innovation works
CASE STUDY

Sprouting Insights: Plant Vitals Drive Smarter Greenhouse Decisions



Leaficient is an AI-powered agritech company bringing laboratory-grade insights to commercial greenhouses. Leaficient uses low-cost cameras, hyper-spectral imaging, and environmental sensors to track plant biometrics in real time—down to the leaf level. The result is unprecedented visibility into photosynthesis, growth rates, stress signals, and yield forecasts, often before problems are visible to the naked eye.

Leaficient's flagship cloud-based platform, HeliOS, transforms complex inputs such as photosynthetic radiation, humidity, and vapor pressure into clear, conversational guidance powered by their large language model. Rather than navigating dashboards or interpreting spectral outputs, each grower is effectively equipped with an AI assistant that monitors every plant with scientific precision, enabling intuitive and rapid adaptation, more efficient crop management, and measurable gains in revenue, productivity, and cost control.

Founded in 2022 by robotics veteran **Brian Stancil** and bioengineer (and farmer) **Andy Rape, PhD**, Leaficient applies the rigors of autonomous systems, optics, and computer vision to agriculture. Both Carnegie Mellon University (CMU) alumni, the pair previously led a medical robotics startup developing next-generation wearable monitors for human vital signs. With early National Science Foundation SBIR support, the Leaficient team leveraged their biometrics expertise to tackle plant systems, refining their approach through iterative development and strategic evolution.

Driven by innovation and a mission to advance sustainable, high-yield food production, Leaficient aims to give every grower an AI co-pilot that monitors plant health, predicts outcomes, and optimizes resource use. The company has swiftly grown into a leading intelligence platform for controlled environment agriculture.

Challenge

In 2023, Leaficient faced a critical test: prove that leaf-level biometric tracking could perform reliably inside real greenhouses. The prototype had to withstand heat, humidity, fluctuating light, and daily production demands while generating data robust enough for predictive modeling. An Innovation Works Scalable Grant funded ten HeliOS Alpha units, enabling the company to capture more than one million plant-hours of data and validate its core technology.

By 2025, the challenge evolved from validation to scaling. Leaficient needed a fully networked system capable of integrating dozens of cameras and sensors across entire facilities, while remaining affordable, manufacturable, and simple to install. A second Scalable Grant supported 120 redesigned HeliOS V3 units built with off-the-shelf components and modular assemblies, translating early lessons into a repeatable, connected platform ready for commercial deployment.

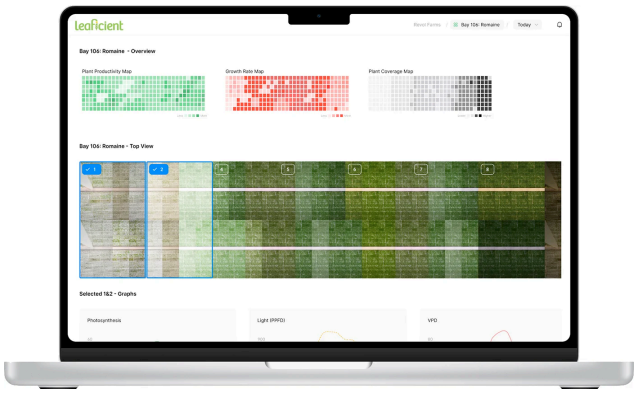
Project Details

Company:
Leaficient

Year Founded:
2022

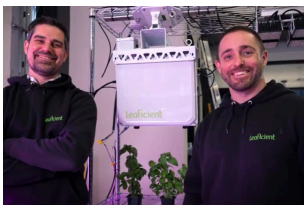
Founders:
Brian Stancil and **Andy Rape, PhD**

Programs Participated In (Year):
Innovation Works Scalable Grant (2023)
Robotics Factory Accelerate Program (2023)
Innovation Works Scalable Grant (2025)



Solution

To meet its 2023 deployment goal, Leaficient partnered with Innovation Works and Robotics Factory. A $25,000 Scalable Grant enabled the team to work with Hellbender Inc., an experienced Pittsburgh electronics manufacturer, to turn early concepts into ten field-ready Alpha units. The first-generation system combined a camera, light sensor, and controller wired directly into greenhouse circuits to manage lighting illumination. While functional, managing installation and power circuitry involved licensed electricians, code compliance, and significant labor. By the time Leaficient joined the inaugural Robotics Factory Accelerator Program cohort that year, the team was already envisioning the next prototype iteration. The accelerator's hands-on guidance, manufacturing seminars, rapid development courses, and mentorship provided the knowledge and resources the team would use to refine and scale their product.



Armed with hard-earned lessons from its first-generation system and accelerator knowledge, Leaficient evolved. In 2025, with a second Innovation Works Scalable Grant, Leaficient turned to Pittsburgh's Formica Protofab to rapidly prototype and redesign HeliOS V3 for manufacturability and scale. The team moved away from hardwired electrical control and toward networked, digital integrations for lighting and environmental systems, dramatically simplifying installation and eliminating the need for intensive on-site electrical work. The platform was rebuilt around commodity-grade off-the-shelf components and modular sub-assemblies, incorporating hyperspectral scanning that breaks light into discrete spectral bands for deeper plant insight. With cameras capturing images every ten minutes, often across



The Robotics Factory provided all the necessary tools, space, and support to help us launch Leaficient. "

--Brian Stancil
CEO & Founder, Leaficient

80 units per client, the system feeds a streamlined platform that distills complex biological data into the metrics growers actually need and can quickly access through an intuitive user interface. The outcome is a lighter, faster-to-deploy, fully networked plant intelligence system engineered not just for technical performance, but for real greenhouse economics and long-term growth.

Leaficient's growth is deeply rooted in Southwestern Pennsylvania's innovation ecosystem, enabling the company to iterate quickly, pivot strategically, and move from prototype to manufacturable system without losing momentum. Engagement with programs such as CMU's VentureBridge and recognition in the 2023 New Venture Challenge at Duquesne University helped refine their commercialization strategy and strengthen connections to capital and industry partners. The company has evolved into a scalable, networked platform that converts millions of plant-hours of spectral and environmental data into clear guidance for growers, establishing a digital layer for controlled environment agriculture where every photon and every square foot drives measurable return.

Innovation Works and the Robotics Factory

Innovation Works is one of the most active early-stage investors in the country and the most active in Pennsylvania. Since its inception of the seed fund in 1999, Innovation Works has invested in over 780 companies that have gone on to raise $3.4 billion in follow-on funding. Innovation Works is part of the Ben Franklin Technology Partners network, which has catalyzed economic growth over the last 30 years by providing access to capital and networks that help foster innovation and technology-based economic development in Pennsylvania. The Robotics Factory is an array of robotics programs led by Innovation Works and the Pittsburgh Robotics Network. Learn more at **innovationworks.org** and **roboticsfactory.org**.