

TERA NOVA REPORT

Food security remains an everlasting challenge across civilizations
we empower the world's granaries with Chinese wisdom.



Food security is an everlasting challenge transcending civilizations; we empower the world's granaries with Chinese wisdom.

01 Background Information

The Global Agricultural Technology Market Landscape
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Joining hands to Pioneer New Frontiers
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Media Coverage and Industry Events
Interactive exchange

The Broader Picture

Market Growth Insights

\$49billion

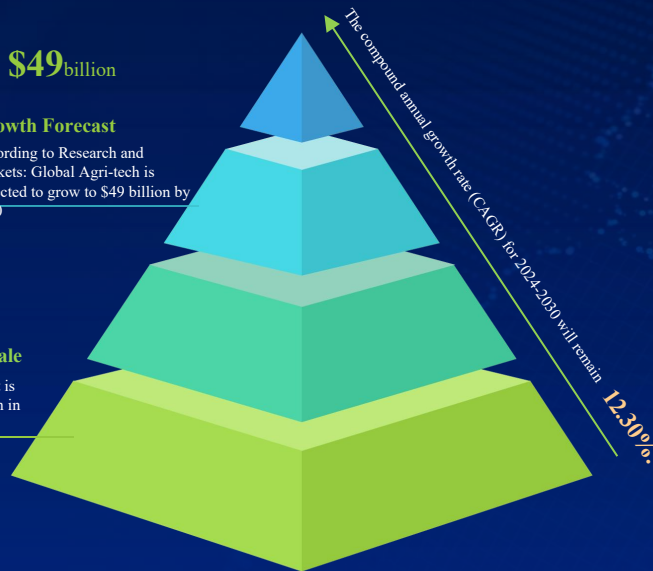
Growth Forecast

According to Research and Markets: Global Agri-tech is expected to grow to \$49 billion by 2030

\$24.42billion

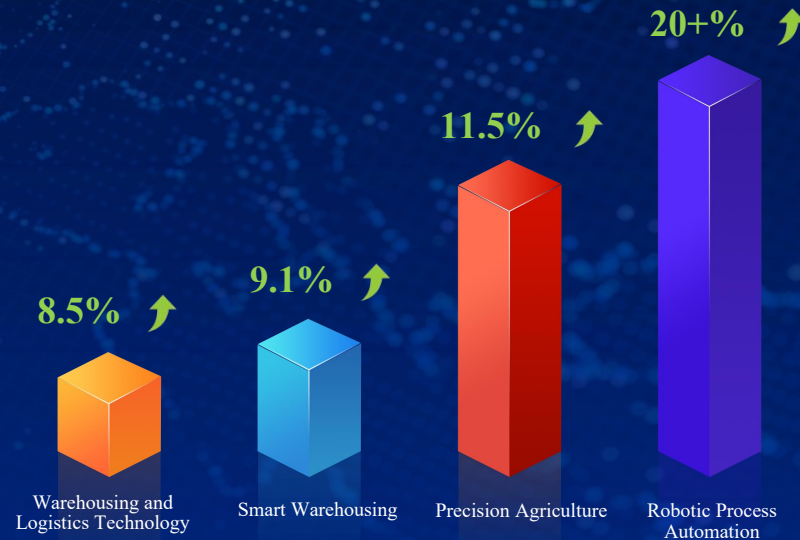
Two-dimensional scale

The global agritech market is experiencing robust growth in 2024



Contribution by different sectors

Among these, agricultural robots, as the category with the highest degree of technological integration have become the key engine driving market growth



Global Grain Storage Nations Market Scale

Market Size Data

Grain Silos and Storage System Market
Forecast
2030 Forecast

Market Size
\$6.53 billion+

According to The Global and Mail, the Silos and Storage System market is set to expand to \$6.53 billion by 2030.

Chinese Market:

Benchmark for Grain Storage in Major Grain-Producing Nations

Contribute to the incremental growth in storage demand in the Asia-Pacific region



According to People's Daily: The industrial output value in China's grain enterprises have surpassed **¥4 Trillion (\$561.5 Billion)** with a storage capacity exceeding **730 Million tons**.



According to worldgrain.com, the Indian government has pledged to invest **\$15 Billion** with the eventual goal of having enough capacity to store 100% of the nation's grain production, while China has increased its storage capacity by 34% in the past 10 years.



According to American Farm Bureau Federation:

U.S. storage capacity is estimated at **25.48 billion bushels (650 million tons)** which leaves roughly **2.4 billion bushels (61 million tons)** less space than needed to hold total production and existing stocks

Core Grain Storage Nations Matrix

China, India and United States are known to be the Largest grain producers in the world.



China



India



United States



Russia



Brazil



Others

Major Grain Producers' Demand Traits



Mature Market

United States: As a leading grain exporter, the nation is focusing on upgrading automated control systems for large silos. Investment in grain storage sector reached US\$3.6 billion in 2024, with core demands centred on efficiency enhancement and data-driven management.

EU Member States: Driven by environmental policies, key demand centres on green intelligent storage technologies such as photovoltaic warehouse rooftops and energy-efficient ventilation equipment. Stringent requirements exist for data compliance and carbon reduction outcomes.

Market pain points: While existing technologies are mature, the high cost of equipment upgrades creates an urgent demand for cost-effective intelligent alternatives, with a strong emphasis on compatibility with existing systems.



Core Growth markets

China: Policy-driven demand for large-scale upgrades remains robust. As of end of 2023, China has increased its grain warehouse capacity to 700 million tons (up 36% compared to 2014), including 200 million tons of Low/Quasi-Low Temperature grain storage capacity, 55 million tons of Air-control grain storage capacity, keeping the storage cycle loss rate at 1%.

India: India is launching a \$15 billion grain storage expansion to modernize its outdated infrastructure and storage shortfall, India currently produces 350 million tons of food grains and faces a significant 47% storage shortfall.

Brazil: According to a study by Itaú BBA, approximately R\$102 billion (\$19 billion) would be needed to eliminate the current grain storage deficit. Brazil currently produces around 330 million tons of grains but only has static capacity to store 60% of its production (213 million tons). Brazil needs robust public policies and massive infrastructural investments in order to resolve its storage challenges.

Global Agricultural Robotics Market Potential

Market Size in 2024

\$7.34 billion

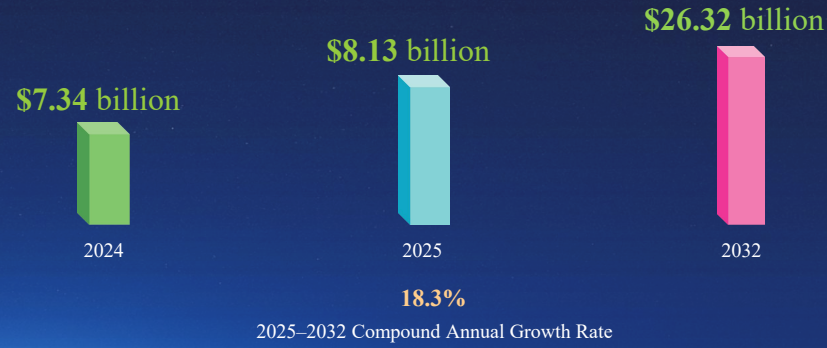
According to Fortune Business Insights:
The global agricultural robots market is valued at \$7.34 billion in 2024 and is projected to expand to **\$26.32 billion** by 2032, with a CAGR of 18.3% (2025-2032)

China Market Breakthrough

¥24.6 billion (Forecasted volume)
(\$3.47 billion USD)

According to ChinaIRN:
Agricultural Robots in AI, Automation, Sensor technology will account for over 40% of the smart agricultural development before 2030.

Market Size Growth Forecast



Growth in China's Market Size



Market Summary: North America leads globally with a 38.55% share; Asia-Pacific region shows fastest growth with China as the core market achieving 2-fold expansion over five years and achieving RMB 50 billion in market size (\$7 billion USD).

China holds the world's largest grain reserves

Global food security faces severe challenges, with core grain storage regions emerging as the primary battleground for technological innovation and strategic deployment.

As the country with world's largest grain reserves , China has established a multi-dimensional security barrier to prevent risks, regulate markets, and safeguard the national grain reserves through a reserve system that integrates central and local efforts and coordinates grains and strategic reserves.



Policy-driven

Global food security strategies are being upgraded, with countries intensively rolling out agricultural technology support policies. Initiatives such as China's "14th Five-Year Plan for Robot Industry Development" and the EU's Carbon Border Adjustment Mechanism explicitly promote the intelligent transformation of agriculture.



Demand-driven

According to FAO: Global population growth is driving up food demand (with crop requirements projected to increase by 60% by 2050), while labor shortages intensify, rising labor costs in developed nations are accelerating the shift toward technological substitution.



Technical Support

The maturity of technologies such as IoT, AI, and autonomous navigation continues to advance, propelling agricultural technology from proof-of-concept to large-scale commercial application. In 2023, global investment in Agri-tech exceeded \$16 billion.

Introduction to Seedlight Robot

The Core Supplier of "Grain Situation AI Monitoring System" and "Specialized Robotics" for China Grain Reserve Corporation (Sinograin)

As an innovative leader in China's smart grain storage sector, Seedlight Robot has assembled a cross-disciplinary team of experts including seasoned Grain storage specialists, technical experts from national research institutes, engineers specializing in advanced manufacturing, and AI pioneers. The company integrates expertise from 12 technical fields such as grain science, intelligent monitoring and control systems, automation technology, pest and mold prevention, smart robotics, structural design, precision manufacturing, optical sensing, IoT communications, and large-scale AI algorithms. Over 33% of its workforce holds doctoral degrees or senior professional titles, with accumulated patents exceeding 50 in smart grain storage technologies. Seedlight's Ningbo facility features fully automated SMT circuit board production lines, AGV intelligent logistics systems, MES digital management platforms, equipped with hundreds of high-precision injection molding machines and mold processing centers. Seedlight has established a complete manufacturing capability loop covering design, simulation, process development, precision machining, and assembly debugging. This forms a full industrial chain technology breakthrough system from basic R&D to industrial implementation, providing solid support for the engineering deployment of smart grain storage systems.



SEEDLIGHT

Guardian of Food Security

Serving the Global food security strategy, with the dual-core technology of AI and robotics Seedlight aims to lead the development of autonomous and intelligent solutions for Global Grain Industry.

Corporate Vision

To become the world's leading provider of intelligent solutions for grain storage, and to reshape the world with smart technology

Mission and Values

Mission: To improve the efficiency and security for Grain storage by intelligent technology innovation.

Core values: Technological innovation, Safety, customer-centric, continuous improvement

Global Food Security

Food security is related to national security and social stability, and grain-leveling operation is an important link to ensure the safety of grain storage

The "Bottlenecks" of Traditional Grain-leveling Operations

Poor working conditions, low efficiency and high intensity, huge safety risks, labor shortage, inadequate existing solutions

Talent Team



The Technical Team of Seedlight is composed of top experts from China and abroad, with strong interdisciplinary collaboration ability and global vision, which provides a solid foundation for the innovation and development of the company.

The team covers robotics, mechanical design, grain storage science, artificial intelligence, materials engineering and other fields, and has a deep cooperation with Sinograin Chengdu Storage Research Institute.

Xiao Xiao

(Technical director)

Background: Former director of Changzhou Institute of Robotics, Chinese Academy of Sciences, expert in robot control and system architecture.

Innovation achievements: led the planning of the national robot software and hardware operating system and multi-machine collaborative communication architecture, laying the foundation for the autonomous, safe and controllable robots in grain storages.



Yi Jin

(doctor)

Background: Expert at the Academy of National Food and Strategic Reserves Administration, specializing in grain science and environmental monitoring.

Innovation contribution: Promote the reliable operation of robots in extreme environments such as high temperature and high humidity.



Xu Yongwei

(doctor)

Background: Doctoral degree from the University of Tokyo, Japan. Expert in robot control system and collaboration algorithm.

Technical breakthrough: The multi-robot partition scheduling and dynamic obstacle avoidance algorithm are developed, and the technical breakthrough of large-scale cooperative operation of working robots is realized.



Jin Hangjia

(doctor)

Background: Expert in mechanical design and manufacturing, Jilin University, focusing on precision mechanical and transmission system design.

Highlights: The turbine transmission structure and lightweight design of the robot are optimized to make the equipment more efficient and adaptable to complex environments.



Zhang Liang

(doctor)

Background: Expert in grain storage and mechanization field of Hunan Agriculture University, specializing in grain storage automation field.

Core contribution: Develop grain storage modeling technology based on 3D point cloud data, combined with laser radar imaging algorithm, improve the accuracy and safety of grain storage operation.



Zhu Linjun

(doctor)

Background: Head of intelligent analytics and prediction AI algorithms.

Technological innovation: realization and iteration of robot deep learning and reinforcement learning algorithms.

The Technical Team is composed of 35 members: covering robotics technology, mechanical design, grain storage science, artificial intelligence, material engineering and other fields, and has a deep cooperation with Sinograin Chengdu Storage Research Institute.

Patent Protection · Authoritative Recognition



Intellectual Property Right

Through the Technical team's core technological breakthroughs, Seedlight has completed comprehensive patent deployment in the intelligent grain storage management sector. The company has filed over 50 patents cumulatively, with Seedlight Robot contributing [40 patents]. These patents cover all dimensions including product design production processes, and smart applications, establishing a robust patent portfolio to safeguard its technological leadership.



Authorised Recognition

- Cooperation with Sinograin Chengdu Storage Research Institute
- National food security strategy support
- Industry technology leadership
- Expert team endorsement



Technical Barrier



- The world's first technical route
- Core algorithm independent research and development
- Independent design of key components
- Leading system integration capability



Cooperative credibility

Strategic Partners

Sinograin Chengdu
Storage Research Institute
Co.,Ltd

Technical Certification

Tested by an authoritative body

Position in Industry

A leader in the field of intelligent grain
storage

Customer Trust

Quality service reputation guarantee

Intelligent Grain-Leveling Solution



Intelligent Cloud Platform

The intelligent monitoring platform enables end-to-end data visualization



Intelligent Vision

Integrated LiDAR System
Supports 3D Environmental Modeling



Intelligent Control

Smart Control Host Integrates
Distributed Algorithms



Intelligent Connect

Network Communication Equipment
Ensures stable data transmission

AI decision-making system

Real-time 3D modeling with dynamic scheduling algorithms, intelligent partition planning for multi-machine collaborative path optimization, enabling autonomous grain-leveling throughout the entire process; real-time monitoring and early warning systems, automated generation of operational reports and fault analysis charts, supporting optimized management

Operations Execution System

Powered by a spiral wheel and National Standard Grade II energy-efficient motor, with proprietary algorithm support, the smart robot can reach speeds of 2m/s on soft grain-surface. Its ultra-light dust-proof body withstands extreme environments, featuring 2-hour battery life and 1-minute battery swap, enabling true 24-hour operation.

Environmental Sensing System

High positioning at the top of the Grain warehouse's interior, integrating human eye safety level solid-state lidar and high-definition starlight camera, with dual engine driving of million-point 3D modeling and real-time imaging every second.

Six core technology innovations

01 Innovation

Ultra-wide Angle all solid state
RGBD Fusion LiDAR

02 Innovation

High leaf axis ratio spiral
wheel operating robot

03 Innovation

High torque density
motor for granary

04 First adopted

High density solid power battery

05 Innovation

Grain cluster operation algorithm

06 Innovation

Flexible platform
of functional modules

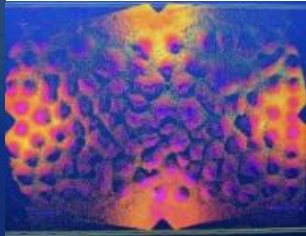
Core Technological Innovation and Disruptive



01

Efficient Intelligent Perception and Accurate Positioning

The large-view multi-mode lidar based on RGBD fusion technology can build 3D grain surface map in real time, accurately identify the height and position of grain pile, and measure the volume of granary



02

Unique Loose-Surface Adaptive System

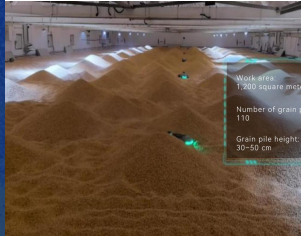
Innovative spiral power system: patented spiral wheel design, completely solve the problem of grain surface depression and slippage.



03

AI-Intelligent Decision and Efficient Cluster Operation

The central control system plans the operation area of each robot based on the 3D grain surface map, builds the electronic fence for the robot's operation, and plans the operation path



04

Full process automated Grain-leveling operation

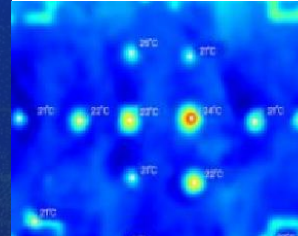
Coarse leveling operation: LiDAR navigation, 0.5 day to complete 1400m² Grain leveling, grain surface height difference ≤15cm, zero fragmentation.
Precision operation: multi-robots operation



05

Intelligent inspection and grain condition warning

The mechanical arm can be loaded to accurately deploy temperature and humidity, gas sensors, and real-time data is sent back. The monitoring platform can intuitively present the grain warehouse situation with thermal map, predict abnormality in real time, and push expert advice report simultaneously



06

Flexible Control and Convenient Operation and Maintenance

Support Wi-Fi and central control system for data transmission and instruction execution The tablet computer App can communicate directly with the robot through Bluetooth, real-time control, and deal with special situations (such as manual remote control rescue when the robot is buried)



Grain Multi-Param AI-Monitor Solution

The LD08 Smart Grain Silo Pest Trapping Device supports three power supply modes: PoE+, battery, and DC.

With an ultra-long battery life that enables continuous monitoring for approximately 90 days, it features high precision, low power consumption, and portability. Equipped with domestically developed chips and a 5-megapixel camera module, this device is suitable for various grain storage environments. Particularly effective in continuously monitoring pest activity within gas-sealed nitrogen-regulated silos, it significantly enhances intelligent supervision efficiency while reducing manual maintenance costs.

Flexible power supply configuration

It provides PoE network cable 48V power supply, which is suitable for specific routers or switches; the non-SE version uses 9.6V, 15A h lithium iron phosphate battery pack, and is paired with single or multi charging base to meet the power demand of different scenarios.

Safe and reliable design

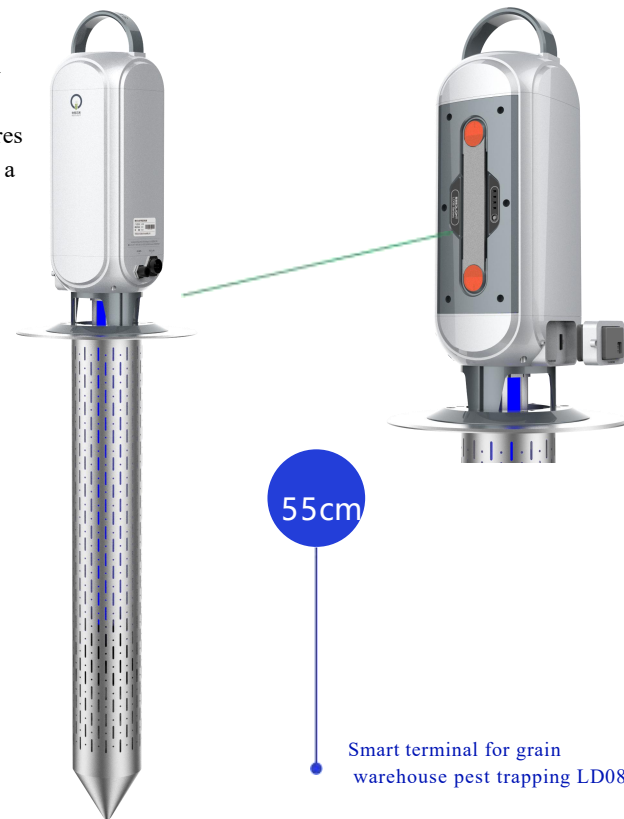
It complies with the dust explosion standard of Zone 21, and the key components are certified in many ways. It passes EMC/EMI test to ensure the safe operation of the equipment in the complex grain storage environment.

Intelligent interaction management

Based on the MQTT protocol, the device and the system interact with each other in both directions. It supports scheduled, remote, and PDA command photography, has standard, trap, and demonstration modes, and can work in a single machine or network to facilitate management.

Stable network connection

The non-SE version features built-in 2.4 GHz Wi-Fi and connects to Seedlight servers via a 4G router, while the SE version connects to the internal network through PoE LAN. Bluetooth 5.1 assists in network configuration, and UWB technology enables precise indoor positioning to ensure stable device connectivity and accurate location tracking.



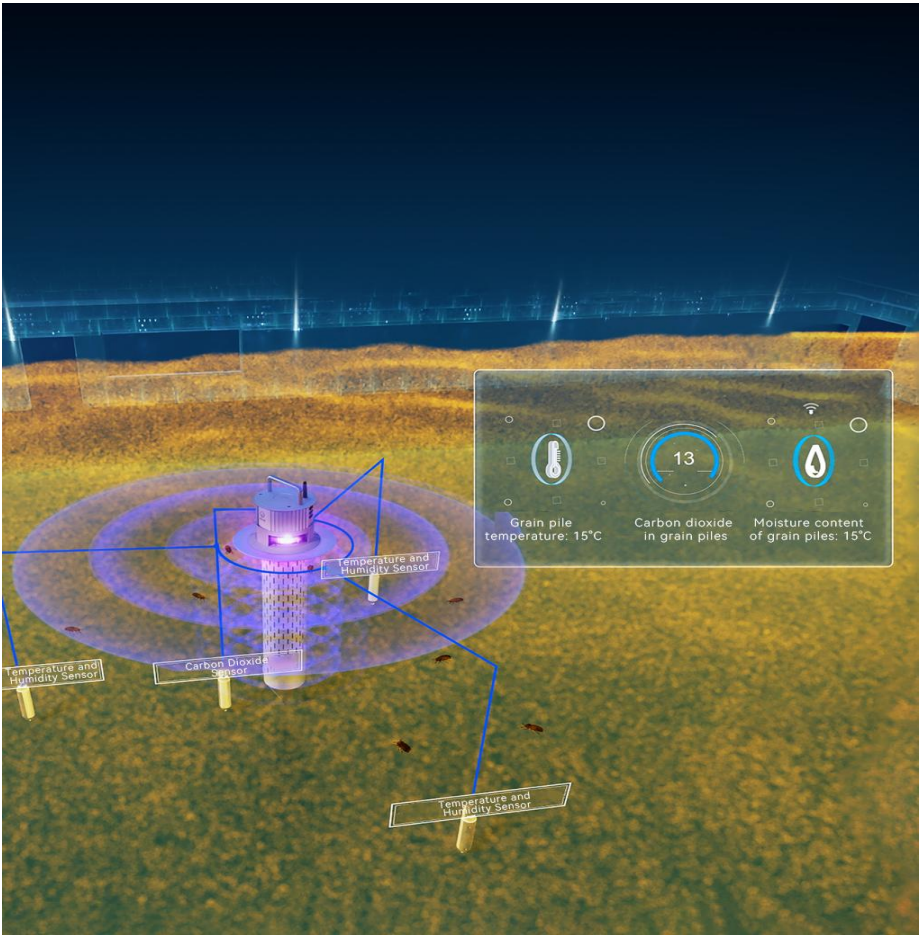
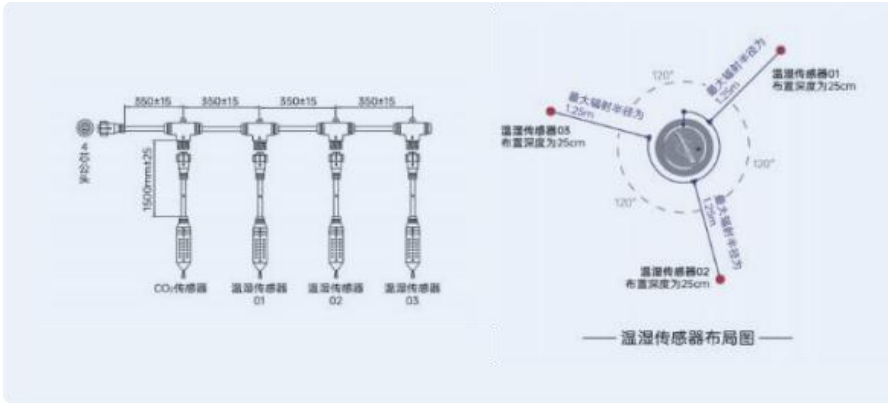
55cm

Smart terminal for grain
warehouse pest trapping LD08

Sensor Module

The intelligent terminal uses grain storage sampling points and pest-prone areas as bait locations. When operational, the isolation plate is positioned below the grain pile. Multiple sensors are installed within a 1-meter radius of the bait device in the warehouse's grain storage area, with adjustable installation depths ranging from 0 to 3 meters. The sensor module contains temperature/humidity sensors, gas detectors, and moisture sensors. These devices collect data from both the grain pile and Grain warehouse environment, including internal grain pile information.

Temperature data, grain pile humidity data, grain pile moisture data, grain pile gas data, etc., grain warehouse data includes grain warehouse temperature data, grain warehouse humidity data.



Seedlight Grain Storage AI Model



The Seedlight Grain Storage AI Prediction Large Model is a 3-in-1 intelligent monitoring platform for Grain storage ecosystems, integrating smart terminals, IoT sensing, and AI models. This groundbreaking system combines physical monitoring with AI analytics to create a comprehensive multi-model AI platform that covers grain condition monitoring, risk prediction, and intelligent decision-making.



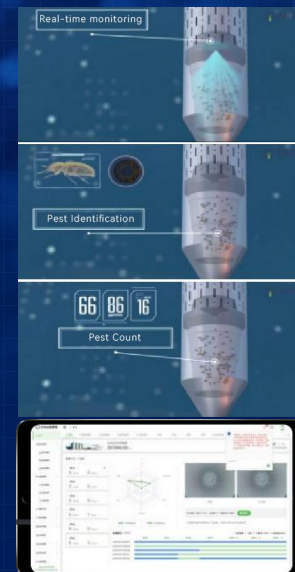
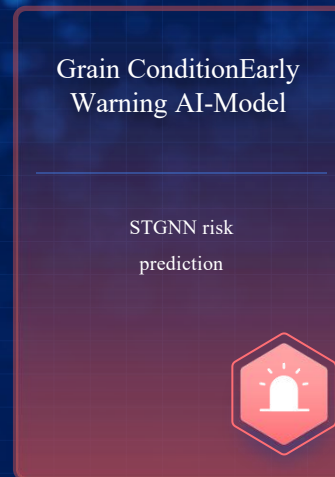
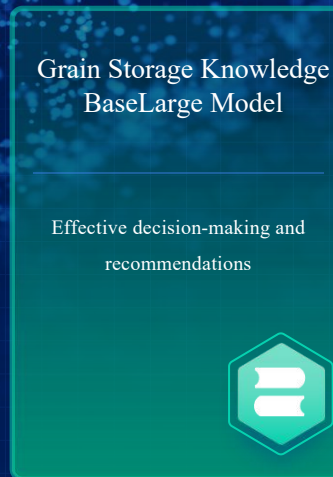
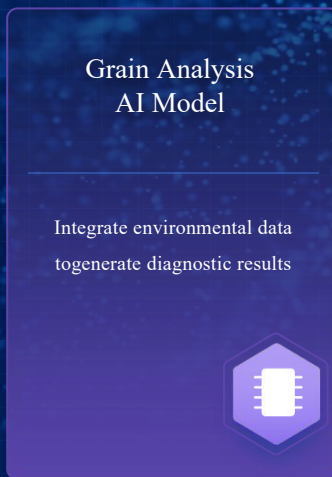
Seedlight Grain Storage AI Model

Key data flow: Pest situation data input analysis model → analysis results input early warning model → early warning results trigger knowledge base call

Combined with the "mechanism + data" dual-driven method and the long-term grain storage practice in seven ecological regions, intuitive cloud map of grain storage situation was quickly generated

Intelligent identification strategy, automatic identification typical characteristic modes to trace or analyze the history, real-time status and dynamic changes in the next 21 days of Grain Storage, and issue Grain storage Hazard forecast and early warning

Intelligent Automation Closed Loop



Corporate Highlights



Broad Market Space

The product is expected to cover 100,000 grain-silos in China within the next 5 years, with a domestic market share of more than **80%** (in the granary robot segment)



Core Technological Barriers

The core technology of the project is 100% self-developed, and a close-circuit patent barrier protection covering hardware architecture, intelligent algorithm and system integration.



Clear business model

Hardware sales combined with annual software licensing fees.
Continuous cash-flow from trusted grain enterprises.



Significant Social Benefits

Solving the practical problems of Chinese National food security is in line with the national strategies



Tier-1 Grain Enterprise Endorsements

Seedlight has signed a strategic cooperation agreement with China Grain Reserves Group, and reached strategic cooperations with leading grain enterprises such as BDH



In line with the "disruptive technology and first set policy" in China

With disruptive product technology and broad market prospects, Seedlight Robot is a typical representative of the deep integration of scientific and technological innovation and the real economy

Business value and market potential

Sustainability

Traditional mode is labor-intensive, with the current global labor shortages, rising costs, safety requirements for the grain industry, intelligent robot offers the sustainable solution to the dilemma.

Efficiency

Grain-leveling
Operation's efficiency is reduced from 3-5 days (intensive labor) to 0.5 days (cluster operation)

Standardized operations

High standardization, after leveling the grain surface height difference is $\leq 15\text{cm}$.



Single-use equipment market: more than 20 billion CNY (\$3 billion USD), annual service fee market: 200 million CNY/year (\$30 million USD)



Business objective: Seedlight plans on deploying more than 100,000 grain silos within the next five years



Global market outlook: Based on the growth trend of smart grain warehouse management system, Internet of Things and automation equipment, the total size of global smart grain warehouse related market is expected to exceed \$10 billion by 2030, with a compound annual growth rate of more than 18% per annum

Government Client

Digital granary model project, policy guided procurement

National Storage System

(China Grain Reserves Corporation directly managed Grain-silos) standard flat grain warehouses and squat silos are the main ones, emphasizing safety and consistency in operations.

Private grain storage/processing enterprises

Focus on cost-benefit ratio, operational efficiency, and personnel substitutability

Typical application scenarios

Suitable for standard flat grain warehouse (30m×60m), squat silos (Φ22m) and other types of warehouse

Based in China, we export advanced storage technologies worldwide and spin off leading LiDar sensors and robotic control technologies to support the automation technology development of major Grain-producing nations globally.

Regional Market Positioning and Strategy

1.European market

Focusing on premium markets such as Grain-producing nations: France and Germany, promoting smart grain-leveling robots compliant with carbon emission standards, highlighting their dust reduction and energy-saving advantages, and connect with local agricultural technology incubators.

2.Regional markets such as APAC (South and Southeastern Asia)

For regions with significant storage gaps such as India and Indonesia, we provide an integrated “equipment + training + operations and maintenance” solution tailored to basic grain storage facility conditions.

3.North American market

Leveraging technical endorsement from our partnership with Sinograin, Seedlight Robot will provide the technical know-how and automation support for major global grain enterprises, emphasizing cluster operation efficiency and cost advantages, bringing automation into North American grain enterprises.





Media Coverage and Industry Events



China's grain bins now

就可以完成1400平米的平房仓平梁任务

Press Releases



Press Releases

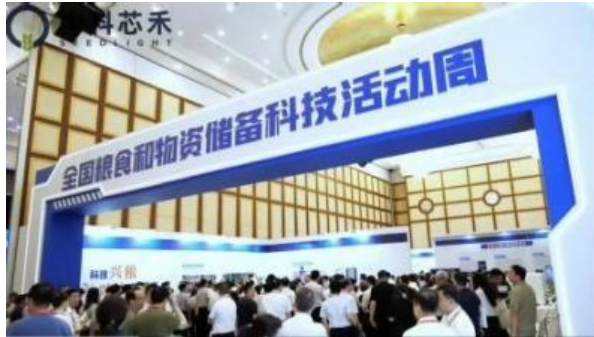


The launch ceremony of the National Science and Technology Activities on Food and Strategic Reserves in Hefei, Anhui province in 2023, 2024 and 2025 was attended by key leaders, industry experts and scholars, reported by CCTV.



The main venue of 2023 National Food and Strategic Reserves Science and Technology Activity in Wenzhou, Zhejiang province was visited by leaders, industry and scholars and reported by central and Zhejiang provincial media and publishings.

Industry Exhibitions



Industry Exhibitions



2024 National Food Trade Conference--Wuhan Hubei Province

Liu Huanxin, Secretary of the Party leadership group and director of the National Food and Strategic Reserves Administration

Liu Xiaonan, a member of the Party leadership group and deputy director of the National Food and Strategic Reserves Administration, attended the conference



2024 Walk into Yunnan, Shandong-- World Food Day Yunnan Provincial Integrated Conference on Storage Technology and Shandong Provincial Red Flag Granary Promotion Meeting

Industry Exhibitions



2024 National Green Grain Storage Work Field Promotion Conference - Zhangjiagang. **Qin Yuyun**, Member of the Party Leadership Group and Deputy Director of the National Food and Strategic Reserves Administration (NAFRA); **Xiao Yanchuan**, Member of the Party Leadership Group of Jiangsu Provincial Development and Reform Commission and Director-General of Jiangsu Provincial Food and Strategic Reserves Administration ; **Zhou Guanhua**, Director of the Department of Safe Storage and Technology of the NAFRA ; and **Xu Gaopeng**, President of the Academy of NAFRA; participated in on-site observation and exchange activities.



Liu Huanxin, Party Secretary and Director of the NAFRA, **Ren Zhufeng**, Standing Committee Member of the Jiangxi Provincial Party Committee and Executive Vice Governor, and **Qin Yuyun**, Director of the Grain Reserve Department of the National Food and Strategic Reserves Administration, **attended the visit and provided guidance.**

2024 National Modern Agricultural Facilities-Digital Technology Exhibition

Industry Exhibitions



Liu Huanxin, Party Secretary and Director of the National Food and Strategic Reserves Administration (NAFRA), attended the 2023 National Field Work Promotion Conference on Grain Saving and Loss Reduction in Binzhou, Shandong Province

Qin Yuyun, Director of the Food Reserve Department of the NAFRA ; **Zhou Guanhua**, Director of the Safe Storage and Technology Department of the NAFRA; **Zeng Zanrong**, Standing Committee member of the Shandong Provincial Party Committee and Executive Vice Governor; and provincial leaders visited and gave guidance



In 2024, the National grain top enterprises visited Hubei series of activities —Hubei Provincial Party Committee Standing Committee member, Executive Vice Governor **Shao Xinyu**, National Food and Strategic Reserves Administration Party leadership group member, Deputy Director **Qian Yi** jointly attended and delivered a speech

Long Xiaohong, member of the Party leadership group and deputy director of Hubei Provincial Development and Reform Commission, secretary of the Party Leadership Group and director of Hubei Provincial Grain Bureau attended and accompanied the visit.

Industry Exhibitions



The 2023 National Food and Strategic Reserves Science and Technology Week saw attendance from prominent officials including **Cong Liang**, Deputy Director-General and Party Leadership Group Member of the National Development and Reform Commission (NDRC) and Director of the National Food and Strategic Reserves Administration (NAFRA); **Fei Gaoyun**, Standing Committee Member of the Anhui Provincial Party Committee and Executive Vice Governor; and **Lu Jingbo**, Deputy Director-General and Party Leadership Group Member of the NAFRA.



Yan Bo, Party secretary of the Academy of National Food and Strategic Reserves Administration (NAFRA) and chief engineer of the NAFRA visited the Beijing Changping base.

Huang Wei, deputy director of the NAFRA, visited the Beijing Changping base.

Yan Bo, Party secretary of the Academy of NAFRA and chief engineer of NAFRA, led a team to investigate the application of the Zhangjiagang Grain Depot project

Seedlight Robot

Shaping the future of Global Granary

Thank you for listening

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