

Pioneering the Low-Carbon Model for Dairy Cattle Rearing

Modern Farming



PROJECT OVERVIEW

In May 2022, Modern Farming, in collaboration with the top-tier domestic expert team, officially launched the "Full Life Cycle(LCA) Low-Carbon Dairy Farm" demonstration project. The initiative established a systematic and actionable greenhouse gas emission reduction plan for dairy farming and comprehensively implemented emission reduction practices across different regions and climatic conditions. The project covers whole supply chain, including upstream forage supply, dairy cattle rearing process, and downstream waste treatment, enabling systematic management and reduction of greenhouse gas emissions.

On the upstream forage supply side, the Group take action focus on improving forage quality, increasing the proportion of locally sourced feed, and reducing reliance on imported feed to cut down carbon emissions from transportation. Within our own operation scope, which is the midstream dairy cattle rearing process, research and application of low-carbon breeding technologies have been carried out targeting enteric fermentation, manure management, and energy use emissions. At the same time, for downstream emission control, actions include chemical fertilizers replacement action during waste control process and increasing the proportion of new energy vehicles for raw milk transportation were taken.

In December 2024, Modern Farming officially designated its first batch of "Low-Carbon Demonstration Farms." Three of its farms successfully obtained low-carbon certification and were jointly recognized by multiple authoritative institutions. The carbon emission intensity of the product decreased by over 10% compared to pre-implementation levels.

At the same time, Modern Farming has actively engaged in ecological civilization education and awareness initiatives. For three consecutive years, it has

collaborated with the Education Center of the Ministry of Ecology and Environment to host "Green Farm Open Day" events, promoting green collaborative innovation across the entire industry chain and enhancing its resilience and sustainability.

COMPANY/ORGANIZATION PROFILE



Modern Farming (Group) Co., Ltd (hereinafter referred to as Modern Farming) was founded in Ma'an shan City, Anhui Province, China, in 2005 and listed on the Hong Kong Stock Exchange in 2010. As a leading enterprise in China's dairy cattle rearing industry, the Group is the pioneer of 10,000+ head farms operator in China, and currently operates 63 large-scale farms in 14 provinces across the country, with a controllable herd of more than 500,000 cows, a daily output of 9,000 tons of fresh milk, and a market share of 10%. Recognized as a "National Key Leading Enterprise in Agricultural Industrialization," it is the first dairy group in China to have received the Monde Selection Gold Award for 12 consecutive years and the first enterprise that passed the certification of the "Quality Milk Project - Supreme Grade Milk" initiative.

PROJECT OUTCOME

1. Upstream GHG emission reduction: Cultivating high-quality forage on over 66,700 hectares of self-planted/contracted land close to the farm and purchased over four million tonnes of high quality local corn silage annually with average transportation distance of only 90 km. Continuous quality improvement actions ensure >30% starch and dry matter content in silage,

lowering both transport emissions and enteric methane emission.

2. Livestock rearing&production procedure GHG emission reduction: Deploy energy-saving technologies in the operational and production process: adopting permanent magnet motors, LED lighting, precision spray systems, automated manure scrapers and sensor-actuated fans etc. to cut down energy consumption. In 2024, the Group patented self-developed feed raking machine to replace the original diesel-powered equipment – an industry-first innovation reducing operational energy use.

Enhancing Production Efficiency and Feed Structure, Improving Genetic Traits, and Implementing Low-Protein Diets: under equivalent operational boundaries, the carbon emission intensity per unit of product in 2024 decreased by 10% compared to 2021.

3. Green Energy Proportion increasing: the Group implemented farming-photovoltaic complementary systems by installing solar panels on the roofs of cattle barns to increase the proportion of clean energy usage. Biomass energy was recycled and utilized for electricity generation and heating, replacing fossil fuels. In 2024, the Group generated over 100 million kWh of electricity from biomass biogas, with renewable energy accounting for more than 65% of total energy consumption.

4. Downstream GHG Emission Reduction: To reduce reliance on chemical fertilizers, a manure fertilizer pipeline spanning 915 kilometers was constructed. More than 8 million tons of bio-fertilizer were applied, replacing 66,000 tons of chemical fertilizers. Additionally, new energy vehicles were introduced for raw milk transportation to promote low-carbon logistics.

5. For three consecutive years, the Group hosted the

national "Green Farm Open Day" event, receiving over 300 visitors.

PROJECT HIGHLIGHTS

The project has successfully established a model for low-carbon dairy farming. Three ranches under Modern Farming—Modern Farming (Shanghe) Co., Ltd., Modern Farming (Baoji) Co., Ltd., and Modern Farming (Hefei) Co., Ltd.—were awarded the title of China's first batch of "Low-Carbon Demonstration Farms" in the dairy industry which received joint certification and recognition from three authoritative institutions: the National Alliance for Innovation in Grain Saving and Emission Reduction in Livestock and Poultry, the National Dairy Cattle Industry Technology System, and the Beijing Jingwa Science and Technology Innovation Center. These farms also passed the rigorous evaluation conducted by China Classification Society Quality Certification Co., Ltd. in accordance with the Technical Specification for Low-Carbon Assessment of Large-Scale Dairy Farms, and were granted the "Low-Carbon Ranch" certification.

PROJECT IMPLEMENTATION

1. Establishment of the Quantitative Monitoring and Bench Marking System

Developed an international standard verification model and set clear emission reduction targets based on the verification results: using 2021 as the carbon emission baseline year, a rigid target was set to reduce carbon emission intensity per unit by 20% by 2035.

Collaborated with China Agricultural University to introduce enteric methane measurement equipment, enabling dynamic monitoring of methane emissions from cattle across different farms and achieving localized calibration of emission factors.

Established a dual verification mechanism combining modelling calculation and actual measurements, covering carbon sources across all stages including feed cultivation, farming, manure treatment, and energy consumption, thereby enhancing data accuracy.

2. Integrated Application of Whole-Process Emission Reduction Technologies

Genetic improvement and nutritional regulation: Reduced carbon emission intensity per unit of milk by optimizing herd structure, enhancing production efficiency, and implementing genetic breeding improvements; the group also applied precision feeding formulas to increase rumen digestibility and reduce enteric methane generation.

Manure-to-energy closed-loop system: Pioneered manure resource utilization techniques, converting manure into biogas (for energy generation) and organic fertilizer (to replace chemical fertilizers), achieving carbon sequestration and indirect emission reduction.

Energy structure improvement: Phased out high energy-consuming equipment and introduced photovoltaic power generation and waste heat recovery technologies to reduce reliance on fossil-based grid electricity and heating power.

3. Industry Chain Collaboration and Innovative System Assessment

Established a "Cradle-to-Gate" Life Cycle Assessment (LCA) framework covering the entire process from feed production, cattle rearing, to milk processing and transportation, identifying key emission reduction nodes.

Proposed an integrated "New Circular Agriculture" model, linking crop cultivation, livestock rearing, energy production/consumption, and fertilizer recycling. This model supports manure utilization through integrated farming systems, reduces chemical fertilizer application, and lowers the overall carbon footprint.

Promoted digital collaboration across industry, academia, and research: Partnered with research institutions to develop carbon management algorithm tools for farms, supporting dynamic optimization of emission reduction pathways and contributing to the formulation of industry standards.

4. Development of an Adaptive Low-Carbon Farming Model for High-Altitude Regions

In response to challenges such as harsh climatic conditions, low-oxygen environments, and ecological fragility in high-altitude regions, Modern Farming has established an adaptive low-carbon farming model based on standardized farm construction and professional operational systems.

5. Driving the Industry's Low-Carbon Transition

Modern Farming has established strategic partnerships with institutions such as China Agricultural University and the Feed Research Institute of the Chinese Academy of Agricultural Sciences to jointly explore and develop low-carbon strategies tailored to the realities of China's dairy industry. In 2024, in collaboration with China Agricultural University, the Group released China's first China Dairy Industry Low-Carbon White Paper, serving as a reference for relevant regulatory authorities and industry practitioners. It has also repeatedly organized and participated in industry symposium and contributed to the formulation of multiple national and industry standards, collectively exploring green development pathways for the livestock sector.

Summary

This model breaks through the limitations of traditional single-phase emission reduction approaches. By leveraging precision monitoring technology, cross-stage technology integration (e.g., genetics-nutrition-energy-manure), and innovation in full-chain LCA methodology, it achieves a significant reduction in the carbon intensity of farming systems. Its technical framework establishes a quantifiable and verifiable paradigm for low-carbon development in the livestock industry and provides foundational support for the construction of a digital carbon management platform for the sector.

PROJECT IMPACT & SUSTAINABILITY

The project has achieved a rigid reduction in carbon emission intensity. Through the conversion of manure into biogas for energy (substituting fossil fuels), enhanced production efficiency, and optimized herd structure, it has realized comprehensive cost optimization. This initiative has created quantifiable and tradable carbon reduction assets, laying the foundation

for future participation in the carbon market.

It also fosters industrial chain synergy: in the upstream sector, organic fertilizer supports crop plantation, driving upgrades in feed cultivation models and increasing local farmers' income. For the downstream sector, it supplies LCA-certified low-carbon raw milk while reducing supply chain emissions through new energy logistics.

In terms of ecological impact, the project facilitates multi-dimensional greenhouse gas emission reduction, decreases the use of chemical fertilizers and fossil fuels, ensures animal welfare, and contributes to the protection of ecosystem biodiversity.

Modern Farming's "Full Life Cycle Low-Carbon Ranch" demonstration project provides an outstanding model for low-carbon dairy cattle rearing practices within global agri-food systems. As of now, this comprehensive low-carbon dairy farming model has been promoted across more than 60 ranches in 14 provinces and municipalities in China, covering over 500,000 head of cattle, continuously sharing practical experience with the industry.

Expert Comments

This case shows a strong demonstration effect. The company's "Full-Life-Cycle Low-Carbon Ranch" demonstration project covers the entire value chain from upstream forage supply and dairy cattle breeding to downstream waste treatment, achieving systematic management and reduction of greenhouse gas emissions. By launching the first group of "Low-Carbon Demonstration Ranches", Modern Farming is leading the industry toward low-carbon development. The company's climate action practices exert wide-ranging influence across the industry. In collaboration with research institutes, it has released the White Paper on Low-Carbon Dairy Industry in China, organized and participated in numerous industry exchange conferences, and contributed to the formulation of several national and industry standards, exploring a new pathway for the green development of animal husbandry. Moreover, the company attaches great importance to social engagement. Through its "Green Ranch Open Day" events held for consecutive years, it has promoted green coordination and innovation across the entire industrial chain, strengthening both industry resilience and sustainability.