Development History of Quinoa Flakes Industry

Part I: A Tribute to the Pioneers

As the only pseudocereal crop containing complete high-quality plant protein and all nine essential amino acids for human beings, quinoa is gluten-free, low-glycemic, and suitable for people with sensitive constitutions. Dating back 6,000 years, it was once the sacred staple of the Inca civilization on the Andean Plateau, a marginal highland crop banned during the colonial era, and an endangered grain on the verge of extinction in the mid-to-late 20th century. Having undergone 6,000 years of highland agricultural domestication, over 40 years of global processing technology innovation, more than 30 years of in-depth research on its comprehensive nutritional mechanisms, and over 20 years of breakthroughs in domestication and industrialization in China, quinoa has evolved from a niche highland coarse grain into five core product categories: gluten-free breakfast quinoa flakes, calorie-controlled meal replacement staples, special complementary foods for gluten-intolerant groups, baking grain ingredients, and functional grains for sports nutrition. A full-industry chain system has been established covering quinoa germplasm breeding, standardized highland cultivation, intensive flaking processing of grains, special medical grain foods, new retail of meal replacements, and dedicated gluten-free food production.

A premium high-quality coarse grain ingredient tailored for modern chronic disease management, sensitive constitution diets, and precision nutrition meal replacements, the development of the quinoa flake industry bears witness to four generations of leaps in food industrial technology: primitive highland farming in ancient times, crude processing of coarse grains in modern history, precise intensive processing of grains in the contemporary era, and functional foods for special diets. It embodies the persistent dedication of global highland crop breeding experts, coarse grain processing engineers, special dietary nutrition research teams, gluten-free food R&D institutions, domestic and international grain food safety standard-setting organizations, and production enterprises across the entire industrial chain.

We hereby pay sincere tribute to all individuals, research teams, universities, research institutes, and industrial chain enterprises who have wholeheartedly engaged in the conservation of wild quinoa germplasm resources, domestication and improvement of highland varieties, research on comprehensive nutritional mechanisms, iteration of quinoa flaking processing technology, technological innovation of instant ready-to-eat products, clinical verification of edible safety and health benefits for special populations, global compliance declaration of gluten-free foods, formulation of domestic and international quinoa industry standards, and full-scenario market implementation. In accordance with the principles of industry competition and enterprise privacy protection, this section does not list the names of segmented small and medium-sized brands. We extend our profound respect to all domestic and international research entities and leading manufacturers that have made groundbreaking contributions to the development of this industry.

Honor Roll of Contributors

(I) Core Scientists, Industry Pioneers and Researchers (Sorted by Timeline of Research Achievements and Industrial Implementation)

1. ***Ancient Inca Highland Farmers (5000 BCE, Andes Mountains, South America):***

   Founders of artificial quinoa domestication and the original quinoa consumption system. Around 5000 BCE, plateau inhabitants around Lake Titicaca took the lead in artificially domesticating wild quinoa. Leveraging quinoa's natural traits of high-altitude cold resistance, saline-alkali tolerance, barren soil adaptability, and low maintenance requirements, they cultivated wild highland quinoa grass into a stable food crop. During the Inca civilization, primitive consumption methods such as boiling, stewing, and milling quinoa into powder were established. Quinoa was honored as the "Mother of All Grains", serving as the core staple for plateau soldiers and civilians as well as sacred grain for sacrificial rituals. The world's earliest quinoa cultivation and consumption system was formed, laying the foundational dietary basis for human consumption of quinoa. Distinct from mainstream grain systems of Poaceae including wheat, rice and oats, it pioneered an exclusive track for gluten-free specialty coarse grains.

2. ***Jack Harlan (United States, Botanist):***

   The pioneer behind the revival of modern quinoa germplasm and global quinoa introduction. In the 1970s, he ventured into remote high-altitude uninhabited areas of Bolivia and Peru to rediscover endangered native high-quality quinoa germplasm resources. He systematically conducted fundamental research on quinoa's agronomic traits, nutritional components and stress resistance, refuting the fallacy that quinoa was worthless left over from the colonial period. He led the introduction of native quinoa germplasm into the U.S. agricultural research system, restarted global quinoa breeding and commercial research, ended nearly 350 years of industrial stagnation for quinoa, and kicked off the revival of modern quinoa industrialization.

3. ***Global Crop Nutrition Review Team of FAO (Food and Agriculture Organization of the United Nations, 2008):***

   Official certification team for quinoa as a global supergrain. In 2008, the team completed comprehensive assessments of quinoa's full nutritional profile, dietary adaptability trials for different populations, and long-term consumption safety tracking tests. It officially recognized quinoa as the sole single crop capable of meeting the basic nutritional needs of the human body, designated 2013 as the International Year of Quinoa, and promoted quinoa cultivation and dietary applications worldwide. This authoritative certification completely reshaped the global coarse grain consumption landscape, elevating quinoa from a niche Andean highland grain to a globally recognized super nutritional grain, laying a core value foundation for subsequent R&D and market popularization of deep-processed quinoa flake products.

4. ***North American Grain Deep Processing Research Team (1990s – Early 2000s):***

   Core R&D team for the first-generation quinoa flaking technology and instant quinoa products. Targeting key pain points of quinoa including bitter saponins, a cooking time exceeding 30 minutes for whole grains, poor palatability, and incompatibility with modern breakfast scenarios, the team successively developed physical washing processes for saponin removal, low-temperature conditioning flaking technology, and pre-cooking drying fresh-locking technology. The world's first slow-cook quinoa flakes were launched in 2000, followed by rinse-free quick-cook quinoa flakes in 2006. These innovations solved two major industry pain points: repeated rinsing to remove saponins before consumption and lengthy cooking times. The first-generation quinoa flake product system was established, realizing the morphological upgrade of quinoa from raw whole grains to convenient flaked grains.

5. ***Xizang Agriculture and Animal Husbandry Research Team (China, 1985):***

   Pioneers of quinoa introduction in China and trailblazers who achieved a breakthrough in domestic quinoa cultivation. In 1985, relying on quinoa germplasm gifted by Bolivia, the team carried out China's first trial introduction and planting of quinoa in high-altitude areas of Xizang. The Qinghai-Xizang Plateau shares homologous growth conditions with the Andes – high altitude, intense sunlight and large diurnal temperature differences. The trial verified the feasibility of quinoa cultivation in China's highland regions, filling the research gap in domestic quinoa introduction and kicking off localized quinoa cultivation research in China.

6. ***Researcher Ren Changzhong and Domestic Coarse Grain Breeding Research Team (China, National Oat and Buckwheat Industrial Technology System, Jilin Agricultural University):***

   Leaders in localized quinoa breeding and variety improvement in China. Starting in 2010, the team dedicated over a decade to quinoa germplasm improvement. Addressing six inherent drawbacks of imported quinoa – high lodging rate, inconsistent ripening periods, large threshing losses, poor local adaptability, excessive saponin content, and fragility during flaking – the team independently developed special domestic quinoa varieties featuring cold and drought resistance, low saponin levels, lodging resistance and suitability for mechanized harvesting. The research broke the bottleneck of reliance on imported raw grains, drastically reduced bitterness and processing losses of domestic quinoa raw materials, consolidated the upstream raw material foundation for large-scale, high-quality production of domestic quinoa flakes, and realized the leap of China's quinoa germplasm from overseas introduction to independent innovation.

7. ***Domestic Grain Processing and Special Dietary Expert Teams (Chinese Academy of Agricultural Sciences, Jiangnan University, Henan University of Technology, Academy of State Administration of Grain and Reserves):***

   Core force behind the breakthrough of localized quinoa flake processing and innovative functional product development in China. Since 2013, targeting persistent

industry pain points of early imported quinoa flakes such as high prices, incomplete saponin removal leading to bitter taste, rough flaking technology with high breakage rates, lack of gluten-free standards, poor alignment with Chinese dietary habits, and a blank market for special population-specific products, the teams carried out full-chain technological breakthroughs covering low-temperature physical saponin removal, flexible flaking, hot-air low-temperature fresh locking, instant gelatinization for rinse-free consumption, preservative-free formulations, and customized recipes for sensitive constitutions. Four core technologies were successively mastered: low-temperature original-flavor instant quinoa flakes, pure gluten-free quinoa flakes, tri-color blended quinoa flakes, and high-protein composite meal replacement quinoa flakes. The teams led the formulation of group standards and industry specifications for domestic quinoa raw grains and quinoa flakes, driving the leap-forward development of China's quinoa flake industry from full import dependence and a high-end niche market to independent breeding, localized processing and mass popularization.

8. ***Domestic New Retail Grain R&D Team (2018 – Present):***

Pioneers of scenario-based, snack-style and functionally segmented innovation for quinoa flakes. Closely responding to domestic consumer demands for fat loss and calorie control, gluten-free diets, gastrointestinal care, sports energy supplementation and low-sugar wellness, the team broke the single staple food positioning of quinoa flakes and innovated new product categories including baked quinoa crisps, overnight quinoa bases, quinoa yogurt bowl toppings, quinoa energy bars, and composite grain quinoa breakfast flakes. These products cover all scenarios: breakfast, supplementary meals, afternoon tea, outdoor meal replacements and sports nutrition, transforming quinoa flakes from high-end wellness staples into all-day health foods for the general public and unlocking incremental market opportunities for the quinoa flake industry.

(II) Core Research Institutions and Benchmark Industrial Enterprise Teams

1. ***Ancient Andean Highland Farming Communities (5000 BCE):***

Birthplace of global quinoa cultivation and consumption culture. These communities completed wild quinoa germplasm screening and domestication of stress-resistant highland varieties, enabling large-scale native cultivation under harsh ultra-high-altitude environments. They developed basic boiling and cooking methods for quinoa and established its status as a sacred staple, serving as the origin of global quinoa cultivation culture and grain utilization.

2. ***USDA Agricultural Research Service (United States):***

Cradle of modern quinoa germplasm revival and first-generation processing technology R&D. It restarted systematic modern quinoa research, preserved core global

quinoa germplasm resources, developed the first-generation quinoa conditioning flaking and saponin removal processing equipment, and established the world's foundational standard for quinoa nutritional testing, forming the underlying technical framework for modern deep-processed quinoa manufacturing.

3. ***Food Nutrition and Human Diet Division, FAO:***

   Core institution providing authoritative global endorsement and industrial promotion for quinoa's value. It completed the official nutritional certification of quinoa in 2008 and launched the global International Year of Quinoa promotion campaign in 2013. The division unified global evaluation standards for quinoa nutrition, popularized quinoa's core dietary merits of gluten-free composition, complete protein and low GI, fully activated the global consumer market for deep-processed quinoa products, and defined the core value connotation of the modern quinoa industry.

4. Xizang Academy of Agriculture and Animal Husbandry, College of Agriculture and Animal Husbandry, Qinghai University: Core platforms for research on localized quinoa cultivation adaptability in China's high-altitude regions. Rooted in China's core planting zones including the Qinghai-Xizang Plateau, Qaidam Basin and northwest Shanxi Plateau, they conduct research on regional cultivation adaptability, saline-alkali land improved planting, and highland stress-resistant cultivation for quinoa. The research addresses cultivation challenges of unstable yields and inconsistent quality across domestic production areas, establishing a standardized quinoa cultivation system adapted to China's geographical conditions.

5. ***Academy of State Administration of Grain and Reserves:***

   Leading domestic institution for upgrading quinoa flake processing technology and formulating industry standards. Tailored to the grain characteristics of domestic quinoa, it optimized exclusive technologies for flexible flaking, low-temperature drying and deep saponin removal, lowering breakage rates and bitterness of quinoa flakes. The institute led the drafting of relevant group standards and industry specifications for quinoa flakes, unifying requirements for raw material access, processing techniques, physical and chemical indicators, saponin residue limits, gluten-free testing and label marking, putting an end to the early industry chaos of inconsistent product quality, absent standards and false advertising for quinoa products in China.

6. School of Food Science and Technology, Jiangnan University; School of Grain, Oil and Food Engineering, Henan University of Technology: Top domestic research hubs for intensive quinoa processing and composite application technologies. Focusing on core pain points in deep quinoa processing, they mastered key technologies to mitigate quinoa starch retrogradation, efficiently remove saponins, retain nutrition via low-temperature baking, preserve freshness with clean labels, and preserve full nutritional components. They also conduct extended research on compound quinoa meal replacements, gluten-free baking, plant-based beverages and special medical diets, supporting the market launch of multi-scenario innovative quinoa flake products and advancing China's quinoa industry from basic crude flaking to

high-value functional intensive processing.

7. ***R&D Centers of Leading Domestic Quinoa Industrial Enterprises:***

Core carriers for market implementation and channel popularization of quinoa flakes in China. These centers translate breeding and processing technical achievements from domestic research institutes into pilot-scale amplification and mass production, covering all offline and online channels including physical supermarkets, e-commerce platforms, live-stream new retail and special dietary sales channels. Customized products are developed to meet local Chinese demands for low-sugar diets, sensitive gastrointestinal tracts, gluten intolerance and fat loss & calorie control, breaking the long-term monopoly of overseas quinoa products and constructing a complete domestic system for quinoa production, sales and service.

Part II: R&D History of Quinoa Flakes

(I) Stage 1: Ancient Germplasm Domestication and the Dawn of Raw Grain Consumption (5000 BCE – 1960s)

- Core characteristics of this stage: Wild highland quinoa was artificially domesticated and remained the core staple of Andean civilizations in South America for millennia. Its industrial cultivation was banned throughout the colonial era. No deep-processing flaking technology existed during this period; quinoa was only consumed as whole raw grains after boiling. The industry remained at the primitive farming and raw grain stage with extremely low global penetration.
- Around 5000 BCE, plateau inhabitants around Lake Titicaca in the Andes Mountains of South America first artificially domesticated wild quinoa. Boasting extreme cold resistance, saline-alkali tolerance, barren soil adaptability and high-altitude survival capacity, quinoa was planted on a large scale above 3,000 meters where ordinary grains could not survive, becoming the indispensable staple of the Inca civilization with dual functions as daily food and sacrificial grain.
- In 1532, Spanish colonists invaded South America. To eradicate indigenous local culture, they comprehensively banned quinoa cultivation, burned quinoa fields and forced the promotion of European wheat and barley. Quinoa cultivation retreated to remote mountainous highlands as a niche crop, nearly severing its industrial chain for nearly 350 years under the ban.
- From the 19th century to the 1960s, global grain research focused on the three major staple crops: wheat, rice and corn. Quinoa was consistently overlooked by global agricultural academia with zero R&D on deep processing technology. Worldwide, quinoa was consumed only by direct boiling of raw grains. Natural saponins on quinoa husks taste bitter and cause mild irritation when eaten raw, requiring repeated rinsing before cooking. Whole-grain boiling took 35 to 40 minutes, creating an extremely high consumption barrier incompatible with convenient urban dietary demands, leaving deep-processing technology entirely undeveloped.

(II) Stage 2: Germplasm Revival and Breakthrough of First-Generation Flaking Technology (1970s – 2000s)

- Core characteristics of this stage: Quinoa germplasm resources were rediscovered, and modern grain processing technology was applied to quinoa for the first time. Physical conditioning flaking technology emerged, and the world's first industrially produced quinoa flakes were launched. Quinoa transformed from whole raw grains to convenient flaked grains, marking the first critical industrial transformation – though product convenience remained insufficient.
- In the 1970s, American botanist Jack Harlan reignited quinoa research, officially launching the revival of the global quinoa industry. Multiple European and American countries began small-scale quinoa introduction and basic processing research.
- In the 1990s, North American grain processing teams developed the first-generation quinoa conditioning flaking technology to address lengthy cooking times and tedious rinsing. The process involved pre-washing with clean water to remove most surface saponins, low-temperature conditioning to soften quinoa grain structures, and physical rolling into thin flakes, cutting cooking time down to 12–15 minutes. The world's first mass-produced industrial slow-cook quinoa flakes entered the market.
- Around 2000, mature imported slow-cook quinoa flakes landed in European and American supermarkets, marketed as a healthy gluten-free complete protein product targeted primarily at special groups with gluten allergies and celiac disease. However, the product still required prolonged boiling and could not be brewed instantly without cooking, limiting its audience to a small niche of special dietary consumers with minimal penetration into mass markets.
- Parallel domestic development: China completed its first official quinoa introduction in 1985 with pilot planting launched in Xizang. No domestic quinoa deep-processing production lines existed at the time, and all raw quinoa grains and finished quinoa flakes relied entirely on imports, leaving the domestic industry in a blank, embryonic state.

(III) Stage 3: Iteration of Pre-Cooking Technology and Upgraded Convenient Products (2000s – 2013)

- Core characteristics of this stage: Two core technologies – steam pre-cooking and high-temperature instant gelatinization – were successively commercialized, spawning quick-cook quinoa flakes followed by instant no-cook quinoa flakes, delivering two transformative upgrades to quinoa consumption convenience. Coupled with the official nutritional certification from the United Nations, the industry expanded from niche special diets to mainstream healthy grain tracks.
- In 2006, North American research teams mastered an integrated process combining steam pre-cooking and deep saponin removal to launch quick-cook quinoa flakes. Pre-steamed quinoa flakes eliminated the need for pre-consumption rinsing and reduced cooking time to just 3–5 minutes, catering to the demand for rapid breakfast

among European and American office workers and introducing quinoa flakes to mass breakfast markets.

- In 2008, FAO officially certified quinoa as a super complete nutritional grain, triggering an explosive surge in global quinoa awareness and compelling grain enterprises worldwide to accelerate R&D on instant quinoa products.
- In 2011, breakthroughs were achieved in high-temperature instant gelatinization paired with low-temperature vacuum drying for fresh-locking, creating the world's first quinoa flakes brewable directly with boiling water. No rinsing or cooking was required, perfectly matching the fast-paced urban lifestyle and eliminating the final convenience shortcoming of quinoa flakes.
- Synchronous domestic industrial launch: Commercial large-scale trial planting of quinoa began in Shanxi in 2011 and Qinghai in 2013, enabling self-sufficiency in domestic quinoa raw grains. Domestic grain and oil processing enterprises imported overseas flaking equipment to replicate basic instant quinoa flakes, releasing the first batches of domestic quinoa flakes. Nevertheless, these early domestic products suffered technical flaws including incomplete saponin removal, persistent bitter taste, fragile flakes and severe nutrient loss during processing.

(IV) Stage 4: Localized Breeding Campaign and Standardized Domestic Industrial Breakthrough (2013 – 2018)

- Core characteristics of this stage: Independent domestic superior quinoa varieties were fully rolled out, completely resolving upstream raw material shortcomings. Domestic quinoa flaking technology was optimized for local grain characteristics, industry standards were gradually established, and the monopoly of imported products was broken. Leveraging cost-effectiveness and localized recipes, domestic quinoa flakes rapidly captured China's healthy grain market, ushering in a period of standardized industrial development.
- From 2013 to 2016, large-scale cultivation matured across China's three core production zones: the Qaidam Basin in Qinghai, northwest Shanxi, and Bashang in Inner Mongolia. Widespread promotion of domestic low-saponin, lodging-resistant special quinoa varieties thoroughly addressed the pain points of imported quinoa – exorbitant prices, poor local adaptability and high processing losses.
- Starting in 2015, domestic grain and oil research institutions optimized exclusive flexible flaking technology tailored to domestic quinoa's thinner, more brittle grain texture, resolving issues of fragility, poor rehydration and coarse mouthfeel in domestic quinoa flakes. The quality of domestic quinoa flakes comprehensively surpassed generic overseas processing standards.
- Between 2016 and 2018, China successively released group standards for quinoa raw grains and quinoa flakes, clarifying core specifications including saponin residue

limits, gluten-free thresholds, minimum nutrient content and processing loss rates. Substandard counterfeit quinoa products were regulated, ending the industry's unregulated wild growth phase.

- During this period, overseas quinoa flake brands maintained high price points with recipes incompatible with Chinese light dietary preferences, resulting in continuous market share decline. Domestic original-flavor and tri-color blended quinoa flakes dominated the market, completing full import substitution within China's quinoa flake sector.

(V) Stage 5: Functional Segmentation Innovation and China's Global Industry Leadership (2018 – Present)

- Core characteristics of this stage: Global R&D of quinoa flakes pivoted toward four major directions: precision gluten-free dietary formulations, clean-label zero-additive production, segmented meal replacement functionality, and snack-style morphological innovation. Supported by a fully self-controllable industrial chain, a massive health consumption market and agile iteration of new retail channels, China achieved comprehensive leadership in planting scale, processing technology, product innovation and market volume, emerging as the core engine of global deep-processed quinoa innovation.
- 2018–2021 witnessed an explosion of segmented functional domestic quinoa flakes: sugar-free low-GI quinoa flakes, high-protein sports nutrition quinoa flakes, easy-to-digest gastrointestinal care quinoa flakes, and medical-grade pure gluten-free quinoa flakes were sequentially launched. These products precisely targeted five segmented consumer groups: fat loss dieters, diabetics, gluten-intolerant individuals, athletes and middle-aged & elderly patients with chronic diseases, forming a mature matrix of localized functional products.
- From 2021 to 2023, snack-style innovation of quinoa flakes fully unfolded. New products including baked quinoa crisps, fruit & nut blended quinoa flakes, dedicated overnight quinoa bases and quinoa grain cups gained rapid popularity, breaking the fixed perception that quinoa flakes could only be consumed as hot-brewed staples and expanding all-day consumption scenarios.
- Since 2023, high-end products have undergone continuous iteration: clean-label zero-additive organic highland quinoa flakes, small-molecule easily digestible enzymatically hydrolyzed quinoa flakes, and composite plant-based quinoa grains. China has become the world's largest quinoa planting country, largest consumer market and top exporter of deep-processed quinoa products, holding globally leading full-chain technologies covering upstream breeding, midstream flaking and deep processing, and downstream scenario-based applications, and dictating the global innovation direction of the quinoa flake industry.

Part III: Commercialization Development History of Quinoa Flakes

The commercialization of quinoa flakes coincides with the global surge in demand for special diets, rising public awareness of gluten-free eating, iterative advances in precise grain deep-processing technology, the rise of China's characteristic highland agriculture, and the transformation of new retail channels. Over its 6,000-year evolution, quinoa has passed through five distinct phases: sacred staple of ancient highland civilizations, marginal coarse grain under colonial ban, modern niche special dietary food, mass healthy breakfast grain, and all-scenario functional meal replacement snack. Its clear evolutionary trajectory follows this path: sacred native highland staple → banned marginal coarse grain → niche medical gluten-free diet → national healthy breakfast grain → segmented functional all-day meal replacement snack. A chronological breakdown by dimension is provided below:

(I) Industrial Revival and Dawn of Niche Special Dietary Markets in Europe and America (1970s – 2000)

- Following the revival of quinoa germplasm in the 1970s, European and American markets pioneered commercial quinoa applications. No flaked deep-processed products existed in the early stage; only raw quinoa grains were sold exclusively to patients with celiac disease and gluten allergies, forming an extremely small market limited to medical dietary raw materials.
- The first-generation slow-cook quinoa flakes launched in the 1990s entered the health food aisles of high-end European and American supermarkets, priced far higher than conventional grain flakes such as oatmeal and cornflakes. The consumer base remained confined to high-income health enthusiasts and people with sensitive constitutions, with negligible mainstream public recognition.
- Overall commercial characteristics: Small market scale, narrow customer groups, high pricing and poor convenience. Quinoa flakes remained a peripheral category within grain food markets, excluded from mainstream breakfast grain competition.

(II) Authoritative Certification and Global Mass Market Expansion (2000 – 2013)

- The launch of quick-cook quinoa flakes in 2006 drastically lowered consumption barriers. Coupled with the rising fat loss trend across Europe and America, quinoa flakes broke out of the special dietary circle to enter the mass fat-loss meal replacement market, driving steady growth in global market volume.
- The 2008 FAO supergrain authoritative certification and 2013 International Year of Quinoa global promotion marked the core turning point for quinoa commercialization. Its three core selling points – complete protein, low GI and gluten-free composition – gained universal recognition, and the global health

consumption boom fueled exponential growth of the quinoa flake market.

- The Chinese market remained nearly blank during this period, lacking large-scale domestic cultivation and local deep-processing enterprises. All raw quinoa grains and finished quinoa flakes were imported from South and North America at exorbitant retail prices, available only in high-end supermarkets of first-tier cities with almost zero awareness among general consumers, leaving the domestic market stagnant in its infancy.

(III) Domestic Cultivation Launch and Full Elimination of Import Dependence (2013 – 2018)

- Large-scale commercial quinoa planting officially launched in Qinghai in 2013, marking the start of independent control over China's upstream quinoa raw material supply and breaking the monopoly of overseas raw grain suppliers. Subsequent production launches in Shanxi and Inner Mongolia pushed the domestic self-sufficiency rate of quinoa raw materials upward year by year.
- Starting in 2015, domestic grain processing enterprises flooded into the quinoa flake track. Leveraging local raw material cost advantages and taste formulations tailored to Chinese palates, they launched cost-effective domestic instant quinoa flakes priced at merely one-third to one-half of imported equivalents, rapidly penetrating mass domestic consumer markets.
- Between 2016 and 2018, the rollout of domestic industry group standards eliminated market chaos from counterfeit and substandard products. Domestic quinoa flake brands expanded rapidly across online e-commerce channels, completely ending the long-term monopoly of overseas brands in China and propelling the domestic quinoa flake market onto a fast track of large-scale growth.

(IV) Consumption Upgrade and Full Explosion of Segmented Functional Tracks (2018 – 2021)

- Driven by nationwide surging demand for chronic disease management, precision nutrition, gluten-free diets, and fat loss & calorie control, quinoa flakes underwent a second value upgrade: evolving from affordable high-end healthy breakfasts to segmented functional diets for targeted populations, forming four core specialized tracks.
    1. Basic Essential Track: Original instant quinoa flakes and tri-color blended quinoa flakes, marketed for strong satiety, complete nutrition and affordable convenience for daily household breakfast and mass basic meal replacement scenarios.
    2. Medical-Grade Gluten-Free Track: High-purity deeply de-glutenized quinoa flakes designed for gluten-intolerant and gastro-sensitive consumers as medical

staple substitutes, filling the domestic market gap for gluten-free grain staples.

3. Chronic Disease Blood Sugar Control Track: Low-GI pure quinoa flakes and sugar-free composite quinoa flakes tailored to staple replacement needs of diabetic and hyperlipidemia populations.
4. Taste Upgrade Track: Fruit & nut blended quinoa flakes and yogurt-compatible quinoa flakes optimized for palatability to match taste preferences of young consumers.

- During this stage, China achieved full independent control over the entire industrial chain covering breeding, processing, formulation and sales channels. Its market volume surpassed Europe and America to become the world's largest consumer market for quinoa flakes.

(V) Full-Scale Snack-Style Innovation and China's New Era of Global Leadership (2021 – Present)

- After 2021, supported by mature domestic live-stream e-commerce, content e-commerce and new retail channels, as well as young consumers' demand for snack-style, all-day, aesthetically appealing food, China spearheaded the third global product revolution for quinoa flakes: abandoning the single staple food positioning to fully evolve into all-day casual healthy snacks.
- A dense wave of innovative industry products hit the market: low-temperature baked quinoa crisps, instant quinoa meal replacement cups, dedicated overnight quinoa bases, quinoa sandwich energy bars, and quinoa baking ingredients. Consumption scenarios now span breakfast, sports supplementary meals, afternoon tea, late-night snacks, outdoor travel and camping, completely redefining the consumption boundaries of quinoa flakes.
- The global quinoa industry now features a clear differentiated landscape: established European and American enterprises remain focused on traditional original-flavor quinoa flakes and basic medical gluten-free diets with slow product iteration and weak innovation momentum. Chinese enterprises, backed by massive domestic consumer demand, flexible new retail models and rapid product iteration capabilities, specialize in innovative snack-style quinoa, segmented functional quinoa and composite grain quinoa products, holding sway over global R&D discourse for deep-processed quinoa goods.
- Full industrial chain advantages are fully demonstrated: Upstream coverage of independent highland breeding delivers a domestic quinoa raw material self-sufficiency rate exceeding 90%, eliminating reliance on South American imports. Midstream flexible flaking, low-temperature fresh-locking and deep saponin removal technologies rank among the world's most advanced. Downstream applications extend to baking, prefabricated meal replacements, special medical foods and gluten-free pet complementary feeds, continuously elevating overall industrial chain added value.

Future Development Outlook of the Industry

The global quinoa flake industry will continue upgrading around five core directions: precision functionalization for special diets, clean-label zero-additive ingredients, low-carbon green highland cultivation, internationalization of gluten-free standards, and full-scenario snack-style extension. The industry's growth drivers have shifted from early-stage domestic raw material localization and processing convenience upgrades to a high-quality development model centered on customized nutrition for targeted populations, deep cultivation of medical-grade diets, low-carbon planting and processing, clean-label manufacturing, and cross-category raw material reuse.

Leveraging its full industrial chain advantages in characteristic highland agriculture, advanced grain deep-processing technology and innovative new retail channels, China will lead updates to global standards covering quinoa germplasm improvement, quinoa flake processing safety and gluten-free dietary specifications. The country will continue to deepen development of three high-value tracks: medical special diets, staple foods for chronic disease management, and sports nutrition meal replacements. Quinoa flakes will advance through three tiers of market positioning: from high-end niche healthy grains to daily national staples, dedicated medical diets, and premium baking ingredients. China's core leading position across the full global quinoa industrial chain – planting, deep processing and product innovation – will be continuously consolidated.