

Meet the farmers of the future: Robots

October 3 2018, by Michael Liedtke



In this Thursday, Sept. 27, 2018, photo a robotic arm lifts plants being grown at Iron Ox, a robotic indoor farm, in San Carlos, Calif. At the indoor farm, robot farmers that roll maneuver through a suburban warehouse tending to rows of leafy, colorful vegetables that will soon be filling salad bowls in restaurants and eventually may be in supermarket produce aisles, too. (AP Photo/Eric Risberg)

Brandon Alexander would like to introduce you to Angus, the farmer of the future. He's heavysset, weighing in at nearly 1,000 pounds, not to mention a bit slow. But he's strong enough to hoist 800-pound pallets of maturing vegetables and can move them from place to place on his own.

Sure, Angus is a robot. But don't hold that against him, even if he looks more like a large tanning bed than C-3PO.

To Alexander, Angus and other robots are key to a new wave of local agriculture that aims to raise lettuce, basil and other produce in metropolitan areas while conserving water and sidestepping the high costs of human labor. It's a big challenge, and some earlier efforts have flopped. Even Google's "moonshot" laboratory, known as X, couldn't figure out how to make the economics work.

After raising \$6 million and tinkering with autonomous robots for two years, Alexander's startup Iron Ox says it's ready to start delivering crops of its robotically grown vegetables to people's salad bowls. "And they are going to be the best salads you ever tasted," says the 33-year-old Alexander, a one-time Oklahoma farmboy turned Google engineer turned startup CEO.

Iron Ox planted its first robot farm in an 8,000-square-foot warehouse in San Carlos, California, a suburb located 25 miles south of San Francisco. Although no deals have been struck yet, Alexander says Iron Ox has been talking to San Francisco Bay area restaurants interested in buying its leafy vegetables and expects to begin selling to supermarkets next year.



In this Thursday, Sept. 27, 2018, photo Iron Ox CEO Brandon Alexander looks out at his robotic indoor farm in San Carlos, Calif. Alexander spent a lot of time working his family's farm in Oklahoma before he headed off to the University of Texas to study robotics. After graduating, he moved to Silicon Valley, where he is returning to his roots by building robot farmers that roll maneuver through a suburban warehouse tending to rows of leafy, colorful vegetables that will soon be filling salad bowls in restaurants and eventually may be in supermarket produce aisles, too. (AP Photo/Eric Risberg)

The San Carlos warehouse is only a proving ground for Iron Ox's long-term goals. It plans to set up robot farms in greenhouses that will rely mostly on natural sunlight instead of high-powered indoor lighting that sucks up expensive electricity. Initially, though, the company will sell its produce at a loss in order to remain competitive.

During the next few years, Iron Ox wants to open robot farms near metropolitan areas across the U.S. to serve up fresher produce to

restaurants and supermarkets. Most of the vegetables and fruit consumed in the U.S. is grown in California, Arizona, Mexico and other nations. That means many people in U.S. cities are eating lettuce that's nearly a week old by the time it's delivered.

There are bigger stakes as well. The world's population is expected to swell to 10 billion by 2050 from about 7.5 billion now, making it important to find ways to feed more people without further environmental impact, according to a report from the World Resources Institute .

Iron Ox, Alexander reasons, can be part of the solution if its system can make the leap from its small, laboratory-like setting to much larger greenhouses.



In this Thursday, Sept. 27, 2018, photo a bok choy plant is lifted up and displayed at Iron Ox, a robotic indoor farm, in San Carlos, Calif. At the indoor

farm, robot farmers that roll maneuver through a suburban warehouse tending to rows of leafy, colorful vegetables that will soon be filling salad bowls in restaurants and eventually may be in supermarket produce aisles, too. (AP Photo/Eric Risberg)

The startup relies on a hydroponic system that conserves water and automation in place of humans who seem increasingly less interested in U.S. farming jobs that pay an average of \$13.32 per hour, according to the U.S. Department of Agriculture. Nearly half of U.S. farmworkers planting and picking crops aren't in the U.S. legally, based on a survey by the U.S. Department of Labor.

The heavy lifting on Iron Ox's indoor farm is done by Angus, which rolls about the indoor farm on omnidirectional wheels. Its main job is to shuttle maturing produce to another, as-yet unnamed robot, which transfers plants from smaller growing pods to larger ones, using a mechanical arm whose joints are lubricated with "food-safe" grease.

It's a tedious process to gently pick up each of the roughly 250 plants on each pallet and transfer them to their bigger pods, but the robot doesn't seem to mind the work. Iron Ox still relies on people to clip its vegetables when they are ready for harvest, but Alexander says it is working on another robot that will eventually handle that job too.

Alexander formerly worked on robotics at Google X, but worked on drones, not indoor farms. While there, he met Jon Binney, Iron Ox's co-founder and chief technology offer. The two men became friends and began to brainstorm about ways they might be able to use their engineering skills for the greater good.

"If we can feed people using robots, what could be more impactful than

that?" Alexander says.



In this Thursday, Sept. 27, 2018, photo the mover robot called Angus transports plants being grown at Iron Ox, a robotic indoor farm, in San Carlos, Calif. At the indoor farm, robot farmers that roll maneuver through a suburban warehouse tending to rows of leafy, colorful vegetables that will soon be filling salad bowls in restaurants and eventually may be in supermarket produce aisles, too. (AP Photo/Eric Risberg)



In this Thursday, Sept. 27, 2018, photo the temperatures of some two dozen plant varieties are monitored at Iron Ox, a robotic indoor farm, in San Carlos, Calif. At the indoor farm, robot farmers that roll maneuver through a suburban warehouse tending to rows of leafy, colorful vegetables that will soon be filling salad bowls in restaurants and eventually may be in supermarket produce aisles, too. (AP Photo/Eric Risberg)



In this Thursday, Sept. 27, 2018, photo from left, packages of red romaine, red veined sorrel and basil are displayed at Iron Ox, a robotic indoor farm, in San Carlos, Calif. At the indoor farm, robot farmers that roll maneuver through a suburban warehouse tending to rows of leafy, colorful vegetables that will soon be filling salad bowls in restaurants and eventually may be in supermarket produce aisles, too. (AP Photo/Eric Risberg)



In this Thursday, Sept. 27, 2018, photo Iron Ox CEO Brandon Alexander gives a tour at his robotic indoor farm in San Carlos, Calif. Alexander spent a lot of time working his family's farm in Oklahoma before he headed off to the University of Texas to study robotics. After graduating, he moved to Silicon Valley, where he is returning to his roots by building robot farmers that roll maneuver through a suburban warehouse tending to rows of leafy, colorful vegetables that will soon be filling salad bowls in restaurants and eventually may be in supermarket produce aisles, too. (AP Photo/Eric Risberg)



In this Thursday, Sept. 27, 2018, photo bok choy is seen growing in the foreground at Iron Ox, a robotic indoor farm, in San Carlos, Calif. At the indoor farm, robot farmers that roll maneuver through a suburban warehouse tending to rows of leafy, colorful vegetables that will soon be filling salad bowls in restaurants and eventually may be in supermarket produce aisles, too. (AP Photo/Eric Risberg)

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