumers love the hydroponic version. I envision more automation involving product transported by automated carts, waste heat being circulated from power plants and gas turbines and piped into greenhouses, and a growth in rooftop greenhouses. This is a big area that will develop rapidly in an attempt to eliminate food deserts."

There is a rapidly growing list of advocates who insist hydroponic farming will change the world. One company, AmHydro, notes: "We are no longer limited by climate or season in the pursuit of fresh food. We can grow virtually any plant, anywhere, at any time of day or year with simple, effective hydroponic systems coupled with modern horticultural lighting."

One beacon of success in the industry is Jenn Frymark, a graduate of the University of Arizona's Controlled Environment Agriculture Center (CEAC) in Tucson and the current chief agricultural officer and manager at Gotham Greens Holdings, LLC, which now grows 10 million heads of lettuce and other greens year-round without soil in rooftop greenhouses in New York and Chicago. The Windy City facility, at 75,000 square feet, is one of the largest rooftop greenhouses in the world.

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## FROM NOVELTY TO NEED

While still a relatively new technology, hydroponics has been evolving rapidly since its inception some 70 years ago. It's grown from a future concept to a current methodology—a family of techniques in use throughout the world to meet specialized agricultural needs.

According to a University of Arizona agricultural publication dealing with hydroponically grown tomatoes, "This technology can efficiently generate food crops from barren desert sand and desalinated ocean water, to mountainous regions too steep to farm, to Arctic communities and city rooftops. In heavily populated areas where skyrocketing land prices have driven out traditional agriculture, hydroponics can provide locally grown, high-value specialty crops. Hydroponics is highly productive and suitable for automation."

## GLOBAL CONSERVATION

Europeans are also excited about the growth and direction of the industry. Looking at it from London, Commercial Hydroponics' web page notes "even astronauts will use hydroponics" in their Mars exploration. It further states, "We believe that the future lies in locally grown and sold produce that limits road miles. The hydroponic method is a more sustainable model than those currently practiced and allows far more flexibility to grow more in a specific place and achieve faster harvests. We support all initiatives to reduce unnecessary energy consumption and lower dependence on fossil fuels along with efficient structures, energy curtains, heat sinks, the correct use of ventilation, and other initiatives. Using bio-fuels and alternative sources of power, such as micro-turbines, will help make the commercial hydroponics industry a viable, long-term one."





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## HIGH YIELDS, LOW INPUTS

Domestically, in a short market forecast with a long title (*The Emerging Hydroponics Industry: Hydroponics Systems, Issues, Crop Values, and Global Markets*), sustainability researchers at Manifest Mind LLC in Colorado predict “the hydroponic food production industry is expanding at a rate set to outpace the estimate of global growth through 2018. While agriculture is traditionally a conservative market sector, the benefits of hydroponics’ higher yields with lower inputs, improved soil and water quality, and food safety are compelling forces for change.”

Creative experimentation has already begun. In Florence, Italy, think-tank developers at Plant Nature and Technology (PNAT) have unveiled what they believe is a game-changing innovation. The designers and biologists affiliated with the University of Florence built a self-sustainable floating hydroponic greenhouse called the Jellyfish Barge. On the barge, plastic drums support a glass greenhouse in a canal, a structure equipped with an automated system for remote control and monitoring. The Jellyfish Barge is powered entirely by renewable energy generated by on-board solar panels and miniature wind turbines. Plant Nature and technology’s CEO, Camilla Pandolfi, says the big raft is “going to change the way we cultivate fruits and vegetables.”

## ROLL OUT THE ROBOTS

Expect some of the new twists on how things are done, particularly for the hydroponic production of tomatoes, to come directly from current growers. The 2017 International Conference on Soilless Culture noted that “consumer acceptance of greenhouse-grown produce, specifically hydroponic tomatoes, has been phenomenal, with a projected 50 per cent of the fresh tomato market expected to be supplied by greenhouse grown within five years.”

In discussion of hydroponic advantages over soil culture, Resh references several facts including higher planting densities and higher yields. Field tomato density is about 5,000 plants per acre, while greenhouse hydroponic tomatoes can be up to 11,000 plants per acre. Field yield runs between 10-40 tons per acre versus 300 tons per acre or more for tomatoes grown using greenhouse hydroponics.

Another industry pioneer, Merle Jensen, professor emeritus of Plant Life Sciences and founder of the University of Arizona’s CEAC, advises we look to further automation.

“More and more, we’re headed to robotics, where you’ll seed lettuce at one end of the line, which will move hydroponically on floating systems, then be harvested at the other end by a mowing machine. In between, an overhead camera will monitor the moving belt with small pinholes and blow off the leaves that are not the proper quality. At the end of the transport belt, the mowed produce will be machine-sorted and bagged into shelf-ready packages. All of this will be computer-controlled under artificial lighting systems.”

Gene Giacomelli, a director at CEAC, predicts a positive year for hydroponics in controlled environments “because there is a market demand for specialty food. This does not presume hydroponics will begin to subsume open-field agriculture, but may complement it in most locations or possibly replace it in special circumstances where resources are unavailable.”

Where there is a thriving market that offers even more growth potential, like the field of hydroponics, expect innovative changes in what is done and how it’s done that will make the process faster, cheaper, and more productive. **MY**

