

2024



Muyuan Foods

Green and Low-Carbon Action Report



Muyuan Basic Law

I. Business Purpose:

To produce wholesome foods for society, improve the life quality of all, and serve people's enjoyment in an abundant life.

II. Core Values:

Create value and serve society. Be internally and externally upright to promote social development. External value outweighs internal value; Long-term interests outweigh immediate interests; The value of humans outweighs the value of things; Common value outweighs individual value; Social value outweighs profit value; Customer value outweighs production value.

III. Business Approach:

Create true value with our own strengths, rather than chasing nominal profits.

IV. Business Principles:

Seek to maximize social value without shifting burden, shirking responsibilities, or leaving behind hidden dangers. Take beneficial instead of harmful or rivalrous actions. Stay committed to creating value, unshaken by highs or lows. Expect no fluky profits and never bow for profit's sake. Refuse business bribery and turn away from unearned or ill-gotten gains. Stand firm against speculation, manipulation, or plunder, and never trade integrity for money. Practice strict self-discipline, shoulder responsibilities, and pursue excellence.

V. Employee Benefits:

Bring benefits for employees.

Treat employees as family members, guide their growth, and build a career platform for them fulfilling the value of life.

Bring happiness to every employee and every family in Muyuan.

VI. Customer Benefits:

Help in our customers' successes.

Refrain from giving others what we wouldn't accept and offer what we cherish.

Feel for others and treat others with honesty and sincerity.

Treat customers as siblings and help each other, to embrace fairness, openness, and simplicity, and deliver efficient and shared success.

VII. Social Responsibility:

Put knowledge into action to benefit society. Balance financial returns with ecological and social benefits.

Promote environment-friendly and animal-friendly business practices, develop circular economy, adopt cleaner production, and curb air pollution.

Continuously improve food quality standards.

Act proactively in building industrial ecology and promoting sustainable development.

Actively carry out public welfare undertakings, support education improvement, and fuel social and economic development.

VIII. Long-lasting development:

Adhere to the values and construct a platform for sharing. Keep pace with the times and explore the unknown. Face challenges courageously and surpass our limits. Seek a selfless path to build a long-lasting company.

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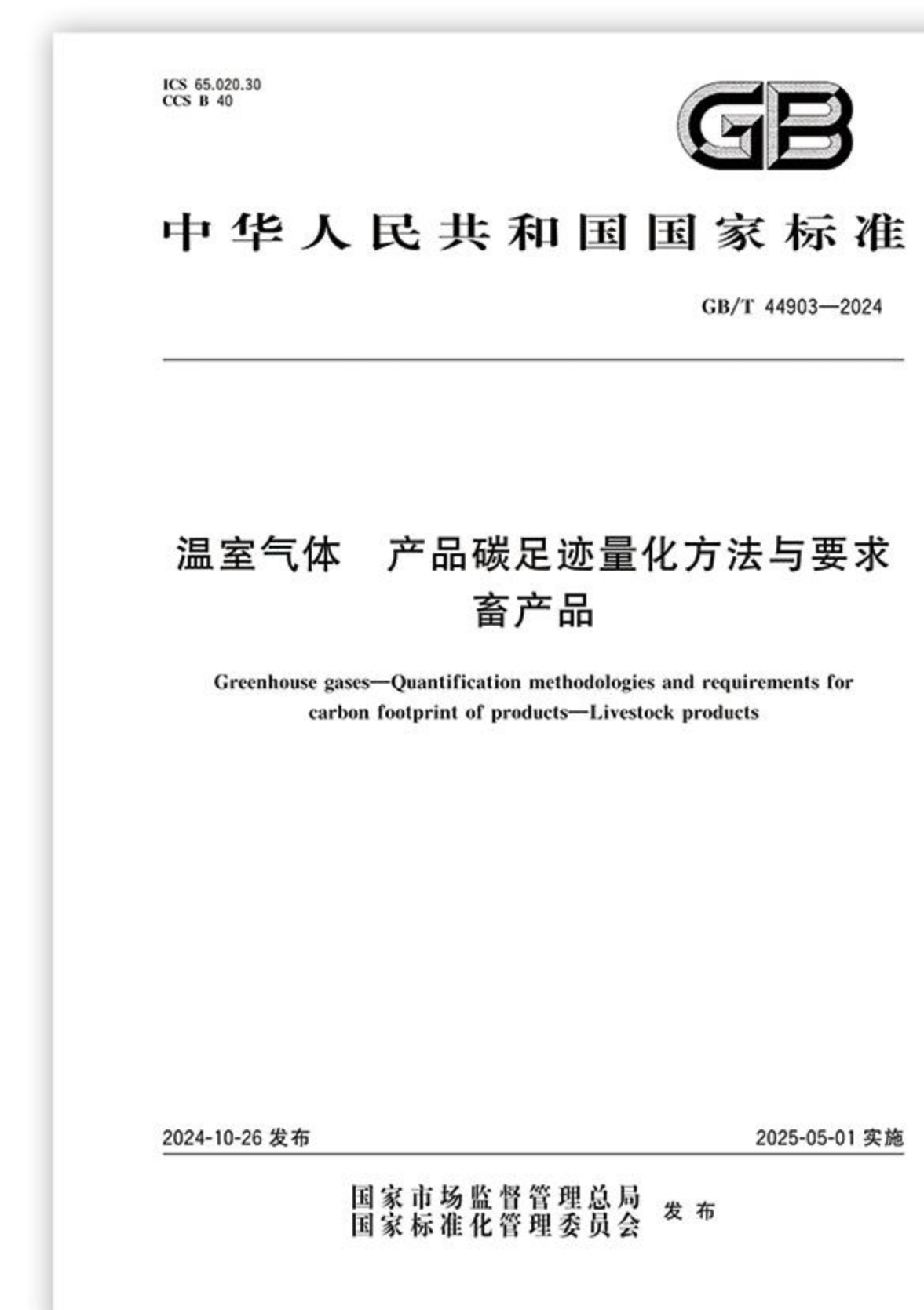


Foreword

Green and low-carbon is the foundation for sustainable development. Muyuan proactively embraces the concept of green development, explores pathways for green and low-carbon development and promotes sustainable transformation of the industry. In 2024, China released the national standard "Greenhouse Gases -- Quantification methodologies and Requirements for Carbon Footprint of Products -- Livestock Products", with Muyuan playing a pivotal role in its formulation. The standard employs the life cycle assessment method and establishes principles and purposes for carbon footprint accounting by providing clear and consistent methods and requirements for quantifying the carbon footprint of livestock products. It outlines the scope, steps, data, methods, and reporting requirements for accounting.

Guided by our corporate vision of "Serving people with wholesome pork for their enjoyment in an abundant life", Muyuan places environmental protection and sustainable development at the core of our corporate strategy. Since 2022, we have released Green and Low-carbon Action Report for three consecutive years. While practicing green initiatives, we actively engage our supply chain partners in collaborative emission reduction efforts to jointly drive green transformation across the industry chain, explore sustainable development opportunities, and strive to foster new quality productive forces for the livestock industry.

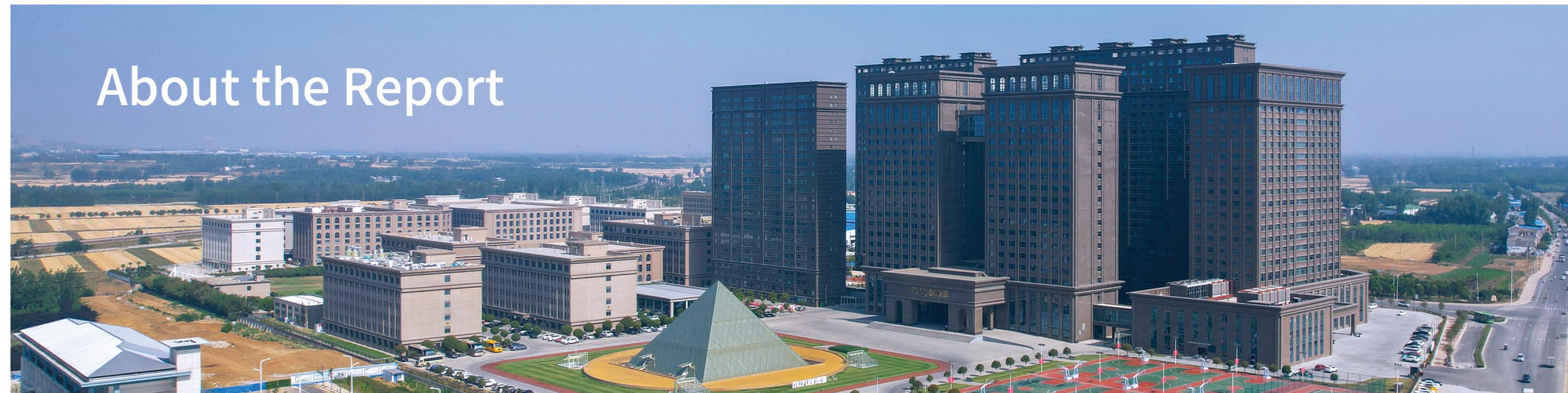
In 2024, Muyuan continues to invest in research and development of clean production technologies, building a "circular economy model in farms" to efficiently convert waste into resources, achieving ecological cycling. Under the integrated crop-livestock model, we promote green agricultural development and contribute to rural revitalization. We are committed to developing low-carbon solutions across the entire lifecycle, optimizing energy use structures throughout the entire industrial chain to reduce greenhouse gas emissions. Through technological innovation and management upgrades, Muyuan is pioneering a sustainable development path that ensures food safety while promoting environmental protection.



Muyuan played a pivotal role in the formulation of the standard. The accounting of this report adhere to the standard, which will officially come into effect on May 1, 2025.



About the Report



Muyuan Foods Co., Ltd. (hereinafter referred to as "Muyuan", "Muyuan Foods", "the Company" or "we") hereby issues the Muyuan Foods Green and Low-Carbon Action Report 2024 to elaborate on Muyuan's goals, actions, and achievements in practicing green and low-carbon meat production.

Scope of Report:

The Report covers all farms operated by Muyuan Foods Co., Ltd. and its subsidiaries. The reporting period spans from January 1, 2024 to December 31, 2024, with some descriptions extending beyond this timeframe.

Standard of Report:

The report is prepared in alignment with internationally recognized greenhouse gas (GHG) emission calculation standards, while reflecting industry-specific characteristics and corporate priorities. Key references include the "Greenhouse Gases -- Quantification methodologies and Requirements for Carbon Footprint of Products -- Livestock Products", the "ISO 14064 International Standard", the "2006 IPCC Guidelines for National Greenhouse Gas Inventories (2019 Refinement)" and the "General Rules for Calculation of the Comprehensive Energy Consumption (GB/T2589-2020)".

Report Availability:

The Report is available online and can be reviewed and downloaded on CNINFO (www.cninfo.com.cn), the official information disclosure platform for listed companies accredited by the China Securities Regulatory Commission ("CSRC"), and the Company's official website (www.muyuanfoods.com)

Notes on the Report's Data:

The data and information contained in this report are all from internally collected data, public documents, green and low-carbon practice cases submitted by subsidiaries and qualitative and quantitative questionnaires prepared for reporting.



Low-carbon Goals and Achievements

Striding Towards 1.5°C

Goals of Low-carbon Management

By 2025

Reduce carbon footprint of 1kg pork by 1.5%

Increase biogas utilization rate to 20%
Add 800 MW of installed PV power generation capacity
Further optimize energy mix, reducing consumption of fossil fuels
Implement soil-testing-based fertilization, expanding service area to 320,000 hectares of farmland

By 2030

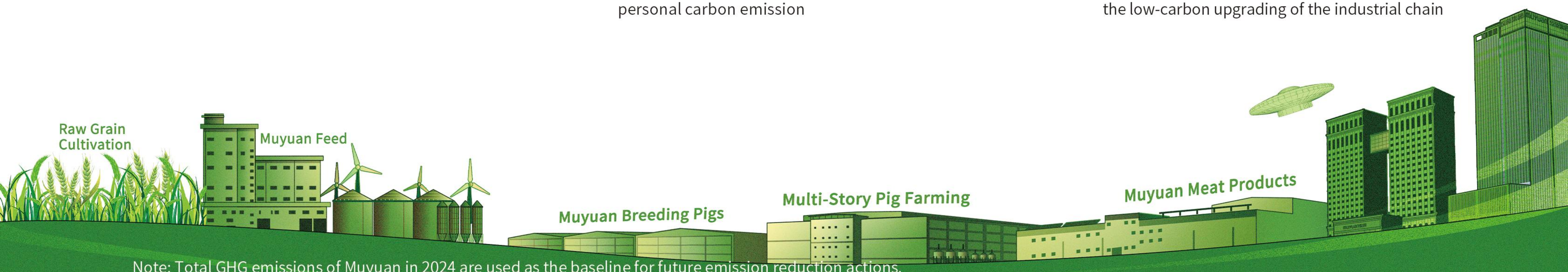
Implement full life-cycle carbon management for pork production
Reduce carbon footprint of 1kg pork by 20%

Increase biogas utilization rate to 60%
Expand PV power generation capacity to over 10 GW
Increase renewable electricity substitution rate to 30%
Enhance manure-based fertilizer use, replacing over 50% of chemical fertilizers
Launch the Muyuan Carbon Management Platform
Introduce individual carbon emission accounting of employees and encourage employees to reduce personal carbon emission

By 2050

The whole society work together to limit the average global temperature increase to 1.5 °C

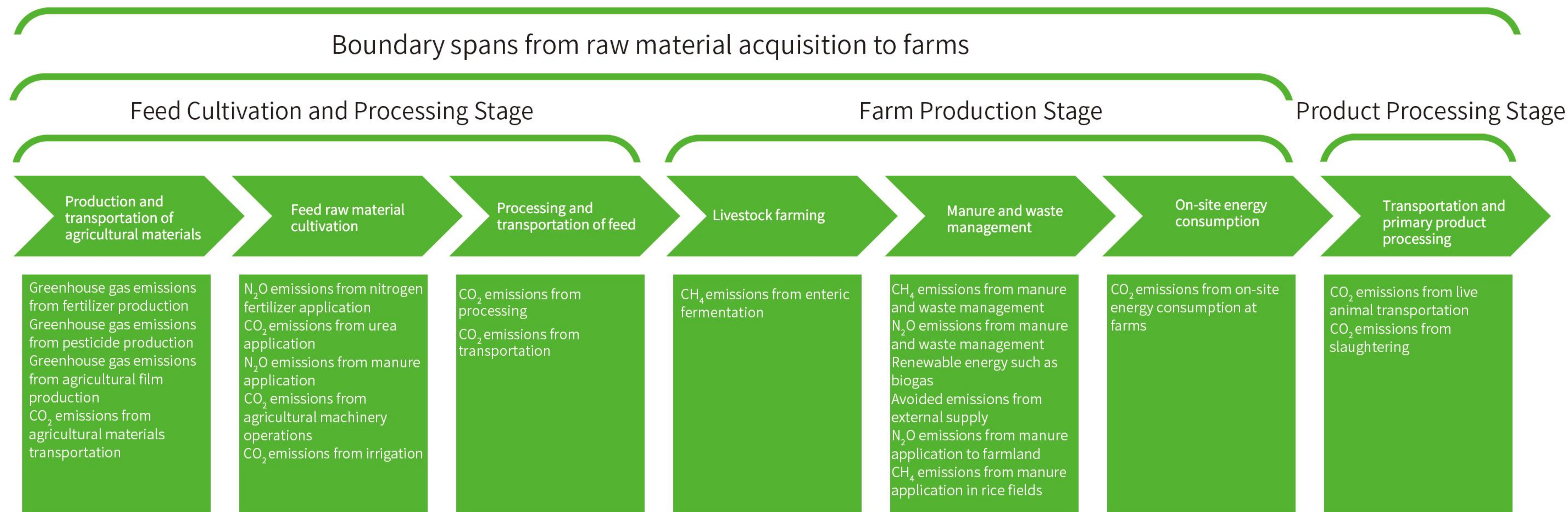
Refine plans for energy saving, carbon emission reduction and sequestration continuously to achieve carbon emission reduction of the highest standard
Carry out carbon emission reduction services in the upstream and downstream of the industrial chain to reduce emissions together
Explore ESG finance and investment to support the low-carbon upgrading of the industrial chain



Note: Total GHG emissions of Muyuan in 2024 are used as the baseline for future emission reduction actions.

Unit Processes, Life Cycle Stages, and System Boundaries for Carbon Footprint Accounting

Boundary spans from raw material acquisition to product processing plants



This inventory covers greenhouse gas emissions within Muyuan's organizational and reporting boundaries for the year 2024, including emissions from various stages such as production and transportation of agricultural materials, feed raw material cultivation, transportation and processing of feed, livestock farming, manure and waste management, on-site energy consumption, product transportation, and slaughtering, encompassing all operational sites.

The GHGs involved in this inventory are: CO₂, CH₄, and N₂O.

Basis:

- ① “Greenhouse Gases -- Quantification methodologies and Requirements for Carbon Footprint of Products -- Livestock Products” (GBT 44903-2024);
- ② “2006 IPCC Guidelines for National Greenhouse Gas Inventories (2019 Refinement)” ;
- ③ “ISO 14064-1:2018 Greenhouse Gases—Part 1: Specification with Guidance at the Organization Level for Quantification and Reporting of Greenhouse Gas Emissions and Removals” ;
- ④ “ISO 14064-3:2019 Greenhouse Gases—Part 3: Specification with Guidance for the Verification and Validation of Greenhouse Gas Statements” ;
- ⑤ “GHG Protocol: Corporate Accounting and Reporting Standard” , as well as other applicable laws, regulations, and related standards.

Explanation of Emission Factors and Data Inventory for Greenhouse Gas Accounting

Explanation of Data Inventory for Lifecycle Emission Factors of Livestock Products		
Data Values	Values	Data Sources
GWP _{N2O}	265	"2006 IPCC Guidelines for National Greenhouse Gas Inventories (2019 Refinement)"
GWP _{CH4}	28	"2006 IPCC Guidelines for National Greenhouse Gas Inventories (2019 Refinement)"
Direct N ₂ O-N Emission Factor from Nitrogen or Manure Application (t N ₂ O-N/t N)	0.01	"Greenhouse Gases -- Quantification methodologies and Requirements for Carbon Footprint of Products -- Livestock Products"
Indirect N ₂ O-N Emission Factor from N Deposition Caused by NH ₃ and NO _x Volatilization [(t N ₂ O-N)/(t NH ₃ -N+NO _x -N)]	0.01	"Greenhouse Gases -- Quantification methodologies and Requirements for Carbon Footprint of Products -- Livestock Products"
Indirect N ₂ O-N Emission Factor from N Loss via Leaching/Runoff [t N ₂ O-N/ (t N leaching and runoff)]	0.011	"Greenhouse Gases -- Quantification methodologies and Requirements for Carbon Footprint of Products -- Livestock Products"
Proportion of N Loss from NH ₃ and NO _x Volatilization Due to Nitrogen Fertilizer Application [(t NH ₃ -N+NO _x -N)/t N applied]	0.11	"Greenhouse Gases -- Quantification methodologies and Requirements for Carbon Footprint of Products -- Livestock Products"
CO ₂ Emission Factor from Urea Application(t C/t Urea)	0.2	"Greenhouse Gases -- Quantification methodologies and Requirements for Carbon Footprint of Products -- Livestock Products"
Electricity Emission Factor (kgCO ₂ e/kWh)	0.6205	"Announcement on the Release of 2023 Electricity Carbon Footprint Factor Data"
Methane Emission Factor from Enteric Fermentation	1.5	"2006 IPCC Guidelines for National Greenhouse Gas Inventories (2019 Refinement)"
Maximum Methane Production Capacity of Manure(m ³ CH ₄ /kg VS)	0.45	"2006 IPCC Guidelines for National Greenhouse Gas Inventories (2019 Refinement)"
Direct N ₂ O Emission Factor from Manure Treatment Systems - Composting(t N ₂ O-N/t N)	0.005	"Greenhouse Gases -- Quantification methodologies and Requirements for Carbon Footprint of Products -- Livestock Products"
Direct N ₂ O Emission Factor from Manure Treatment Systems - Anaerobic Biogas(t N ₂ O-N/t N)	0.0006	"2006 IPCC Guidelines for National Greenhouse Gas Inventories (2019 Refinement)"
Direct N ₂ O Emission Factor from Manure Treatment Systems - Forced Aeration System(t N ₂ O-N/t N)	0.005	"Greenhouse Gases -- Quantification methodologies and Requirements for Carbon Footprint of Products -- Livestock Products"
Proportion of N Loss from NH ₃ and NO _x Volatilization in Manure Treatment Systems - Composting	0.65	"2006 IPCC Guidelines for National Greenhouse Gas Inventories (2019 Refinement)"
Proportion of N Loss from NH ₃ and NO _x Volatilization Due to Nitrogen Fertilizer Application- Anaerobic Biogas	0.05	"2006 IPCC Guidelines for National Greenhouse Gas Inventories (2019 Refinement)"
Explanation of Life Cycle Activity Data Inventory for Livestock Products		
Number of Piglets Sold (10,000 heads)	565.9	Muyuan Data
Number of Breeding Pigs Sold (10,000 heads)	46.5	Muyuan Data
Number of Commercial Pigs Sold (10,000 heads)	6,547.70	Muyuan Data
Feed Consumption (10,000 tonnes)	2,531.90	Muyuan Data
Diesel (L)	115,410,000	Muyuan Data
Fuel Gas(m ³)	137,903,426	Muyuan Data
Electricity Consumption (MWh)	6,985,169	Muyuan Data
Methane Content in Biogas	0.65	Based on Muyuan's Actual Biogas Measurements
Biogas Utilization Volume (10,000 m ³)	3,725	Muyuan Data

A Glance at 2024 Carbon Footprint Performance

Carbon emission for 1kg pork¹:

2024	2023	2022
0.905¹kgCO₂e	0.964kgCO₂e	0.998kgCO₂e

Note 1: For comparability, the accounting standards in this report remain consistent with previous years.

Emission percentages by major segments

37.67%

Feed Cultivation
and Processing



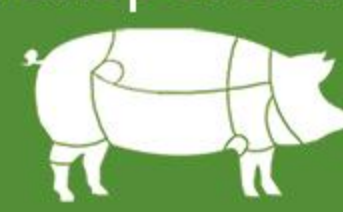
61.80%

Pig Farming



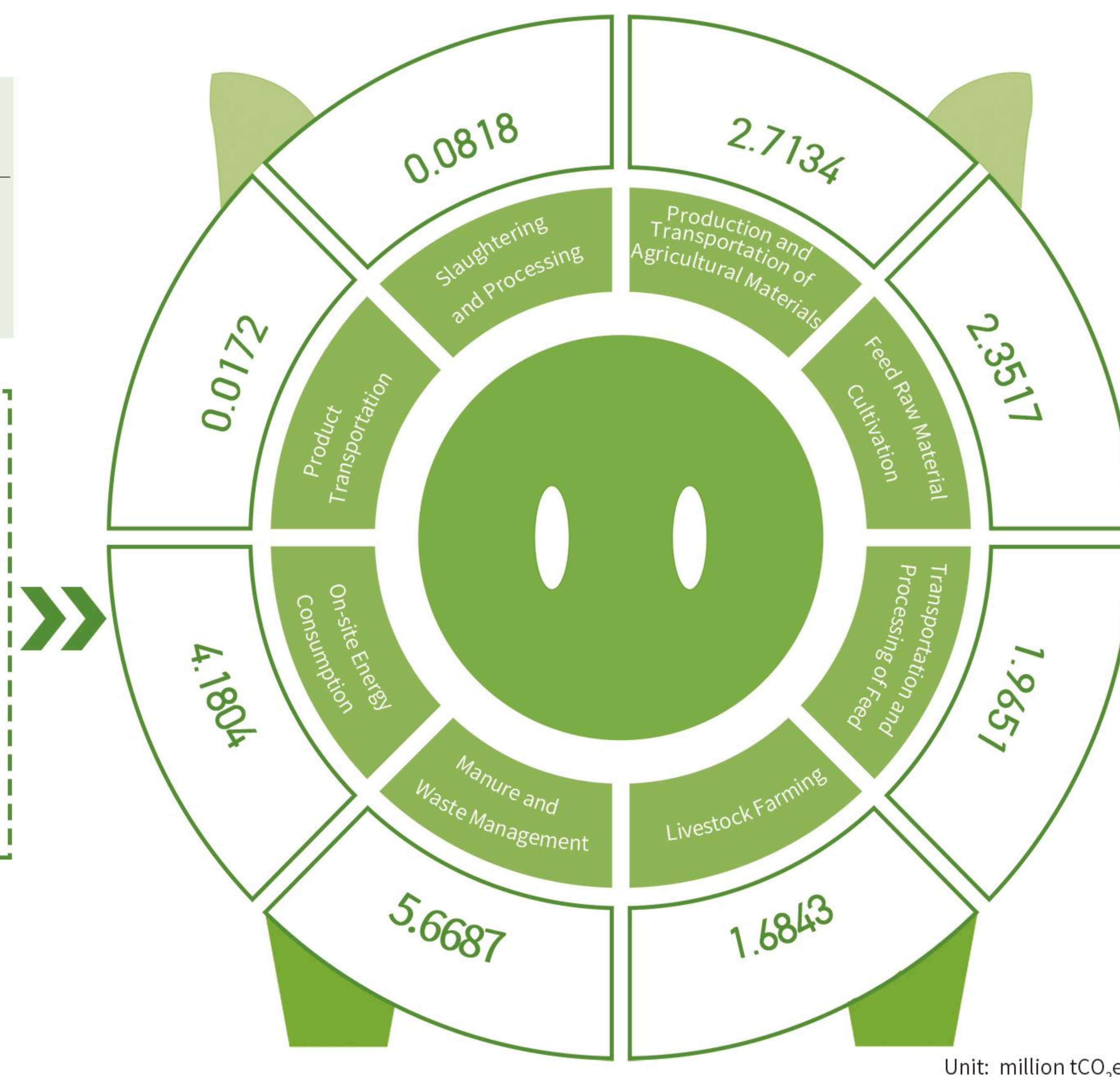
0.53%

Products
Processing and
Transportation



Notes:

- ① Accounting standards have been updated, with expanded scope and boundaries, including additional emission sources such as agricultural material production and transportation, and feed raw material cultivation;
- ② Emission factors are now selected from "Greenhouse Gases -- Quantification methodologies and Requirements for Carbon Footprint of Products -- Livestock Products" and "2006 IPCC Guidelines for National Greenhouse Gas Inventories (2019 Refinement)" instead of previous "2006 IPCC Guidelines for National Greenhouse Gas Inventories";
- ③ Reference for electricity emission factors has been updated from provincial average CO₂ emission factors to the national average electricity carbon footprint factor (0.6205).



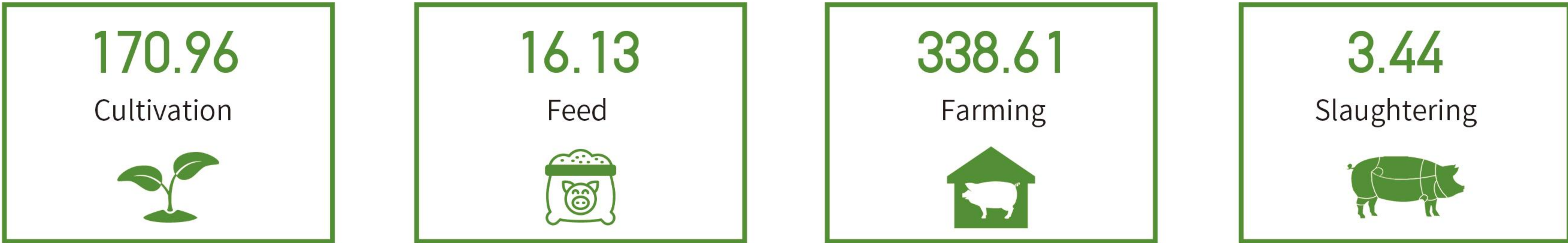
Accounting data is calculated in accordance with the "Greenhouse Gases -- Quantification methodologies and Requirements for Carbon Footprint of Products -- Livestock Products (GBT 44903-2024)". The product carbon footprint accounting boundary includes the Feed Cultivation and Processing Stage, Farming Stage, and Product Processing Stage.

A Glance at 2024 Low-carbon Actions

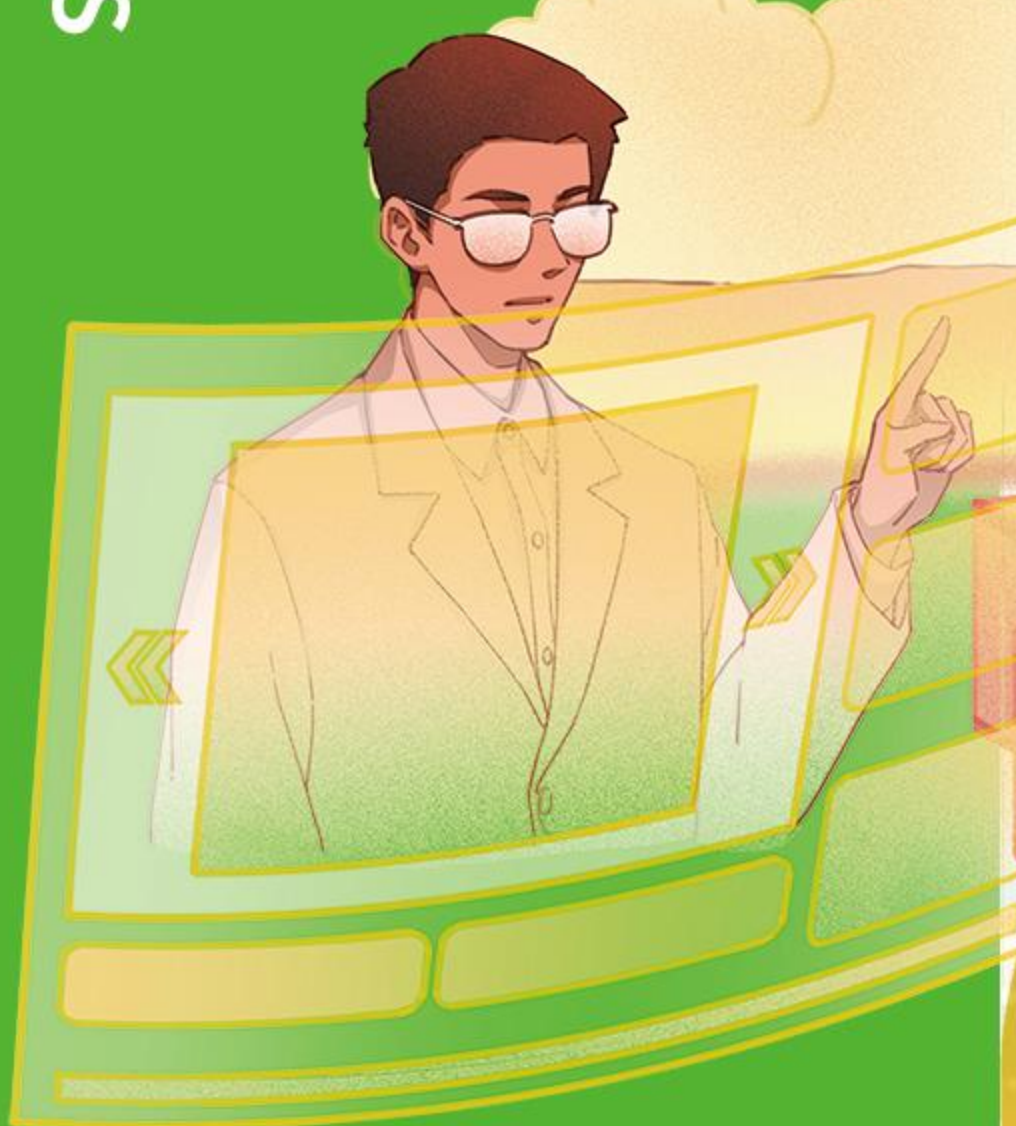
2024 Emission Reduction Highlights



Emission Reduction Value by Business Segments in 2024 (Unit: 10,000 tCO₂e)



Measures to Achieve Green and Low-Carbon Goals Muyuan's Actions



Green Procurement and Low-Carbon Feed

161.3

thousand tCO₂e

Reduction of GHG Emissions

83

thousand tonnes

Total Nitrogen Emission Reduction

1.26

kg

Nitrogen Emission Reduction per Pig

143

Million CNY

R&D Investment

100.7

thousand tCO₂e

Reduction through Feed Bulk Transportation

2,797

tCO₂e

Reduction through Soybean Meal Bulk Transportation

30

thousand tCO₂e

Reduction from Multimodal Transportation

Collaborative Innovation to Aid Precision Farming and Intelligent Technology to Drive Green Development

Collaborating with Westlake University, Muyuan has established Henan Muyuan Anliang Synthetic Biotechnology Co., Ltd., which has improved amino acid production efficiency by 30% and significantly reduced soybean meal usage. With near-infrared technology and smart terminals, feed formulas are precisely adjusted, reducing feed conversion ratios and enhancing grain conversion efficiency. With 387 technical staff and a comprehensive nutrition R&D and operational application system to ensure the implementation of precise nutrition, it continuously upgrades the intelligent equipment and enhances the automation of feeding management to ensure efficient feed utilization.

Deepening Local Procurement and Low-Carbon Transportation to Practice Sustainable Development

In 2024, 81.40% of Muyuan's raw grain was procured locally. Multimodal transport accounted for 20% of raw grain transportation, reducing road transport by 1.0537 million tonnes and greenhouse gas emissions by 30 thousand tCO₂e. Bulk transport of soybean meal accounted for 92%, reducing greenhouse gas emissions by 2,797 tCO₂e. Through local procurement and optimized transportation solutions, feed raw material transportation emissions are reduced, and suppliers join the efforts to address deforestation risks associated with soybeans, promoting green and sustainable development.



Photovoltaic Power Generation

Muyuan actively responds to the national sustainable development strategy, fully utilizing roof space to develop a "livestock-photovoltaic complementarity" model.

Through photovoltaic power generation on pig barn and slaughterhouse roofs, the proportion of green energy use is significantly increased, traditional energy consumption is reduced, while carbon emissions in production processes decreased and green and low-carbon upgrades in the pig farming industry promoted.



589.88^{MW}

Cumulative Installed Capacity as of 2024

380.99^{MW}

Newly installed capacity of photovoltaic (PV) power generation in 2024

205^{Million kWh}

Cumulative Electricity Generated in 2024

108.4^{thousand tCO₂e}

GHG Emission Reduction



Case Study: Integrated Smart Management of Photovoltaic-Storage Microgrid



In 2024, the photovoltaic installed capacity on the roofs of pig barns at Pingyu Muyuan Farm 5 reached 5.8 MW, including a new 700 kW/1505 kWh energy storage station, generating about 5.8 million kWh of electricity annually, reducing greenhouse gas emissions by 3,574.22 tCO₂e. The annual average charging and discharging volume of the energy storage system is about 1 million kWh, and the system's energy conversion efficiency is increased to 87%, with the green electricity usage rate in the farm area rising from 40% to 70%.



Comprehensive Management of Photovoltaic and Energy Storage Systems

Energy Flow Management : The overall system design ensures that photovoltaic power generation prioritizes supplying the pig farm's load and charging demands, with excess energy stored in the energy storage system. During nighttime or when photovoltaic power is insufficient, the energy storage system supplies power to charging stations, so the load-side control shifts from rigidity to flexibility.

Information Flow Management : An energy monitoring system is deployed to monitor the operational status of each component in real-time, enabling remote monitoring and fault alarming.

Grid Connection/Disconnection Switching : The system has the capability to switch between grid-connected and off-grid modes. When the main grid fails, the microgrid can operate independently, ensuring basic charging services and power supply for critical loads.

Safety Protection : Multiple protection measures are integrated, including overload protection, short-circuit protection, and battery thermal management, to ensure the safe operation of the system.

Biogas Utilization

Case Study



The biogas produced by Wolong Muyuan Farm 3 undergoes dehydration, desulfurization, and other treatments before entering the biogas pipeline sent to the feed mill's boiler, where it is combusted in place of natural gas. This project has achieved resource reuse, reduced dependence on natural gas and lowered fuel costs. In 2024, the biogas utilization volume at this site increased by 82% compared to the previous year, reducing carbon emissions by 841.91 tCO₂e.

Year	Utilization Volume (m ³)	Standard Coal Replaced (tonnes)
2023	360,226	301
2024	655,208	548

Biogas Utilization in the Past Two Years



Innovation in Methods to Return Water and Fertilizer to Field

In 2024, Muyuan innovatively applied drip irrigation, pole-mounted spray irrigation, hose reel irrigators, ground-inserted spray irrigation, and two-hole micro-spray irrigation for returning water and fertilizer to the field. Drip irrigation technology provides precise and efficient water and fertilizer utilization solutions for crops. Pole-mounted spray irrigation demonstrates good ecological adaptability in large-scale wheat fields and other scenarios. Hose reel irrigators and ground-inserted spray irrigation cater to flat land and hilly terrains, respectively, meeting the needs of water and fertilizer utilization under different topographic conditions. Two-hole micro-spray irrigation is suitable for woodland, enhancing the sustainability of precision irrigation. The promotion and application of these technologies have not only effectively improved the efficiency of agricultural water and fertilizer use, reduced waste of resources and soil degradation risks, but also laid the foundation for the long-term health management of farmland ecosystems.

5

Innovative Water and Fertilizer
Utilization Methods

66,033 hectares

Farmland Applied

Low-carbon Achievements of Field Return Innovation

Efficient Utilization of Resources

Delivering water and fertilizer directly to the crop roots enhances the utilization efficiency and reduces water evaporation and nutrient loss. This meets the needs of crops at different growth stages, decreases chemical fertilizer use, promotes crop growth, and increases both yield and quality.

Fertility Enhancement

Soil structure is improved, soil fertility is enhanced, soil nutrients are replenished, and the reproduction and activity of soil microorganisms are promoted, thereby strengthening the soil's water and fertilizer retention capacity. Chemical fertilizer pollution to the soil is reduced, soil organic matter content is increased, and soil carbon sequestration capacity is improved.

Reduction of Environ- mental Pollution

The use of chemical fertilizers and pesticides is reduced, significantly lowering the negative environmental impact of agricultural activities. Additionally, it helps reduce greenhouse gas emissions and promotes sustainable agricultural development.

30.38%

Reduction in N₂O Emissions

40.67%

Reduction in Ammonia
Emissions

Manure Drip Irrigation
Technology for Field Return



Building a Circular Economy Model: “Pigs Nourish Croplands, Croplands Nourish Pigs”

We have strengthened the integrated application of livestock manure return-to-field utilization, creating a circular economy within each farm, and building a circular economy model of "pigs nourish croplands, croplands nourish pigs" to promote green and low-carbon sustainable development in the livestock industry.

In 2024, we actively carried out agricultural demonstration projects covering a total of 10,340 hectares and, in collaboration with the National Animal Husbandry Service Station, established eight Green and Low-carbon Crop-livestock Cycle Integrated Bases to explore manure return-to-field parameters in different regions, reduce ammonia and carbon emissions in manure application, fully utilize manure resources to replace chemical fertilizers, enhance soil fertility, promote sustainable agricultural development, help farmers reduce inputs and increase income, and drive rural revitalization.

Based on these eight Bases, long-term monitoring points for manure processing and utilization emission reduction and carbon sequestration effects have been established. Monitoring of carbon and nitrogen emissions is conducted across the entire chain from livestock farming, manure collection and processing, to manure application. The emission reduction and carbon sequestration effects of green and low-carbon crop-livestock integrated cycle in different regions and types are concluded. Green and low-carbon accounting methods and technical specifications are developed, forming a scientific green and low-carbon evaluation system to provide technical support for green and low-carbon development in livestock farming.

Exploring More Efficient Resource Utilization to Build Green Crop-livestock Cycle Integrated Bases



314,720 hectares
Manure Application Area

14,482
Villages Served

282 thousand
Farmers Trained

4,714.95 CNY/hectares
Inputs Reduced and
Income Increased for Farmers

21,213 hectares
Saline-alkali
Land Improved

6,047 hectares
Desertification Treated

1.4474 Million tCO₂e
Total Soil Carbon Sequestration

20.57 kgCO₂e
Soil Carbon Sequestration
Per Pig Produced

Chemical fertilizer reduction of 154.6 thousand tonnes,
equivalent to a GHG emission reduction of 128.6 thousand tCO₂e

Green Meat Processing Plants

In 2024, a total of **34.4** thousand tCO₂e of greenhouse gas emissions were reduced

Carbon emission for producing 1kg pork: **0.0664**kgCO₂e

37.5063 Million kWh of Photovoltaic Power Generation

23.4 thousand tCO₂e Carbon Emissions Reduced

119.2 thousand GJ of Waste Heat Recovery

Reducing Carbon Emissions by **11** thousand tCO₂e

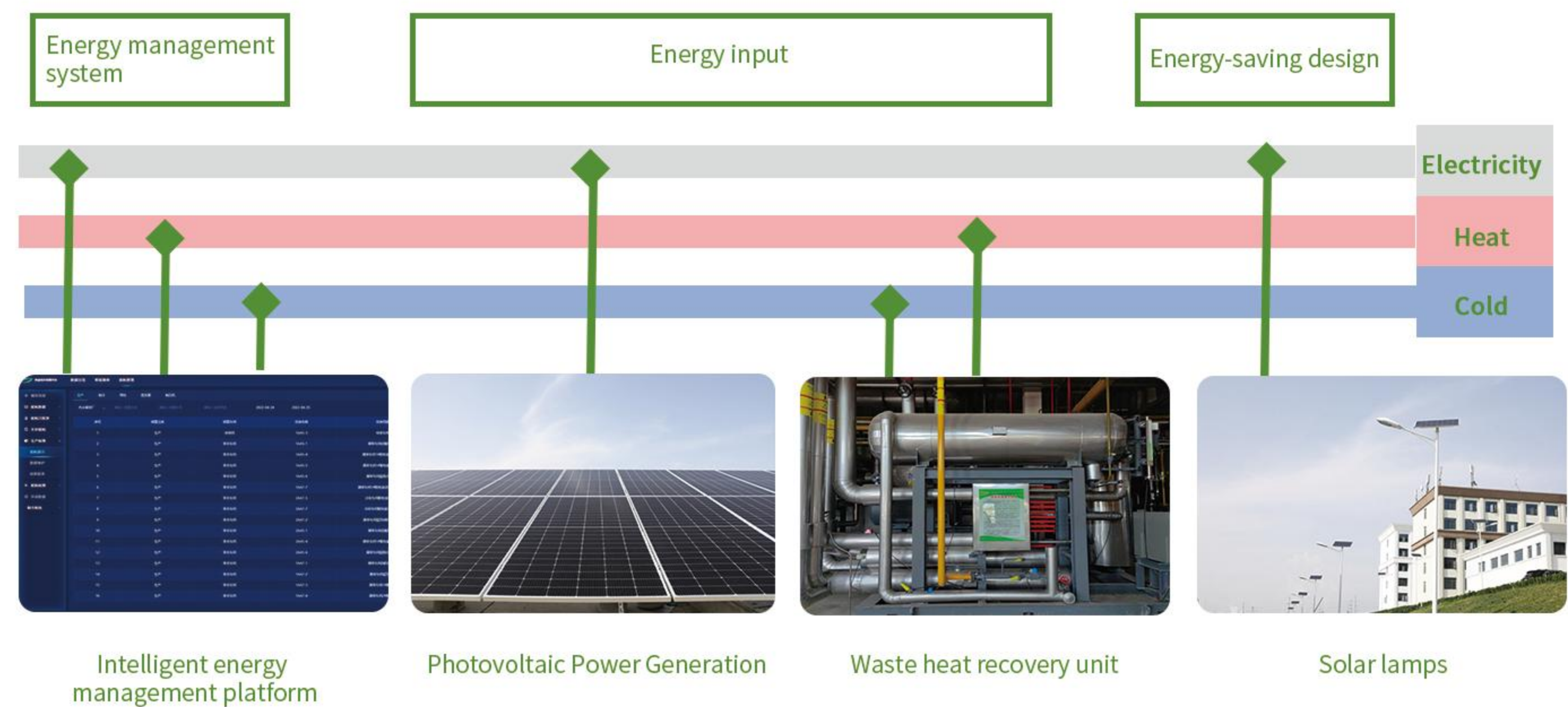
50 Tonnes of Green Packaging Used
Reduction in Plastic Packaging Usage Compared to Products of the Same Specification

726.8 thousand m³ of Water Reuse
Promoting Efficient Water Resource Recycling

Environmental Protection Investment: **61.4977** Million CNY

Energy-saving Renovation Investment: **53.6462** Million CNY

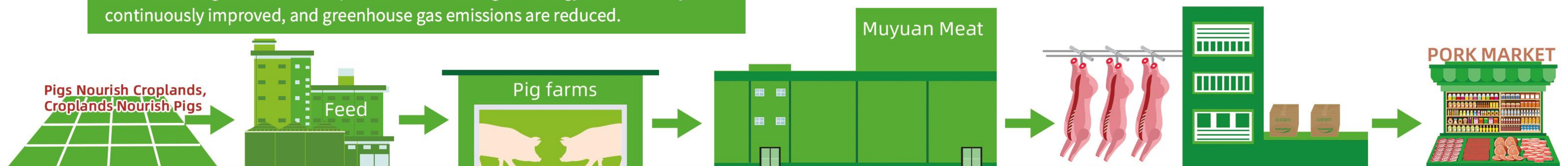
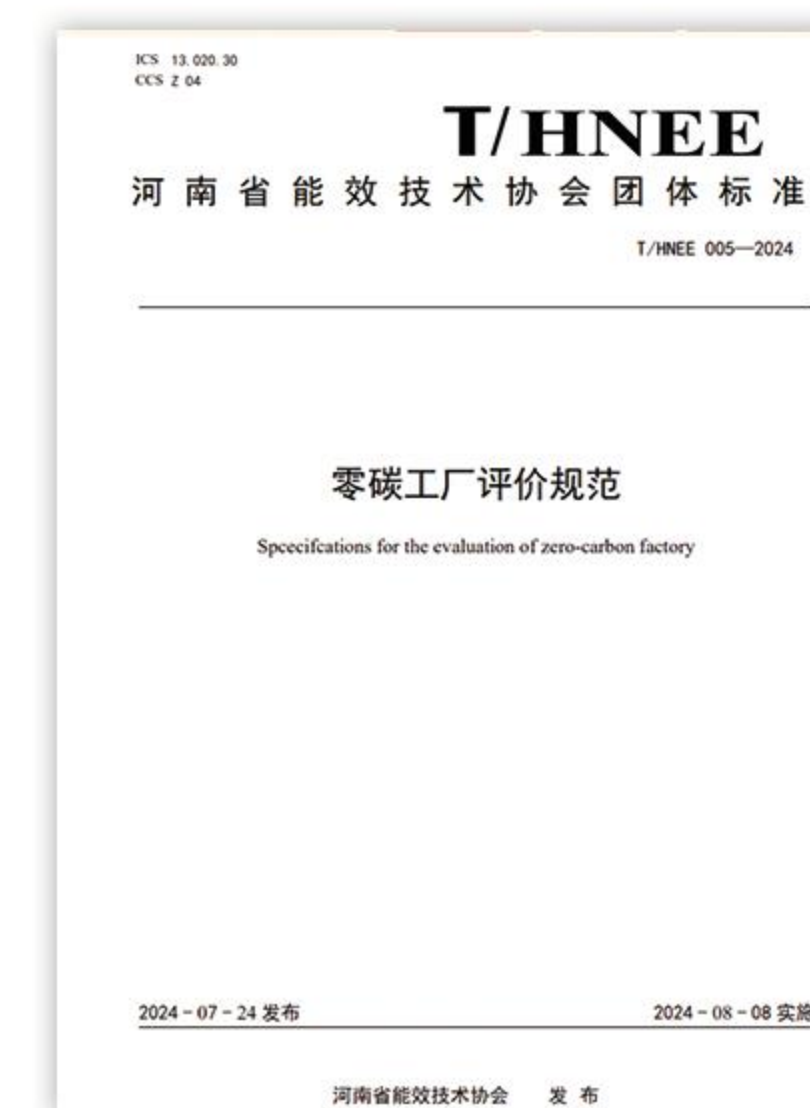
In the pork production process, by establishing an energy management system and innovating environmental protection technologies, energy use efficiency is continuously improved, and greenhouse gas emissions are reduced.



Muyuan Meat Co., Ltd. has so far established

- 1 National-level Green Factory
- 3 Provincial-level Green Factories

It has participated in the formulation of the group standard "Specifications for the Evaluation of Zero-Carbon Factories" by the Henan Energy Efficiency Technology Association, establishing unified standards to promote the green and low-carbon process.





Implementing Low-carbon Actions
Across the Entire Value Chain

Forging Ahead

Collaboration of Industry and Research Institutes for Making Breakthroughs in Core Technologies

■ Participation in National Key R&D Projects

Research and Demonstration of Collaborative Reduction Technologies for Greenhouse Gases and Ammonia Emissions in Pig Farming

In collaboration with the Institute of Environment and Sustainable Development in Agriculture of the Chinese Academy of Agricultural Sciences (IEDA·CAAS), we are studying the impact of manure management and ventilation on greenhouse gas and ammonia emissions in pig barns. We aim to establish a demonstration site for collaborative reduction technologies for greenhouse gases and ammonia emissions across the entire pig farming chain and conduct assessments of reduction effects.

Integrated Treatment of Atmospheric, Soil, and Groundwater Pollution

In partnership with Zhengzhou University, we are researching the integrated demonstration of ammonia reduction technologies in large-scale farming operations and evaluating the effectiveness of ammonia reduction technologies in agriculture and animal husbandry. These efforts aim to address ammonia reduction issues in livestock and poultry farming and provide scientific evidence for formulating relevant standards and technical guidelines.

■ Intergovernmental International Science and Technology Innovation Cooperation Project

Achievements of the project "Research and Demonstration of Collaborative Reduction Technologies for Greenhouse Gases and Ammonia Emissions in Pig Farming":

1. On-site monitoring to determine characteristic parameters of greenhouse gas and ammonia emissions in pig barns.
2. Development of robotic automatic manure removal technology for emission reduction.
3. Establishment of a demonstration site for collaborative reduction technologies for greenhouse gases and ammonia emissions across the entire pig farming chain.



Muyuan, in collaboration with the Nanjing Institute of Environmental Sciences of the MEE, Nantong University, Beijing University of Technology, and the Institute of Environment and Sustainable Development in Agriculture of the CAAS, jointly developed the project "Key Technological System and Application for Accounting and Control of Ammonia Emissions in Livestock and Poultry Farming". This project won the Second Prize for Scientific and Technological Progress at the 2024 Environmental Protection Science and Technology Awards.

■ Collaboration with Westlake University on Greenhouse Gas Emission Factor Monitoring

Measurements of typical atmospheric pollutants and greenhouse gas emissions from various stages such as pig farming and manure management have been conducted. Based on these measurements, a factor database and carbon emission accounting methods will be established, providing important theoretical and tool support for collaborative governance of pollution and carbon reduction in the livestock industry. This will further support the implementation of the national "Implementation Plan for Establishing a Carbon Footprint Management System".



Westlake University - Muyuan Joint Research Institute

Sharing Technology for Common Improvement

Co-creation and Sharing Advocating Green Development in the Industry, Illuminating the Path for the Industry

The National Animal Husbandry Service Station has established five green technology service mobile stations for the animal husbandry industry. As the deputy director unit of the Neixiang mobile station, Muyuan actively promotes the work of the green and low-carbon technology service mobile station for the animal husbandry industry, disseminates green and low-carbon technologies, and supports regional development.



The Neixiang Green and Low-Carbon Technology Service Mobile Station Pilot Work Exchange and Discussion Meeting was held in Nanyang to summarize and exchange progress in the pilot work of the mobile station and discuss and study the implementation plan for the baseline survey.



From April 19 to 20, a survey was conducted at the Neixiang Animal Husbandry Green and Low-Carbon Technology Service Mobile Station.

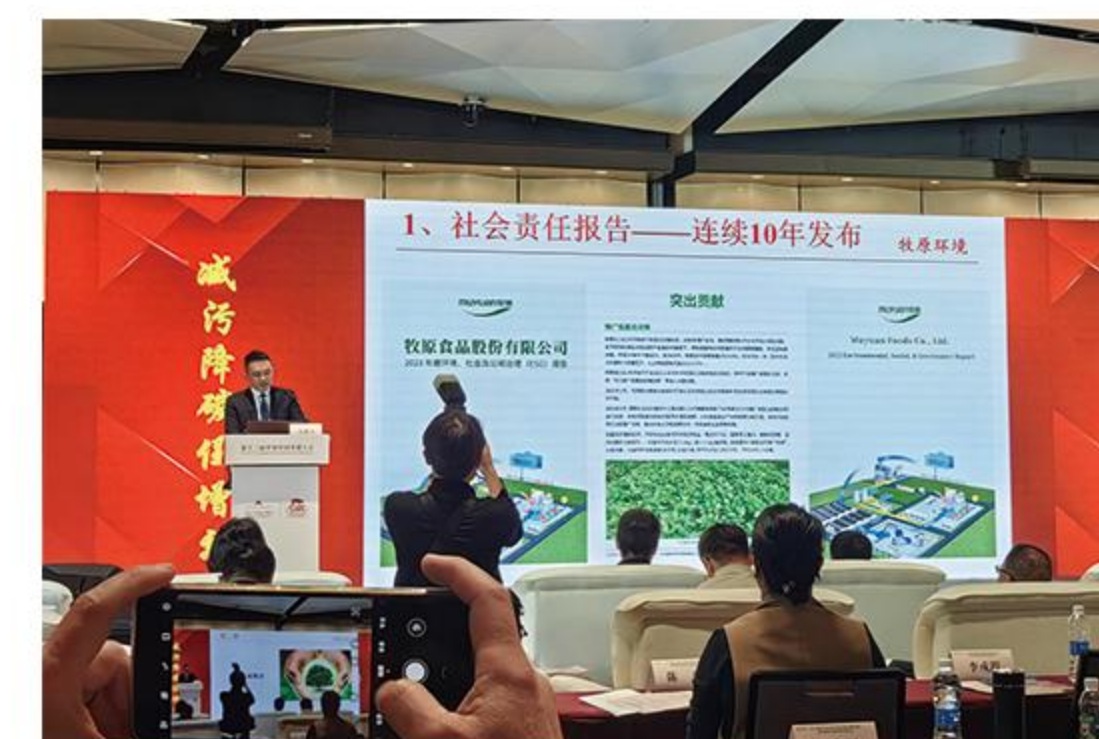
The Neixiang station adopted a combination of on-site visits and discussion meetings to complete on-site surveys of the green and low-carbon status of several small and medium-sized farms and growers (specialized cooperatives) in Neixiang County related to animal husbandry.

In the "China Agricultural and Rural Low-Carbon Development Report", Muyuan shared technologies and methods in energy conservation and emission reduction, new energy development and utilization, resource recycling, and low-carbon management and operation across the entire pork food industry chain. It provided replicable and scalable typical cases, exerting a significant demonstration effect and boosting the industry's development.



In May 2024, the China Agricultural and Rural Low-Carbon Development Report Release Conference and the 17th Agricultural Environment Academic Seminar were held in Beijing.

At the "First Exchange Meeting on Deodorization Technologies and Applications in Livestock and Poultry Farming", Muyuan shared its "Practice of Ammonia Reduction and Deodorization", discussing efficient odor elimination technologies and the latest technical achievements and experiences. The aim is to enhance the level of ammonia reduction and deodorization in farming and promote sustainable development in the livestock industry.



At the "Second Conference on Green and Low-Carbon High-Quality Development of the Animal Husbandry Industry", Muyuan delivered a report on the theme of "Reducing Pollution, Lowering Carbon, and Enhancing Efficiency", sharing the results of carbon emission accounting and reduction practices across the entire pig farming chain, as well as achievements in green and sustainable development.

Sharing Technology for Common Improvement

Industrialized Ammonia Reduction and Deodorization Services Driving Industry Upgrades

Muyuan actively promotes industrialized ammonia reduction and deodorization services, effectively improving the environment around farming facilities, enhancing air quality, and building a better corporate image. It further optimizes the environment inside barns, improving livestock and poultry production efficiency. By addressing the issue of odor disturbance, community harmony is promoted. Muyuan's successful practices provide a demonstration for environmental upgrades in the industry, driving the livestock industry towards environmentally friendly, efficient production, and harmonious coexistence with communities.

Environmental Improvement

Effectively addressing odor issues around farming facilities, improving local air quality, and reducing the impact on nearby residents' lives, which helps enhance corporate image and social recognition.

Efficiency Enhancement

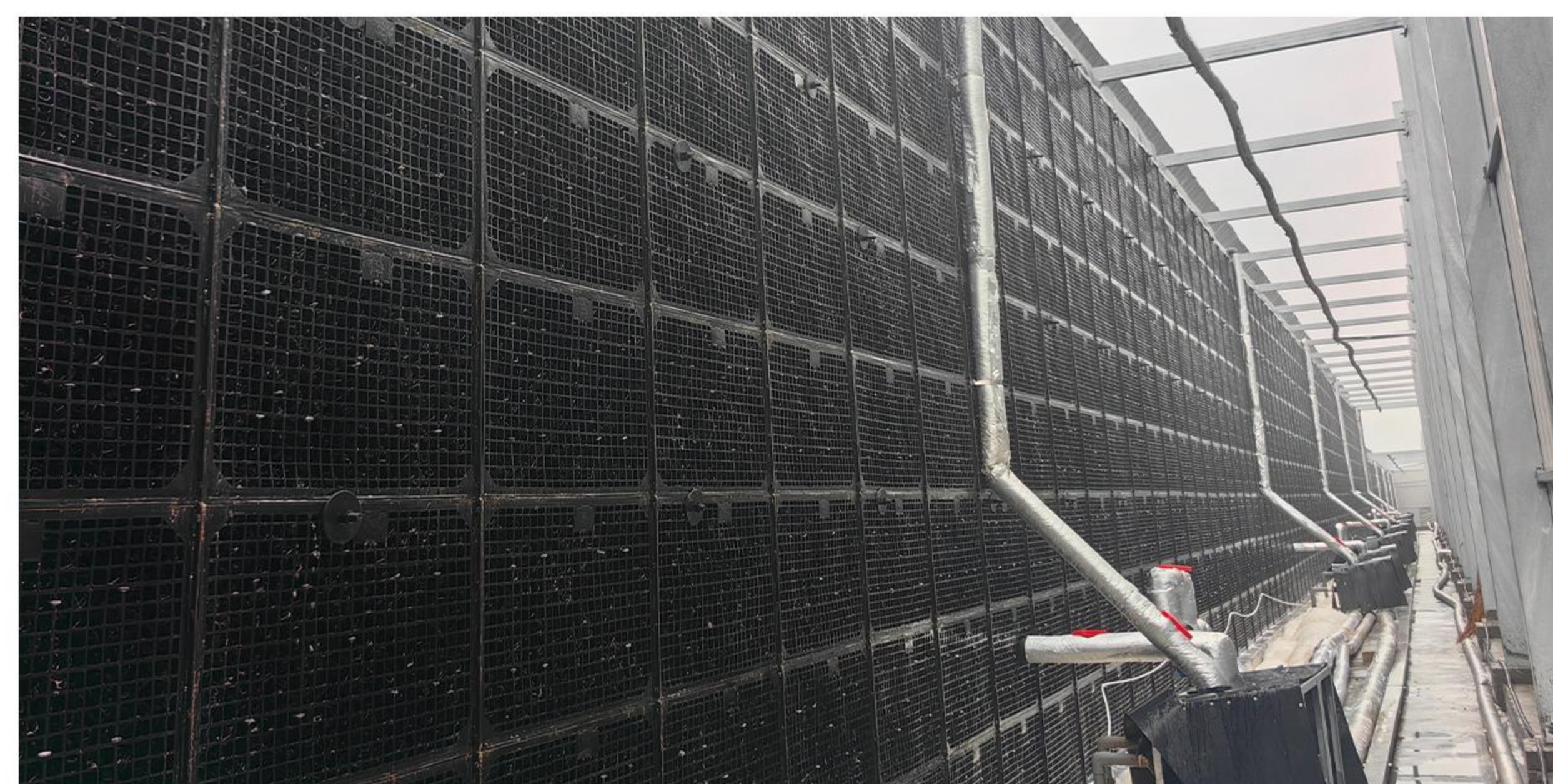
The installation of the sterilization and deodorization system not only solves the odor problem but also improves the environment inside barns, reduces disease incidence, and enhances the health and growth efficiency of livestock and poultry, indirectly improving production efficiency.

Community Harmony

By addressing the issue of odor disturbance, harmonious coexistence between enterprises and surrounding communities is promoted, which is conducive to the long-term development of enterprises and social stability.

Exemplary Leadership

Through the promotion of sterilization and deodorization systems, Muyuan provides successful environmental rectification cases for other livestock farming enterprises, contributing to the environmental upgrade and sustainable development of the entire industry.



Case Sharing

In October 2024, Muyuan developed an ammonia reduction and deodorization plan for the Yuexi Chicken project, achieving:

- ① Corporate satisfaction – smooth operations
- ② Public satisfaction – no odor, no disturbance
- ③ Government satisfaction – harmonious village-enterprise relations

Fully Implementing Green and Low-Carbon Practices

Muyuan actively practices the ESG concept, building a green, environmentally friendly, and low-carbon sustainable office environment. Starting with green office practices, we promote paperless management, process optimization, and the application of energy-saving equipment, encouraging employees to adopt energy-saving habits. In terms of green living, we advocate for low-carbon consumption, reduce the use of disposable products, practice waste sorting and the "clean plate campaign", and enhance environmental awareness. For green travel, we encourage the use of public transportation and new energy vehicles, promoting carbon emission reduction. Through a series of low-carbon initiatives, we integrate the concept of green development into corporate operations and employee behavior, jointly building a sustainable future.

Green office

Muyuan promoted the replacement of paper-based signatures with electronic seals. In 2024, 374.8 thousand electronic seals were used, resulting in a total emission reduction of 65.59 tCO₂e. Muyuan was honored with the "2024 Corporate Pioneer in 'Carbon Reduction through e-Signature'" title.

Note: calculation is based on the carbon reduction calculation model co-developed by Fadada, China Beijing Green Exchange, and Enterprise Green Development Research Institute.

374.8 thousand Electronically Sealed Contracts
65.59 tCO₂e Total Emission Reduction



It also implemented the paperless office, fully adopting online submission of logs and intelligent form filling, which significantly reduced the consumption of paper. It actively used online methods such as video conferencing and teleconference for system training and business communication, which significantly reduced carbon emissions from transportation and the consumption of meeting supplies.

80.7 thousand tCO₂e Cumulative Emission Reduction by the End of 2024

Note: The carbon reduction data is measured and certified by China Beijing Green Exchange.

Green Life

At its headquarter in Nanyang, a photovoltaic power generation system has been installed on the roof of the office building to promote the widespread use of green electricity within the park. As of the reporting period, the installed capacity at the headquarter has reached 1.49MW, with an annual power generation of 1.8734 million kWh and self-consumption of 1.7824 million kWh, accounting for 95.14% of total generation.

95.14%
PV Power Self-Sufficiency Rate

1.7824 million kWh
Self-Consumption Power



Muyuan Group has included the implementation of "clean plate campaign" into its "Employee Code of Conduct". The code requires that all employees should actively follow the requirements of the "clean plate campaign", practice thrift and oppose waste, no matter in internal or external business activities (such as going out for investigation and reception). We established a joint assessment mechanism for diners - catering service attendants - chiefs, and built a chat group of "clean plate" for transparent management.



"Clean plate campaign"
reducing carbon emissions by an average of 39 g/meal

Data source: Carbon Generalized System of Preferences Platform, Green Partnership of Industrial Parks in China

Fully Implementing Green and Low-Carbon Practices

Green activities

In 2024, Muyuan not only successfully held zero-carbon conferences, achieving carbon neutrality for its own events, but also actively assisted multiple external events in moving towards carbon neutrality, fulfilling its responsibility and commitment to environmental protection. Furthermore, it widely disseminated the concept of green and low-carbon living in society, joining hands with various sectors to accelerate the transition towards a greener and low-carbon future.



Expanding dual carbon services to assist the 2024 Suzhou Jinji Lake Half Marathon in achieving carbon neutrality, with a carbon offset of 1,450 tCO₂e.

Note: This event has neutralized part of its greenhouse gas emissions through carbon credits issued by the Gold Standard (GS) for Chinese projects..



“Zero-Carbon Conferences”

The total greenhouse gas emissions during the preparation, execution, and conclusion stages of this conference amounted to 14.231 tCO₂e, achieving carbon neutrality on December 8, 2024.

Note: Based on the guidelines from the "Guidelines for Carbon Neutrality in Large-Scale Events (Trial)" issued by the Ministry of Ecology and Environment in 2019, this event has neutralized its greenhouse gas emissions through carbon credits issued by the Gold Standard (GS) for Chinese projects.



World Agrifood Innovation Conference – Beijing • China

At the 2024 World Agrifood Innovation Conference (WAFI) – Agrifood Industry Entrepreneurs Summit, Muyuan shared innovations in pig farming and green, low-carbon practices, aiming to reduce resource consumption, lower carbon emissions, and produce higher-quality pork with fewer resources.

Leading Green and Low-Carbon

Muyuan always adheres to the business precept of "Respect nature and love people; take actions according to the natural law," regarding the harmonious coexistence of humans and nature as the core principle of our development. We firmly believe that green and low-carbon development is not only an inevitable trend of the times but also a significant driving force for promoting high-quality social development.

Achieving Clean Production, Creating a Model of Circular Economy

Muyuan delves into technological innovation, driving clean production through science and technology, significantly reducing resource consumption and environmental impact in the pork production process. We propose the concept that "a farm is a circular economy entity". Waste has been efficiently converted into resources and returned to the ecological cycle. Relying on the integrated crop-livestock model, Muyuan integrates green development into agriculture and rural areas, helping farmers increase their income and creating the "Muyuan Model" for high-quality and green agricultural development.

Promoting Industrial Synergy, Empowering the Green Upgrade of the Industry

Adhering to the philosophy of "building an industrial ecosystem together and creating a commercial civilization," Muyuan collaborates with upstream and downstream partners to jointly promote the green transformation of the industry chain. We are willing to share technology, resources, and carbon reduction strategies, not only enhancing our own processes but also injecting green development momentum into the industry. Through lifecycle low-carbon solutions, Muyuan contributes to promoting a broader green transformation.

Embracing Green Development Opportunities, Drawing a Sustainable Blueprint Together

"Lucid waters and lush mountains are invaluable assets." Promoting low-carbon and green economic and social development is a crucial path to achieving high-quality development. Taking green development as an opportunity, Muyuan taps into growth potential, stimulates development dynamics, deeply integrates green concepts into production and life, and advocates embracing a low-carbon lifestyle with an open mindset, jointly depicting a beautiful blueprint of production development and ecological harmony.

Joining Hands to Create a Green Future

Green and low-carbon development is not only a development concept but also a responsibility and mission. Guided by responsibility and driven by innovation, Muyuan will continuously promote green and low-carbon production. We firmly believe that with the joint efforts of the whole society, green and low-carbon development will become an important cornerstone for humanity's journey towards a sustainable future. Let us move forward together, turning the vision of harmonious coexistence between humans and nature into reality, and building a green future that is livable, beautiful, and sustainable!





Tribute to Pigs

A pig's life is ordinary, yet sublime.

They come to this world quietly, and silently bid goodbye in their time.

When they're no longer in sight, they've given all they could provide.

A pig's life, in truth, is one of greatness and pride!

The spirit of pigs mirrors Muyuan people's devotion inside.

A pig's life is one of giving, pure and true.

Through their life's offering, people find joy anew.

Today, pigs teach us that life sustains life; only through life can we achieve life's higher worth.

Muyuan people bear the noble mission of providing food for all, like our pigs, we give freely, making life better for one and all.

A pig's life is one of pure delight.

Facing life's precious gift, they ask not for length of days, count not their feed, but grow with joy always.

Today, pigs show us that life's worth lies not in its length but quality. Like them, we trade duration for excellence, without regrets.

A pig's life is filled with wisdom.

While humans ponder life's meaning and chase fame's embrace, pigs simply live their truth with natural ease: life's essence lies not in what we take, but what we give to human grace.

Today, we hesitate no more, waste no time in debating life's worth; like pigs, we simply give more, calculate less, creating value on earth.

We are grateful.

Our business is raising pigs, yet in truth, they sustain our lives.

To honor pigs is to honor ourselves, to revere them is self-respect's rise.

Let's join with pigs, in simple joy and mirth, giving ourselves to create a life of highest worth!

Appendix-1: Calculation Formulas

Carbon Footprint Calculation Method

1. Calculation formula of the carbon footprint per unit of feed in the feed cultivation and processing stage

$$CF_{\text{feed}} = E_{\text{feed}} / \sum T_i$$

CF_{feed} : Carbon footprint per unit of feed in the feed cultivation and processing stage, measured in tonnes of CO₂ equivalent per tonne (tCO₂e/t)

E_{feed} : Total GHG emissions in the feed cultivation and processing stage, measured in tonnes of CO₂ equivalent (tCO₂e);

T_i : Total amount of feed ingredient i consumed annually by the farm, measured in tonnes (t).

2. Calculation formula of the carbon footprint per unit of livestock product from feed cultivation and processing to farm production stage

$$CF_{\text{farm product}} = (E_{\text{feed}} + E_{\text{farm product}}) / M_{\text{farm product}} \times AF_{\text{farm j}}$$

$CF_{\text{farm product}}$: Carbon footprint of livestock products "from raw material acquisition to the farm boundary", measured in tonnes of CO₂ equivalent per tonne (tCO₂e/t);

$M_{\text{farm product}}$: Amount of livestock products produced within the farm boundary, live animal weight, measured in tonnes (t);

E_{feed} : GHG emissions generated in the feed cultivation stage, measured in tonnes of CO₂ equivalent (tCO₂e);

$E_{\text{farm product}}$: GHG allocation factor for product j in the farm production stage, %.

3. Calculation formula of the carbon footprint per unit of livestock product from feed cultivation and processing to the livestock product processing stage

$$CF_{\text{product}} = [(E_{\text{feed}} + E_{\text{farm product}}) \times AF_{\text{farm j}} + E_{\text{product}}] / M_{\text{product}} \times AF_{\text{process k}}$$

CF_{product} : Carbon footprint per unit of livestock product "from raw material acquisition to the livestock product processing plant boundary", measured in tonnes of CO₂ equivalent per tonne (t CO₂e/t);

E_{feed} : GHG emissions generated in the feed cultivation and processing stage, measured in tonnes of CO₂ equivalent (tCO₂e);

$E_{\text{farm product}}$: Total GHG emissions in the farm rearing stage, measured in tonnes of CO₂ equivalent (tCO₂e);

E_{product} : Total GHG emissions in the product processing stage, measured in tonnes of CO₂ equivalent (tCO₂e);

$AF_{\text{farm j}}$: GHG allocation factor for product j in the farm production stage, %;

Allocation Methods

1. GHG Allocation Method for the Feed Cultivation and Processing Stage

GHG emissions from the feed crop cultivation and processing process should be allocated based on the dry matter mass proportion of feed crop raw materials and processing processes. The allocation factor is calculated using the formula:

$$AF_{\text{feed i}} = D_i / 100 \times P_i$$

$AF_{\text{feed i}}$: Allocation factor for emissions from crop i as a feed ingredient, %;

D_i : Dry matter mass of crop i as a feed ingredient as a percentage of the total dry matter produced, %;

P_i : Mass fraction of crop i as a characteristic component in feed ingredients, %;

i: Crop type.

2. When allocating GHG emissions from the production process of live pigs (such as breeding pigs, piglets, etc.), the allocation is based on the dry matter mass consumed by each animal category.

3. When co-products are produced during the processing stage, GHG emissions need to be allocated to different co-products. For pork products, the mass allocation method is used, with the allocation factor calculated using the formula:

$$AF_{\text{process, k}} = D_k / (D_k + F_k) \times 100$$

$AF_{\text{process, k}}$: Allocation factor for emissions from livestock product k in processing, %;

D_k : Main product output of livestock product k processed, measured in tonnes (t);

F_k : By-product output of livestock product k processed, measured in tonnes (t)

k: Type of livestock product.

Calculation Steps

The basic steps for calculating the carbon footprint of livestock products are as follows:

- Determine the system boundary, GHG generation stages, and functional unit.
- Select and collect qualitative activity information and quantitative activity data for each unit process within the system boundary.
- Select and obtain emission factor data.
- Calculate GHG emissions and removals for each unit process.
- Determine the allocation method.
- Calculate the carbon footprint of livestock products within the system boundary.

Appendix-2: Calculation Formulas

1. CH₄ emissions from enteric fermentation:

$$EF_{CH4,enteric} = \sum_j (EF_{CH4,enteric,j} \times AP_j \times 10^{-3}) \times GWP_{CH4}$$

Wherein:

$EF_{CH4,enteric}$ —Methane emissions from enteric fermentation of livestock j, measured in tonnes of CO₂ equivalent (tCO₂e)

$EF_{CH4,enteric,j}$ —Methane emission factor for enteric fermentation of livestock type j, in [kg CH₄ per head (or animal) per year]

AP_j —Activity data for livestock type j in the accounting year (number of heads)

GWP_{CH4} —Global warming potential of methane

2. CH₄ emissions from manure management:

$$E_{CH4,manure} = \sum_j [AP_j \times VS_j \times 365 \times (0.67 \times B_{o,j} \times MCF_{s,r} \times MS_{j,s}) \times 10^{-3}] \times GWP_{CH4}$$

$$VS = [GE \times (1 - DE) + (UE \times GE)] \times [(1 - ASH)] / 18.45$$

Wherein:

$E_{CH4,manure}$ —Methane emissions from livestock and poultry manure management, measured in tonnes of CO₂ equivalent (tCO₂e)

AP_j —Activity data for livestock type j in the accounting year (number of heads)

VS_j —Volatile solid excretion per day for livestock type j, in {kg VS per head (or animal) per day}

0.67—Density of CH₄ at 20°C and 1 atm, in (kg CH₄/Nm³)

$B_{o,j}$ —Maximum methane production capacity of manure from livestock type j, in (m³ CH₄ per kg VS)

$MCF_{s,r}$ —Methane conversion factor for manure management system s in climate region r, %

$MS_{j,s}$ —Proportion of manure from livestock type j managed using system s

GWP_{CH4} —Global warming potential of methane

3. Direct N₂O emissions from manure management

$$E_{N20,manure,D} = (\sum_s [\sum_j (Nex_j \times MS_{j,s} \times AP_j)] \times EF_{manure,D,s}) \times 10^{-3} \times 44/28 \times GWP_{N20}$$

Wherein:

$E_{N20,manure,D}$ —Direct N₂O emissions from manure management, measured in tonnes of CO₂ equivalent (tCO₂e)

AP_j —Activity data for livestock type j in the accounting year (number of heads)

Nex_j —Annual nitrogen excretion per head for livestock type j, in (kg N per head (or animal) per year)

$MS_{j,s}$ —Proportion of manure from livestock type j managed using system s

$EF_{manure,D,s}$ —Direct N₂O emission factor for manure management system s, in (t N₂O-N/tN)

GWP_{N20} —Global warming potential of nitrous oxide

4-1. Indirect N₂O emissions from manure management:

$$E_{N20,manure,ID} = [N_{V-MMs} \times EF_{manure,GAS} + N_{L-MMs} \times EF_{manure,LEACH}] \times 44/28 \times GWP_{N20}$$

Wherein:

$E_{N20,manure,ID}$ —Indirect N₂O emissions from manure management, measured in tons of (tCO₂e)

N_{V-MMs} —Nitrogen loss from manure management systems due to NH₃ and NO_x volatilization, measured in tons of N per year (t N/a)

$EF_{manure,GAS}$ —Emission factor for indirect N₂O emissions from atmospheric deposition of NH₃ and NO_x, in (t N₂O-N/tNH₃-N+NO_x-N)

N_{L-MMs} —Nitrogen loss from manure management systems due to leaching and runoff, measured in tons of N per year (t N/a)

$EF_{manure,LEACH}$ —Emission factor for indirect N₂O emissions from nitrogen leaching and runoff, in (t N₂O-N per t N leached or run off)

GWP_{N20} —Global warming potential of nitrous oxide

4-2. Nitrogen loss from manure due to leaching and runoff:

$$N_{V-MMs} = \sum_s [\sum_j (Nex_j \times MS_{j,s} \times AP_j)] \times 10^{-3} \times Frac_{v,Ms}$$

Wherein:

N_{V-MMs} —Nitrogen loss from manure management systems due to leaching and runoff, measured in tonnes of N per year (t N/a)

AP_j —Activity data for livestock type j in the accounting year (number of heads)

Nex_j —Annual nitrogen excretion per head for livestock type j, in (kg N per head (or animal) per year)

$MS_{j,s}$ —Proportion of manure from livestock type j managed using system s

$Frac_{v,Ms}$ —Proportion of nitrogen loss from manure management system s due to leaching and runoff

5. CO₂ emissions from energy consumption on farms

$$E_{energy} = \sum_u Q_{farm,energyu} \times EF_{energyu}$$

Wherein:

E_{energy} —GHG emissions from annual energy consumption on farms, measured in tonnes of CO₂ equivalent (tCO₂e)

$Q_{farm,energyu}$ —GHG emissions per unit of energy u consumed, measured in tonnes of CO₂ per ton (tCO₂/t) or tons of CO₂ per kilowatt-hour (tCO₂/(kwh))

Appendix-3

Dear readers,

Thank you for reading this report. In order to continuously improve our green and low-carbon work, enhance our management level, and optimize the quality of report preparation, we sincerely hope that you will comment on this report. Please kindly provide valuable opinions and suggestions amidst your busy schedule.

- Does this report provide the information you need to know?
Yes ☐ Partially ☐ No ☐
- Does this report comprehensively reflect the company's performance in social and environmental aspects?
Yes ☐ Partially ☐ No ☐
- Does this report fully respond to the expectations and demands of the company's stakeholders?
Yes ☐ Partially ☐ No ☐
- Is the quantitative information disclosure in this report objective, true, and effective?
Yes ☐ Partially ☐ No ☐
- Is the text in this report well-organized and easy to understand?
Yes ☐ Partially ☐ No ☐
- Does the layout design of this report help you understand the information?
Yes ☐ Partially ☐ No ☐
- If you have more detailed comments and feedback, please feel free to share them with us:

If you have any application needs related to environmental policies, environmental technologies, carbon asset management, etc., please follow our WeChat public account to contact us.



Scan the QR code to follow
our WeChat public account



Scan the QR code to fill
out the form online

Muyuan Foods Co., Ltd.

Better pork we serve, better life you enjoy



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