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Thinking of Automating?

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When talking about which country has the most high-tech automation for controlled environment food production, the Netherlands would likely be top of mind. Chris Higgins, president of Hort Americas, a commercial horticultural supply company in Bedford, Texas, said a problem that often occurs with controlled environment food production is that the industry tends to talk about high tech and low tech without regard to what an individual grower may need.

“The reality on the farm side is we should be talking about right tech. Many people in the industry have allowed a Venlo glass greenhouse to dictate how U.S. growers think about technology in most high-tech applications,” Chris said. “Some U.S. growers may think because they don’t have Venlo greenhouses they can’t have high-tech operations.”

Chris talked about the hundreds of acres of strawberries grown in high tunnels in California equipped with raised gutters on fence posts as proof that not everything about an operation has to be high tech.

“The reason these high-tunnel structures work so well for controlled environment strawberry production is because the climate for production is almost perfect,” he added. “Why should growers build greenhouses if they aren’t needed? Does that mean that this technology is low tech?”

For example, he said, the definition of high tech may not apply in this case if referring to controlling the temperature and humidity. But the high tunnels may be equipped with a high-tech irrigation system. Chris noted these strawberry growers are looking to invest in advanced robotics systems that can assist in harvesting, spraying or transportation, as well.

“Requirements of technology will be based more on solving different problems for farms of different sizes based on what that farm can afford to support growth or profitability,” he said. “Why invest in high tech if a grower doesn’t need it?”

Lowering labor, energy costs

Chris pointed out the two biggest areas growers have issues with today and over the last few years are labor and utility costs.

“The inflation tied to those two categories on the growers’ balance sheets has outpaced the cost of price increases farms can put on the products they produce,” he said. “If there is technology that allows growers to address labor and utilities, that is where they should be making their investments.”

Whenever food is being grown in a controlled environment in a climate that isn't conducive to production year-round, energy in the form of utilities is being used to manipulate the climate, he said. This could include supplementing light or lowering or raising the temperature. Savings on utilities is highly dependent on the geographical location and what utility a grower is using the most. These calculations for energy costs are relatively easy to determine.

"How much energy savings are being realized? How many running hours are on a piece of equipment per year?" he asked. "A grower can determine the savings versus the investment in new equipment and if that number is between three to five years payback, the grower should seriously consider an upgrade. The only thing that is guaranteed is the cost of labor and the cost of energy will continue to increase."

Improving efficiency

While labor and energy costs are two of the biggest issues growers are facing, Joe Swartz, vice president at AmHydro, a horticultural hydroponic systems designer and builder in Arcata, California, said there's no single automation solution to resolving these issues.

"There are so many factors involved," Joe said. "Not only the type of automation, but also the level of automation and the specific automation application. Automation application in some instances involves automating repetitive labor tasks. In other cases, logic or using some artificial intelligence (AI) machine learning focusing on data collection and/or analysis is driving what a grower needs."



Clockwise from top left: One objective of the Small Greenhouse and Farm Technology project is to assist small growers to identify their current level of technology adoption and help them determine where to make their next equipment/automation investment. ■ High-tech controlled environment food production can vary for the crop and geographic location. Depending on location and climate, high tunnels or greenhouses can be equipped with high-tech environmental controls and irrigation systems. ■ A grower pain point is moving material from one area to another or throughout a whole facility. Small growers can invest in carts or trolleys, while larger operations may invest in automated conveyor belts. ■ Since labor and energy costs will continue to increase, technology that enables growers to address these issues is where they should consider making their automation investments.

Joe said most growers come to AmHydro to improve or increase efficiency, looking for cost savings through process efficiencies, as well as finding better ways to implement food safety or workplace safety. What it essentially boils down to is either making more money for the growers or freeing up more time or a combination of those two.

"We don't have growers who come to us and say we need to cut down on our labor. It's much more of a

holistic approach. How can they streamline and make their operations work better?” Joe said. “That is one of the things that drives what growers should be looking at with regards to automation. In order to streamline their operations, growers need to produce more using less, and they need to do it faster and better.”

Reducing pain points

Joe said many existing growers are looking to cut their costs and need to lower their labor requirements.

“Labor has become a pain point for a lot of growers,” he said, adding many existing growers feel they have to automate specific processes because of the labor costs. They’re hearing from companies out there that are creating automation equipment and essentially telling growers to purchase this automation technology because it’s so advanced.

“We’re commercial growers at AmHydro, so we are looking at the big picture of how we improve a process. A lot of times we will see something in a process—this could be a method or actual technology that has been implemented and is causing the problem,” Joe said. “We are trying to make growers successful. Sometimes it only takes a little nudge in the right direction or some guidance in ways where they can fix the problem with the tools they already have.”

He said another common pain point facing all size growers is material handling. Whether it’s an automated system that moves plants throughout an operation or moves product from one section to another, he said, material handling applies across the board for all size operations. This includes the small grower who’s invested in a couple carts or monorail trollies to save on labor and create a safer working environment. For larger operations, improving material handling may incorporate automated conveyor systems that move everything from plants to equipment around a facility.

“This can also include processing equipment used in packing areas, such as container-filling and packaging machines, as well as palletizing and shipping logistics automation,” he noted. “Other considerations might include crop scouting or health analysis, which could involve automation in dosing systems covering nutrition and water management.”

Advocating for small growers

For small-scale controlled environment growers who are doing both outdoor field and indoor greenhouse food crops, the decision where to spend their money on equipment and automation can be even more daunting.

“Growers face tough decisions over whether to spend limited dollars outdoors or indoors,” said Peter Konjoian, founder of Konjoian’s Horticulture Education Services in Andover, Massachusetts. Peter grew up on a 5-acre family farm and was involved with operating a 55,000-sq.-ft. greenhouse used for ornamental plant production. He recently started the Small Greenhouse and Farm Technology (SGAFT) project. He’s working with Michelle Klieger, an agricultural economist and strategist, to provide growers with insight as to the factors that need to be considered when making equipment-buying decisions.

“How does the potential of more crop turns in the greenhouse compare to seasonal outdoor production?” Peter said. “The answer can identify where the investment in technology should be made.”

The SGAFT website will provide educational materials tailored to smaller operations. The website will show growers what state-of-the-art technology is and where it’s headed, but most of the information will focus on the technology that they can afford to implement in their operations.

“One objective of the project is to help small growers embrace the big picture, identify their current level of

technology adoption and target what's next," he said. "Understanding where they are and what the next step is results in better decisions about where to spend their next dollar."

Peter is working on describing automation technology within several different categories, including irrigation, environmental controls and glazing. Which category is going to return the most on a grower's investment and which is going to eliminate or remove some of the human error involved in growing quality crops?

"Each category has its technology ladder and each ladder identifies a progressive increase in technology from entry level on the bottom step to state-of-the-art on the highest," he said. "There's never enough money to do everything, so making good decisions is key."

"Another objective is managing the pressure small growers place on themselves trying to achieve the highest level of technology in one step. We don't skip steps climbing an actual ladder, that's dangerous and irresponsible."

A consideration that Michelle has emphasized is where growers are going to purchase their next hour of time.

"Growers also benefit from understanding where their next dollar will buy that coveted extra hour of time to be more productive," Peter added.

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