# 农牧业信息化专题

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## 前沿资讯

### 1．Automated Harvest In Fruit Orchards Remains a Challenge（果园自动化收割仍是一项挑战）

简介：Replicating the human hand ain't easy, writes David Eddy at Growing Produce. The Washington State Tree Fruit Research Commission (WSTRC) was founded more than a half-century ago (1969) by a group of foresighted growers with the purpose of, among other goals, mechanizing harvest. But they, like the many other growers soon to follow, would be frustrated in their attempts. Thus, a discussion on the topic was appropriately held in Yakima, WA, at the 67th annual International Fruit Tree Association conference, themed "Bridging the Gap Between Information and Action."

Today you can see robots that can do practically anything. But not, apparently, pick fruit at its peak. At least not like humans can, especially the experienced pickers that most growers employ. Besides, labor was relatively cheap — until now. Not only has the pay rate increased more rapidly in recent years, but, for the first time, farmworkers in Washington and California — with more states sure to follow — will be eligible for overtime.

Several years ago, commissioners approved a guide for future research and development, and Executive Director Ines Hanrahan provided an update, "WTRFC Technology Roadmap: Where We are Going and Why."

She began by posting a simple slide titled "Harvest robot — what we need," followed by a short but daunting list of what her state's apple growers — who produce 2/3 of the nation's total — would require:

- 80 consecutive days
- 75,000 bins/day
- 1 machine = 100-200 bins/day
- 2-3 cents/fruit

Taking an average of 150 bins per day, that would require 500 robots, running for nearly three months. Hanrahan said to achieve such a goal the industry would need progress in several areas, such as more varieties that ripen at the same time. But perhaps more important, it would take a special effort on behalf of the developers of automated harvest machines, i.e., robots.

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### 2．Autonomous Robots: Answering Three Basic Questions（自主机器人：需要回答三个基本问题）

简介：Autonomous robots are one of, if not the hottest trends in precision agriculture at this moment, according to Future Farming. These robots are equipped with a wide range of technologies and sensors. Because farming is about achieving the best results with minimal effort, I advise farmers to consider the capabilities and the level of autonomy the robots

have before purchasing one. This is more important than focusing on fancy lights, colors, and options that don't add any value to their basic operations.

For a robot to be truly autonomous, it must find solutions to three basic questions:

1. Where is it located at this moment?

2. Where is it going?

3. How does it get there?

In addition to these questions, the robot must also consider how to use the attached implement and how to control it properly, but this is a topic for another article.

To answer the three basic questions mentioned above, the robots have to receive or execute the following inputs and outputs:

1. To have a model of the environment: In agriculture, the environment in which robots navigate is relatively simple with not many variables, but it changes rapidly throughout the year (crops grow, soil is prepared, irrigation equipment in different positions, etc.). In this case, the environment model will be given to the robots, or at least most of it (for example, loading shape files with boundaries, obstacles, and other points featured on it). However, the robot will still have to (at least partially) perceive and analyze the environment through its sensors and algorithms.

2. Find its position and situation within the environment, which is achieved again through data collected by sensors and with the help of algorithms.

3. Plan and execute the given task by using the motion devices with which it is equipped, in a safe and proper way.

来源：Future Farming；Global Ag Tech Initiative；

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## 3．Orchard Robotics Gains $3.8M to Build Robots and AI to Power Precision Crop Management（Orchard Robotics获得380万美元用于制造机器人和人工智能为精确作物管理提供动力）

简介：Tech-enabled precision crop management startup Orchard Robotics has gained $3.8 million in funding from a Pre-Seed round led by Contrary and an oversubscribed Seed round led by General Catalyst with participation from Humba Ventures, Soma Capital, Correlation Ventures, VU Venture Partners, Genius Ventures, along with angel investors Howard Lerman, Joshua Browder, Rory and Kieran O'Reilly, and many others, reports Global AgInvesting.

"Orchard Robotics has a bold vision to transform the future of farming and bring digitization and automation to farms," said Niko Bonatsos, managing director, and Max Rimpel, partner, General Catalyst. "The experience of the team, early success with large customers, partnership approach, and their data-first platform stood out to us, and we look forward to helping the company modernize a legacy industry for the fruit industry and beyond."

Founded at Cornell University by company CEO Charles Wu, Orchard Robotics provides

precision crop management for fruit farmers through a vehicle-mounted, AI-powered vision system that gathers data including fruit size, count, color, growth rate, and more, about the fruit on each individual tree.

"Our mission at Orchard Robotics is to help farmers produce more food for the world, more profitability, efficiently, and sustainably," said Wu. "This starts with giving farmers the precision data they need to do what they do best."

Despite orchards often having up to millions of trees across thousands of acres growing hundreds of millions of fruit, farmers have historically been in the position of having to rely on small and imprecise sample sizes, for instance, counting the fruit on only 10 trees out of a 10,000-tree block to make critical crop management decisions.

Each tree is a unique, living thing, needing specific inputs, treatments, and care throughout the entire season to produce the best, high-quality crops. Using today's imprecise practices and homogenous treatments leads to inefficient resource usage, higher labor costs, and the potential for significant crop loss and value.

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# 4．Groundbreaking Research Validates Biome Makers' BeCrop Soil Intelligence Technology（突破性的研究验证了Biome Makers的BeCrop土壤智能技术）

简介：Biome Makers, a global agtech company, proudly announces its contribution to the publication of two scientific studies validating the efficacy and reliability of the company's revolutionary technology. These landmark papers demonstrate a significant leap forward in the field of soil health intelligence and predicting soil functionality.

The first study titled "Physicochemical Properties and Microbiome of Vineyard Soils from DOP Ribeiro (NW Spain) Are Influenced by Agricultural Management," evaluated the impact of conventional and sustainable management systems of vineyards from DOP Ribeiro on the soil's condition. The multidisciplinary research brought together expertise from a range of institutions: Estación de Viticultura e Enoloxía de Galicia (EVEGA-AGACAL); Instituto de Investigación en Análisis Químicos y Biológicos (IAQBUS) at the Universidade de Santiago de Compostela (USC); Biome Makers Inc; the Área de Edafología y Química Agrícola at the Departamento de Biología Vegetal y Ciencia del Suelo, Facultad de Ciencias, Universidade de Vigo; and Laboratorio de Evaluación y Tecnología Ambiental at the Campus da Auga-Campus de Ourense, Universidade de Vigo.

The second study, titled "Enrichment of putative plant growth promoting microorganisms in biodynamic compared to organic agriculture soils," investigates regenerative versus organic agricultural soils in 3 locations in Germany and 21 locations in France. This was a collaborative effort between the University of Kassel, the University of Geisenheim, BioDynamie Services, and Forschungsring e.V. These studies highlight the effectiveness of Biome Makers' technology, BeCrop, and its proprietary indexes in microbial

metabolism, soil bio-sustainability, while also detecting stress, nutrient deficiencies, and correlating with different management practices.

Dr. Alberto Acedo, Biome Makers' Chief Science Officer and co-founder, commented, "These papers are a testament to our commitment to transparency and scientific excellence. By opening our technology for peer review and validation, we aim to foster trust and collaboration while pushing the boundaries of soil health data and innovative technology."

The significance of these findings extends beyond Biome Makers' own technology; they also highlight the superiority of the soil database and intelligence over others in the market. As noted in one of the papers, "These results showed how the workflow of Biome Makers' index inference works, but also that their databases are superior to the limited literature review we conducted for their verification."

In addition to its scientific validation, BeCrop Technology stands out for its accessibility via API connections. This means that BeCrop's powerful soil intelligence solutions can seamlessly integrate into existing agricultural systems, enabling farmers and agricultural professionals to harness the benefits of advanced soil health assessment without disrupting their workflow.

These papers showcase the trust and credibility of Biome Makers' BeCrop Technology. They provide a competitive edge and a foundation for building knowledge and references that contribute to the advancement of soil science globally.

来源：Biome Makers；Global Ag Tech Initiative；

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## 5．Agri-tech Market Contraction Drives Shift to Resilience, Sustainability and Tech Integration（农业技术市场收缩推动向弹性、可持续性和技术整合转变）

简介：Venture capital investment experienced a significant contraction in 2023, as global business underwent a period of turbulence. According to PitchBook data, the agri-tech sector followed this pattern, with investments decreasing from $11.8 billion in 2022 to $7.1 billion last year, a reduction of 40%. Indoor farming was one area where this fall was particularly severe, falling from $2 billion to under $500 million.

The early signs show that the market contraction has sown the seeds for robust M&A activity in 2024. In reaction to the downward trend, startups have been forced to create more sustainable business models. On top of this, tech companies are new entrants to the market, enticed by the critical role of data in agriculture and the need to transform the industry in response to growing environmental concerns.

According to Ali Al Suhail, Vice President at DAI Magister, the stark devaluation of agri-tech firms means that both venture-backed and early-stage startups will continue to suffer in 2024. As alternative routes to growth, these firms must shift their focus to seeking new partnerships or attracting acquisitions.

Al Suhail said: "In order to attract the right buyer, agri-tech firms need to consolidate

their messaging to crystalize the distinct challenges and opportunities within the sector. Precision farming firms, for example, could emphasize technological synergies to attract tech buyers. Other firms within the sector might focus on a different set of buyers. Looking at fintech solutions for farmers, those firms will need to draw in investors by showcasing fund management capabilities.

"Ultimately, agri-tech is a market intrinsically linked to farmers' economics and the regulatory environment. It is also a sector heavily impacted by forces of the natural world. If there are supply shortages or volatile changes to commodity prices, market confidence can vary hugely. To bring in new investment, it's therefore a question of educating the wider market about the challenges of the sector and how new and innovative solutions will drive the industry forward.

"In the first quarter of this year, we've seen some interesting new acquirers entering the market. Where historically farmers' limited adoption of agri-tech solutions had dampened their ROI and data standardization, a recent shift has signaled a broader embrace of tech applications driven by a regulatory focus on climate and farmer efforts to optimize yield.

"A strong example of a new entrant is tech giant Microsoft, which partnered with Bayer to create data solutions for the agriculture industry. In a similar vein, Google recently launched Mineral.ai, a tool that utilizes AI and machine learning to unlock sustainable methods of farming. In early 2023, Google claimed it has already analyzed 10% of the world's farmland, and we expect them to continue making significant progress throughout this year.

"Finally, AWS partnered with Leaf, making Leaf's Unified Farm Data API available on the AWS Marketplace. These launches and partnerships signal a period of transformation for agri-tech, with new market entrants driving tech adoption."

Al Suhail concluded: "The entry of tech giants may help break the agri-tech M&A valuation ceiling, which has seen only a dozen companies surpass the $250 million mark over the last decade. This could unlock fundraising opportunities for growth-stage players in the sector, who have faced doubts from investors on their ability to cross the $250 million valuation mark."

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## ▶ 学术文献

### 1. 作物生长模型研究现状与展望

简介：作物生长模型由最初的作物生长发育模型发展到农业决策支持模型,在科学研究、农业管理、政策制定等方面发挥着越来越重要的作用。本文首先回顾了作物生长模型的发展过程,并按照模型主要驱动因子,将作物生长模型分为土壤因子、光合作用因子和人为因子驱动3类并分别进行了归纳阐述;然后对典型的模型分别从模型模块、时空尺

度、可模拟的作物类型等方面进行列表式对比；并对作物生长模型在气候变化评估、生产管理决策支持、资源管理优化等方面的应用，以及面临的极端条件、复杂农业景观和模型复杂度等挑战进行了总结，在此基础上认为遥感数据同化和孪生农场是其发展方向。