

Machine Learning and AI for Strawberry Harvesting



l5automation.com La Cañada Flintridge CA

Featured Investors

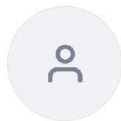
Investors include

Farmhand Ventures

GoodFarms

FarmHand Ventures

National Science Foundation



Farmhand Ventures

Syndicate Lead

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We invested in L5 Automation because they have a better way of automating strawberry harvest. Strawberries are a nutritious crop that can be profitably cultivated, but they're very difficult to pick. Today, strawberry harvesting is entirely manual, and as labor availability decreases and costs increase, it's becoming prohibitively expensive to cultivate strawberries and other soft fruits. L5 is taking a unique approach towards strawberry harvesting with its 2-armed harvester. Alex's technical expertise, startup

[Read More](#) ▾

Invested \$100,000 this round

Highlights

- 1 Patent-pending tech, backed by NSF, enabling world's first hand-eye coordinated robotic harvester

- 2 >\$400k grant and product YTD, potential of ~\$800k for 2024, and \$1.2-2M for 2025
 - 3 \$1.545mm raised in investment thus far, including from our client/partner GoodFarms
 - 4 Our service is a drop-in solution to harvesting berries for growers.
 - 5 Software and hardware platforms are easily extendable to include many additional services \$\$\$
 - 6 Incredible team with experience in tech startups, robotics development and software engineering
 - 7 Top notch advisors and investors with expertise in tech, agriculture, and legal
 - 8 Technology will go way beyond farming, solving problems that have previously resisted automation
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Our Team



Alexander Gutierrez Founder & CEO

Graduate of Carnegie Mellon's Robotics Institute, Alex is a serial founder and family man. Prior to L5 Automation, he co-founded space company Astrobotic, raced robots for DARPA's Grand Challenge, and oversaw technology development for Lockheed Martin.



Dan Schneider Software Engineering Director

Dan has extensive experience with software systems development, successfully delivering complex, embedded, real-time and safety critical systems. He led ground breaking research resulting in peer review and publication. M.S. in Comp Sci from Stanford.



Edward Terry Robotics Research Engineer

A versatile engineer with a specialization in deploying object detection systems on mobile robots in unstructured environments. Ed worked at NASA JPL and KEF Robotics after graduating from Carnegie Mellon's Robotics Institute in 2018.



Bernardo Rocamora, Jr. Robotics Research Engineer

Ph.D. candidate in Robotics at West Virginia Univ. with a background in mechanical engineering. Bernardo worked as the manipulation lead, and system integration and autonomy co-lead for the WVU Robotics team in the NASA Space Robotics Challenge Phase-2.



Zoe Dina Harris Operations Manager

Zoe has been earning her degree at Pasadena City College while leading L5's field operations on various farms in Southern California. She also helped run our blueberry engagement with AgroVision in Peru and is our resident metal machinist.



Sarah Lozano Associate Software Engineer

Starting as a part time Software Intern, Sara now works as a full time engineer at L5 and helps bring the robotic iterations to life while taking college classes part-time.



Xiaoyu Zheng CFO

CFA holder and Portfolio Manager at Guggenheim Partners where he oversees quantitative multi-asset institutional strategies. He has over 15 years of experience in various roles in asset management in global macro research and quantitative analysis.



Edward Lopez Advisor

A graduate at Harvard Law, Ed has been General Counsel at multiple public tech startups. A strategic adviser and counselor to tech companies across the gamut of substantive legal and business matters impacting their businesses.



Derek Parham Advisor

Founding Engineer for Google Apps, a CTO, a startup-advisor and a technology advocate, Derek has been an early supporter, investor and advisor to L5 Automation.



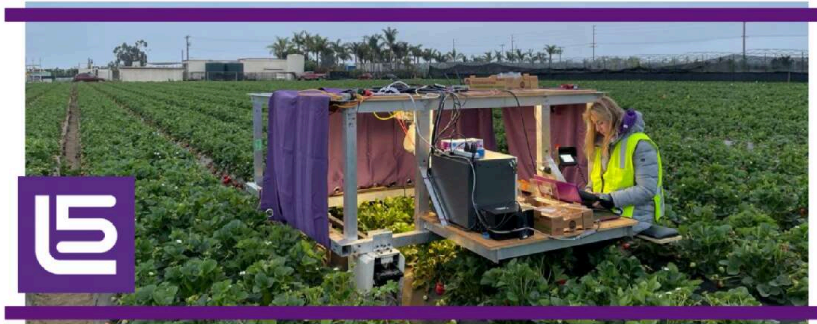
Farmhand Ventures Advisor

Connie Bowen is the founding General Partner at Farmhand Ventures. She's an experienced AgriFoodTech venture investor previously with The Yield Lab and AgLaunch, and thought-leader, writing for outlets including Forbes and AgFunder News.

Come along on our journey

Enabling robotic automation to create a world of plenty

At L5 Automation Inc. we're getting robots out of highly controlled factories and into complex real world environments. Our software enables hand-eye coordination for robotics, allowing machines to work where they have failed in the past. Starting with strawberries, we are developing a drop-in *harvesting solution* to help growers close their labor gaps, increase their productivity, and deliver fresher, healthier food to consumers!



The Technology

Working with farmers in the fields of California and technical development at our Los Angeles headquarters, L5 Automation is proud to introduce the next evolution of robotic automation for totally unstructured agricultural environments.

Historically, agricultural harvesting has been automated using brute force mechanization like combines and shakers, but strawberries and many other specialty crops *need the gentle skillful touch of a person's hand*. More importantly berries are often hidden from view by dense foliage in peak season and *need to be located with hands and eyes*.

Many competitors have entered the space, but their technology has always fallen short due to these factors. In many cases, engineers even decided to change the farm itself to cater to the robots. At L5, we've heard it many times: *"The problem*

L5 Automation has solved the "unsolvable"



Caption: Video of L5 Automation fielding a full-foliage harvester using our patent pending two arm solution.

In the video above, you can see how we employ an intelligent sweep-to-look motion and then a position-to-grab motion using two arms. This mimics how humans actually pick berries during the most difficult part of the season when berries are ripe and foliage is thick. The entire action is done in real time using multiple camera feeds and no preprogrammed actions. The next iteration of the harvester platform will speed up and extend the movements to enable a production ready robot.

Advanced Perception and Localization

L5 is proud to announce that we received a grant from the National Science Foundation (NSF) that will go towards improving our perception and localization software that is critical to the mapping and understanding of the strawberry beds we are working on. [Read about it here](#). The grant-award from the NSF validates our approach and shows the importance of the agricultural problem we are working to solve.



Next Steps

We've built multiple prototypes, began testing on real working farms in 2021 and have even delivered our first harvested flats of strawberries.

With the help of the WeFunder community and the wider investment community, we intend to accelerate the development of our unique patent-pending solution and deploy a more robust and advanced harvester system, speed up our harvesting operations and begin expansion of our pilot programs with farmers.

Our ultimate goal is to build a platform that can be used to automate activities where automation has struggled in the past, enabling a world in which human

productivity is multiplied a thousand-fold.

Production-Ready Harvester Concept Models

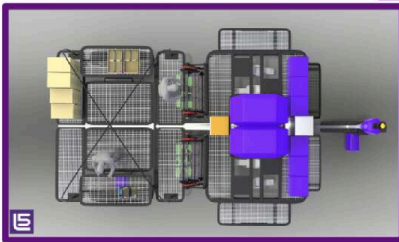


**2-Row Concept
4 to 6 arms**

**Single or dual person
operators/packing
support**



**Machine designed
to be packable for
transport**



Caption: Shown are various iterations of a 2-row 5 arm concept design. All concepts are subject to change.

The Business of Harvesting

Harvesting as a Service

HARVESTING AS A SERVICE

We harvest when it is good for the berries,
NOT when good for humans.

Hours / Day	Up to 16	Crew	5 robots 1 human
Target Cost / Day	\$4620	Human Equivalent	10-15



L5 plans to offer harvesting as a service without requiring growers to make significant capital investments so they can scale their harvest work as needed. We expect a robot crew, made up of 5 harvesters and one human operator to harvest what would normally take 10-15 hand harvest laborers.

Also, our robot can work at night which provides farmers with an extra benefit of harvesting in cooler temperatures resulting in higher quality produce with a longer shelf life.

**Farms traditionally end
their harvest day after
dark for many reasons ...**

but with robotic harvest, farmers can continue 24/7 during peak.

Turns out this is also berry, berry beneficial for the food too!



Beyond that, our vision software can extend to multiple applications, enabling precision farming at scale. As our robots will already be imaging every square inch of a farm, it is easy to extend our business to include advanced analytics to the growers to help with pest, weed and fertilizer management.

In the future, our physical platform is also extensible. Utilizing our core vision and software technology, we can change the end effectors (i.e. robot arms and grippers) to precisely prune plants, caring for each one to maximize yield.

Why Invest in L5 Automation

COMPETITIVE ADVANTAGE OF OUR UNIQUE APPROACH

Whole Season Harvesting	Patent Pending 2-arm solution	Designed for traditional farms	True Drop-in Solution
Even under heavy foliage	Human like manipulation	No modifications to current workflow	Planned onboard inspection and clamshell packing

Platform is being designed to upscale for horizontal opportunities. Field mapping, pest management, weed management, production management, etc.

How L5 stands apart from the competition

L5 is certainly not the first company to tackle automated strawberry harvesting, but we are different. To date, no competitor has fielded a system that works reliably all season long in traditional farms.

We're making sure from the outset that our system can handle peak season foliage. Our patent-pending 2-arm approach enables human-like interaction with the environment, and this is key to allow us to operate on traditional farms (no tabletops or reconfiguration required!).

We've been working closely with GoodFarms to ensure our system fits into their existing harvest flow so we can offer a true drop-in solution – to the point we'll be integrating on-board inspection, sorting and clamshell packing.

Addressable Market and Future Opportunities



Same Fundamental Technology

Multiple Applications

Commercial off the Shelf components

The above chart shows in our initial market of strawberries, growers spend over \$1.5B on harvesting costs of a \$3.5B market value. That means 40% of their market value is spent on direct labor costs, an untenable situation for producers.

Therefore we start with *labor-intense* applications like hand-picked produce, then move into *specialized-labor* like food processing, advanced warehouse automation.

From there we can expand into *extremely specialized* tasks like nuclear cleanup and deep-sea mining.

Finally we can utilize our core tech do work in *labor-impossible* environments, where people can't go but robots can thrive. The future applications of our core technology are practically limitless.

Revenue Discussion

We are making revenue *now*, through grants, ag-related contracting, and pilot harvest days. Currently we are on track to earn >\$400k for 2023, ~\$800k for 2024, and \$1.2-\$2M by 2025. However, where it gets really exciting is when our primary product starts reaching commercial scale, and then later when it extends to other markets.

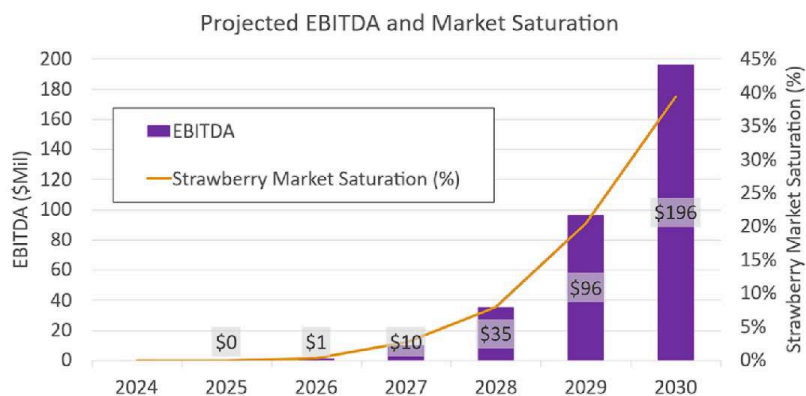
Solely focused on the target market of U.S. based strawberry Harvesting-As-A-Service and excludes additional revenue channels.

2026 Projected Strawberry Harvest Revenue

- 10 Acres under contract (<1% market saturation)
- \$3 million Gross Revenue
- \$1.2 million EBITDA

2029 Projected Strawberry Harvest Revenue

- 6000 Acres under contract (20% market saturation)
- \$141 million Gross Revenue
- \$96 million EBITDA



Caption: Please note our revenue projections only include basic classification, strawberry harvesting, on-board packaging. Not included are tack-on services which would generate additional revenue streams.

Market Saturation

After significant market research with commercial farmers and experts in Ag

Tech, we feel very confident that when our service achieves parity with human labor cost per acre, we expect to be able to achieve significant market share. Also over time, human labor costs continue to increase, but our harvester will decrease in cost per acre which further supports our aggressive market capture rate.

Finally our core technology and proprietary research will be patent protected which should minimize copy cat solutions. The biggest factor that will limit our growth is our ability to build enough robots to meet demand.

A Brilliant Team

So how do you unlock billions (if not trillions) of dollars of labor value that has been difficult to mechanize and automate? First you start with an award winning team of roboticists and engineers.



L5 founder, Alex Gutierrez (*M.S. Robotics, Carnegie Mellon '05*) earned his technical chops from Carnegie Mellon's world renowned Robotics Institute, co-leading an award-winning autonomous race car team in 2003-05. (It