China's Core Position & Competitive Advantages in the Global XOS Supply Chain

Overview

As a globally recognized high-efficiency prebiotic and benchmark water-soluble dietary fiber, **xylo-oligosaccharides (XOS)** have become a core strategic raw material in global food, beverage, dietary supplement, medical food, pet food, feed and pharmaceutical excipient industries, thanks to their ultra-high Bifidobacterium-proliferating activity, extremely low calorie content, excellent acid and heat resistance, and broad application adaptability. They are highly aligned with the dual trends of global consumption upgrading – including sugar reduction, fiber enhancement, gut health and antibiotic-free breeding – and food industry transformation.

At present, China has firmly established itself as the **absolute core hub** of the global XOS supply chain. With five core capabilities – closed-loop full industry chain, large-scale production capacity, extreme cost performance, rapid market response and leadership in technical standards – China has become the preferred supply base for downstream customers worldwide. Its core position and competitive advantages are concentrated in the following four dimensions, precisely matching downstream customers' core demands for cost reduction and efficiency improvement, regulatory compliance, stable supply, product innovation and sustainable development.

I. Core Position in the Global Supply Chain: From Technological Breakthrough to Global Leadership

China has evolved from a technological pioneer and major producer of global XOS to a **production capacity core, trade hub, demand engine, and highland for technology and standards** in the global supply chain. It is deeply integrated into the global downstream industrial division of labor, becoming a decisive force influencing global market supply, pricing, technological direction and standard systems, providing downstream customers with stable, efficient, reliable and value-added full-chain supply support.

1. Core of Production Capacity and Supply: World's Largest Producer with Leading Supply Stability

By 2025, China's total annual XOS production capacity has exceeded **150,000 metric tons**, accounting for more than **62% of the global total**, firmly ranking as the world's largest producer, far surpassing traditional producing regions such as Japan, Europe and North America. An industrial cluster has formed with Yucheng in Shandong (China's Functional Sugar City), Hebei and Jiangsu as core regions, with the three areas accounting for over **78% of national capacity**. Leading enterprises operate single-plant capacities of **20,000–50,000 metric tons per year**, with capacity utilization rates stably maintained at **80%–85%**, enabling uninterrupted year-round supply and effectively resolving industry pain points such as peak-season shortages, delivery delays and quality fluctuations for downstream customers.

Relying on large-scale and circular supply of upstream agricultural by-products such as corn cobs, bagasse and wheat bran, China's self-sufficiency rate of core XOS raw materials exceeds **98%**, effectively mitigating supply

risks from international raw material price volatility and supply chain disruptions, and providing long-term, stable and predictable supply guarantees for downstream customers.

2. Global Trade Hub: Export-Oriented, Global Market Coverage, Efficient Two-Way Circulation

Approximately **25%–30%** of China's XOS production capacity is dedicated to exports, with a network covering more than **50 countries and regions worldwide**, including Japan, South Korea, Southeast Asia, the EU, North America, the Middle East and Australia. Exports to RCEP member countries account for over **60%**. Supported by coastal ports including Qingdao, Shanghai, Ningbo and Guangzhou, an **integrated logistics system of "raw material procurement – production and processing – global distribution"** has been established, enabling fast delivery to core markets within **7–15 days**, significantly reducing downstream customers' inventory costs and logistics cycles.

Meanwhile, as the world's largest XOS consumer market, China accounts for more than **48% of global consumption**, forming a **"domestic sales + export" dual-driven pattern**. This structure not only meets the immediate and customized needs of domestic downstream customers but also simultaneously accommodates large-scale and differentiated orders from global clients, establishing China as a **"two-way hub"** of the global supply chain.

3. Leader of Industry Structure: Led by Top Enterprises, Global First-Tier Players, Extremely High Industrial Concentration

The global XOS industry features a **highly oligopolistic structure with absolute dominance by China**. The top five manufacturers hold more than **75% of the global market share**. Among them, Chinese enterprises including Shandong Longlive Bio-Technology, Bailong Chuangyuan, Baolingbao, Quantum Hi-Tech and Jiangsu Kebang rank among the global first tier, collectively accounting for over **85% of domestic production capacity**, forming a large-scale, intensive and standardized industrial layout.

Through independent innovation and technological iteration, China's leading enterprises have achieved full technological parity and **comprehensive quality surpassing** of international giants (Morinaga of Japan, Roquette of France, Cargill of the USA). With more flexible pricing strategies, faster customized services, closer market responsiveness and more complete compliance systems, they have become the core choice for global downstream customers to replace imports, control procurement costs and enhance supply chain resilience.

4. Leader in Technology and Standards: From Follower to Pioneer, Driving Global Standard Upgrading

China's XOS industry has transitioned from **"introduction and digestion" to "independent innovation + standard export"**. It has not only achieved full international parity in processes, quality and compliance but also taken global leadership in high-purity refining, precise degree of polymerization control, green intelligent manufacturing, circular economy and applied technology development.

- China has led the formulation of core national and industrial standards including **GB/T 35545-2017 Xylo-oligosaccharides**, **QB/T 2984-2008 Xylo-oligosaccharides** and **QB/T 5291-2018 Feed Additive Xylo-oligosaccharides**, which serve as key technical benchmarks for global XOS quality control and international trade.
- Chinese enterprises have completed registrations in all major global markets, including **US FDA GRAS, EU EFSA, Japan Ministry of Health, Labour and Welfare, South Korea KFDA, Russian certification, Halal and Kosher**, fully aligning with global access standards for food, dietary supplements, medical foods, feed and pharmaceuticals. Whether serving domestic or global export markets, downstream customers can use these products directly with no additional compliance investment, achieving a **100% compliance pass rate**.

II. Core Competitive Advantages: Building an Irreplaceable Supply Chain Barrier Across Five Dimensions

Compared with international peers in Japan, Europe and North America, Chinese XOS has built an irreplaceable global supply chain barrier through five core advantages: **full industry chain cost advantage, top-tier quality and compliance advantage, supply and response advantage, technological and innovative advantage, and sustainable development advantage**, precisely matching the full-dimensional procurement needs of downstream customers.

(I) Full Industry Chain Cost Advantage: Closed-Loop Synergy, Extreme Cost Performance, Core Support for Cost Reduction & Efficiency Improvement

Supported by **closed-loop full industry chain synergy of "agricultural by-product raw materials – biological enzymatic hydrolysis – refining and purification – application development – recycling"**, Chinese XOS achieves optimal performance in raw material, production, logistics and compliance costs, creating **globally unmatched cost efficiency** and serving as a core pillar for downstream customers to reduce costs and improve efficiency.

- **Raw material cost advantage**: Using agricultural by-products such as corn cobs, bagasse and wheat bran as core raw materials, costs are only **1/3 to 1/5** of traditional raw materials like chicory and sucrose. Supported by industrial clusters such as Yucheng in Shandong, raw materials are locally sourced, centrally supplied and recycled, with comprehensive raw material utilization exceeding **85%**, further lowering raw material expenses.
- **Production cost advantage**: Leading enterprises adopt advanced technologies including fifth-generation immobilized enzyme continuous catalysis, complex enzymatic hydrolysis + membrane separation and AI intelligent control. Enzymatic conversion rates reach **78%–92%**, by-products are reduced by over **40%**, unit energy consumption drops by **30%–40%**, and unit production costs are **35%–50% lower** than

international peers.

- **Comprehensive cost advantage**: Full industry chain synergy + large-scale production + efficient logistics + one-stop compliance services reduce overall costs by **40%–60%** compared with international competitors, providing downstream customers with the world's most cost-effective XOS products and directly increasing gross profit margins of downstream products by **10%–25%**.

(II) Quality and Compliance Advantage: World-Class Quality, Full-Dimensional Compliance, Zero Barriers to Market Access

With **"high purity, high activity, high stability and full compliance"** at its core, Chinese XOS achieves **world-class quality** with a compliance system covering all major global markets, offering downstream customers quality assurance with zero market access barriers.

- **Quality advantage**: Product purity (xylobiose to xyloheptaose) reaches **95%–99.2%**, with precise and controllable degree of polymerization distribution. It leads globally in acid resistance (pH 2.0–7.0) and heat resistance (121℃/30min), with Bifidobacterium-proliferating activity **10–20 times** that of common oligosaccharides. Non-toxic and side-effect-free, it is suitable for high-end applications including infant formula, medical foods and pharmaceutical excipients.
- **Compliance advantage**: Chinese XOS has obtained certifications from all major global authorities, including China **GB 2760, US FDA GRAS, EU EFSA, Japan MHLW, South Korea KFDA, Russia, Halal and Kosher**, achieving full-category and full-scenario compliance. Downstream customers require no additional compliance declaration; direct use satisfies global market access requirements, **eliminating 100% of compliance costs** and shortening time-to-market by **6–12 months**.

(III) Supply and Response Advantage: Flexible & Efficient, Ensuring Production Continuity, Rapid Customized Response

For large-scale, continuous downstream production, **"stable supply, fast delivery and flexible response"** are core demands. China's XOS supply chain forms unique advantages through four mechanisms: decentralized capacity layout, multi-base coordination, efficient logistics and flexible customization.

- **Supply stability advantage**: XOS production capacity in China is both concentrated and geographically dispersed, with industrial clusters in Shandong, Hebei and Jiangsu. Leading enterprises operate **2–3 production bases**, enabling capacity complementation and off-peak production to avoid supply risks from single-site shutdowns, maintenance or natural disasters. With sufficient raw materials and year-round uninterrupted production, order lead times are extremely short: **3–5 days for domestic orders and 7–12 days for international orders**, far below the 15–30 days of international peers, **100% ensuring continuous downstream production**.
- **Response flexibility advantage**: Chinese enterprises can flexibly adjust product specifications (food grade,

feed grade, pharmaceutical grade, medical food grade), purity (70%–99.2%), degree of polymerization and packaging (25kg/bag, 500kg jumbo bag, 1000kg jumbo bag, small packages) according to customer needs, offering small-batch trials, large-scale customization and urgent order expediting services. They also provide one-on-one technical support, formula optimization, application design, clinical data sharing and animal test data support to help customers improve formulations, enhance taste and functionality, lower production costs and shorten R&D cycles, truly realizing **"customization on demand, full-process empowerment and rapid response"**.

(IV) Technological and Innovative Advantage: Iterative Upgrading, Empowering Downstream Value-Add, Supporting Differentiated Competition

China's XOS industry has shifted from **"introduction and digestion" to "independent innovation + global leadership"**, with continuous technological iteration and product breakthroughs. This not only guarantees stable quality and optimal costs but also delivers value-added services to downstream customers, supporting differentiated competition and capture of the health consumer market.

- **Process innovation advantage**: Top domestic enterprises have upgraded from batch enzymatic hydrolysis to continuous enzymatic hydrolysis, immobilized enzyme catalysis and genetically engineered strain-directed enzymolysis, raising conversion rates to **78%–92%**, cutting by-products by over **40%** and reducing unit energy consumption by **30%–40%**, lowering production costs while improving purity, safety and stability. Green intelligent manufacturing advances continuously, with closed-loop water treatment, clean energy, online HPLC detection, AI intelligent control and circular economy fully applied. COD emissions are **more than 50% better** than national standards, aligning with global green production, carbon neutrality and circular economy trends, helping downstream customers transition to **"clean production and sustainable development"**.
- **Product innovation advantage**: Focused on global downstream demand, high-end specialty products have been developed including high-purity (XOS-95+), pharmaceutical grade, medical food grade, customized polymerization degree, XOS-probiotic complex and XOS-mineral chelate products, expanding into high-value sectors such as medical foods, infant formula, precision pet nutrition, sports nutrition, oral beauty, pharmaceutical excipients and antibiotic-free feed. Backed by strong R&D capabilities, the industry assists downstream customers in developing low-calorie, high-fiber, prebiotic, clean-label and antibiotic-free innovative products – such as functional beverages, sugar-free baked goods, probiotic yogurt, medical foods, pet gut-health diets and livestock antibiotic-free feed – helping capture the health market and increase product added value by **15%–30%**.

(V) Sustainable Development Advantage: Circular Economy, Green & Low-Carbon, Aligned with Global Trends

Centered on high-value utilization of agricultural by-products, China's XOS industry has built a **circular economy model of "whole corn plant industry chain and bagasse comprehensive utilization"**, achieving efficient resource use, zero waste discharge and green low-carbon production. It aligns with global trends of sustainable development, carbon neutrality and circular economy, becoming a core partner for downstream customers' **ESG strategies**.

- **Resource circular advantage**: Using agricultural by-products such as corn cobs and bagasse as raw materials, waste is converted into high-value products, with comprehensive raw material utilization exceeding **85%**. By-products (xylose, lignin, organic fertilizer) are fully recycled, realizing zero-waste, zero-pollution production.
- **Green low-carbon advantage**: Adopting green technologies including biological enzymatic methods, clean energy and closed-loop water treatment, carbon emissions per unit product are reduced by over **50%** compared with traditional processes, and COD emissions are more than **50% better** than national standards. Products have obtained global green product and carbon footprint certifications, helping downstream customers meet global ESG compliance and green consumer demands.

III. Conclusion: Chinese XOS – The Preferred Strategic Supply Chain Partner for Global Downstream Customers

At present, China has fully established its **absolute core position** in the global XOS supply chain. It is not only the world's largest production base, trade hub and demand engine but also a core strategic pillar for downstream customers in cost reduction, compliant operation, stable supply, product innovation and sustainable development.

Compared with international peers in Japan, Europe and North America, Chinese XOS precisely matches full-dimensional procurement needs across global food, beverage, dietary supplement, medical food, pet food, feed and pharmaceutical excipient sectors through **six core advantages: globally extreme cost performance, top-tier quality and compliance, ultra-stable supply, flexible rapid response, technological innovation empowerment, and green sustainable development**, making it the **preferred strategic supply chain partner** for downstream customers worldwide.

In the future, as China's XOS capacity continues to expand (exceeding **250,000 metric tons per year by 2030**), technologies advance (genetically engineered enzymes, molecular modification, precise polymerization control), global layout deepens (overseas production bases, R&D centers, marketing networks) and standard export accelerates, China will further consolidate its absolute core position in the global supply chain. It will continue to provide downstream customers with more valuable, stable, flexible, innovative and green products and services, helping them achieve competitive breakthroughs, value maximization and sustainable development in the global marketplace.