Field Trip to Two Animal Farms in Zhejiang

（一） Introduction of the sites

1. Zhejiang Lianxin Agricultural Technology Development Co., Ltd.

Zhejiang Lianxin Agricultural Technology Development Co., Ltd. was established in Lianxin Village, Changxing County, Huzhou City in 2021. It is the first digitalized multi-story Huyang (Hu sheep) breeding enterprise in Zhejiang Province. The total investment covers a modern sheep farm of 101 acres, equipped with 21 double-story sheep sheds, feed warehouses, manure treatment centers, automated feeding systems, intelligent environment control systems, and automatic manure conveying systems, etc. It aims to create a national leading digital Huyang ranch demonstration benchmark.

The company focuses on the breeding of Huyang breeding sheep and meat sheep, with an annual inventory of 22,500 heads. It has an annual output of 20,000 breeding sheep and 25,000 meat sheep. Through the "Huyang Tianxin" digital platform, it achieves intelligent management of the entire process, integrating functions such as environment monitoring, precise feeding, and individual traceability. The company has received strong support from the government and financial institutions, leading the technological innovation in the industry.

图 1 浙江莲心农业科技发展有限公司调研照片

Figure 1: Farm visit at the Zhejiang Lianxin Agricultural Technology Development Co., Ltd. (Credit: CRAES team)

2. Dongxing Dairy Farm in Jiaxing

Dongxing Dairy Farm in Jiaxing, Zhejiang Province, was established in 1999 and is located in Honglian Village, Wangdian Town, Xiuzhou District, Jiaxing City. It is a national student milk source base, a beautiful ranch in Zhejiang Province, and a demonstration enterprise for ecological circular economy. Through continuous innovation, it has built a three-story modern steel-concrete dairy cow breeding hall with a suspended structure, equipped with a milking parlor, feed processing workshop and other facilities, covering a total area of 6,300 square meters. It has formed an integrated base for dairy cow breeding, dairy production, and circular breeding and planting. The construction on the farm is finishing during the visit. By Aug 2025, there is a total of 700 cows on the farm and the farm is in normal operation.

The farm focuses on high-yield dairy cow breeding with a designed capacity of 1,000 heads and has passed the national dairy cow production performance testing certification. Relying on an organic fertilizer processing center, a liquid manure treatment center, and 3,000 acres of farmland transfer, it has established a closed-loop system of "breeding - manure treatment - organic fertilizer returning to the field - forage planting" to achieve circular agriculture and animal husbandry. It has been awarded as an agricultural leading enterprise in Jiaxing City and serves as the vice chairman unit of the Shanghai Dairy Association.

图 2 浙江嘉兴东兴奶牛场调研照片

Figure 2: Survey Photos of Zhejiang Jiaxing Dongxing Dairy Farm (Credit: CRAES team)

（二） Manure Management Practices at the Two Sites

1. Zhejiang Lianxin Agricultural Technology Development Co., Ltd.

The annual manure production from the sheep sheds of Zhejiang Lianxin Agricultural Technology Development Co., Ltd. is 12,800 tons. The manure treatment facilities include an automatic conveyor belt manure removal system, loaders, self-dumping manure trucks, turners, and aerobic fermentation systems. The manure is conveyed to the organic fertilizer production workshop via a secondary conveyor belt, where it is processed and packaged for use as fertilizer in the supporting farmland (mainly for growing vegetables, fruits, and traditional Chinese medicinal materials), achieving resource utilization. The odors in the organic fertilizer production workshop

are treated using a chemical scrubbing method.

2. Dongxing Dairy Farm in Jiaxing

With the support and assistance from government departments and the financial sector, Dongxing Dairy Farm in Jiaxing, Zhejiang Province, invested over 27 million yuan to introduce high-standard environmental protection facilities, bringing sewage and exhaust gas treatment up to standardized levels. Additionally, the farm invested 25 million yuan to build three major pollution control centers: an organic fertilizer processing center, a sewage treatment center, and an odor control center. It also leased 3,000 acres of high-standard farmland to establish a balanced agricultural and livestock recycling system.

The dairy farm produces an average of about 7-8 tons of dry manure and 60 tons of liquid manure per day. In 2022, the farm had 700 cows and produced more than 4000 tons of milk. The cow manure is scraped into a dedicated manure channel by scrapers and transported to the manure collection pool, where it is separated into solid and liquid by a solid-liquid separator. The separated dry manure is transferred to the fermentation area by a loader and fermented in a trough using a turner. After fermentation, it is used as bedding for cows or sold to fruit, vegetable, and seedling planting bases, with an average daily production of about 6.5 tons of organic fertilizer. The liquid manure is treated with coagulation to remove suspended impurities and then industrially processed to meet discharge standards.

The odors in the farm area are controlled in sections, mainly through chemical scrubbing methods to reduce odor emissions.

图 3 浙江嘉兴东兴奶牛场除臭设备

Figure 3: Odor Treatment Equipment at Dongxing Dairy Farm (Credit: CRAES team)

（三）Methane Reduction Potential

1. Zhejiang Lianxin Agricultural Technology Development Co., Ltd.

Targeting the characteristics of Huyang (Hu sheep) breeding, the enterprise can further explore the potential for emission reduction in rumination management and manure treatment. In terms of rumination management, introducing efficient feed additives (such as algal extracts or nitrates) can inhibit the activity of methanogenic archaea in the rumen. Optimizing the diet formula (e.g., increasing the proportion of

easily fermentable fibers) can shorten the feed retention time, thereby reducing methane emission intensity. Additionally, by conducting genetic strain selection research on Huyang, and screening and promoting low-emission breeding sheep, methane generation can be reduced at the source.

In the field of manure management, the existing aerobic fermentation system can be integrated with methane capture devices to convert fugitive methane into usable energy. Introducing covered composting technology can physically isolate methane emissions during the composting process. Combining this with biochar addition technology can absorb methane and promote its oxidation and decomposition, further enhancing emission reduction efficiency.

2. Dongxing Dairy Farm in Jiaxing

The dairy farm can achieve methane emission reductions through multi-dimensional technological optimization. In terms of rumination management, the application of methane inhibitors (such as 3-nitrooxypropanol) can directly suppress the metabolism of methanogenic archaea in the cows' rumen. Promoting high-oil seed feed formulations (such as flaxseed) can improve the rumen fermentation environment and reduce the proportion of methane emissions. Dynamic diet regulation technology can precisely adjust the concentrate-to-forage ratio according to the production stage of the cows, thereby optimizing rumen function.

In the manure treatment process, constructing a biogas project to anaerobically ferment cow manure can produce biogas on a large scale for energy substitution in the farm area, while also reducing methane emissions. Optimizing the solid-liquid separation process can lower the organic matter content in liquid manure, reducing the risk of subsequent methane emissions. Additionally, covering composting or storage areas with methane-oxidizing bacteria or breathable membranes can promote the biological oxidation of methane, achieving in-situ emission reductions.