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RESEARCH NOTE

Quinoa Industry Development in China

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Abstract

Y. Xiu-shi, Q. Pei-you, G. Hui-min, and R. Gui-xing. 2019. Quinoa Industry Development in China. Cien. Inv. Agr. 46(2): 208-219. Quinoa, a food crop native to South America, is now gaining much attention in China. Quinoa was introduced to China in the 1960s; however, it was only distributed in scattered districts until 2008. The foundation of the Quinoa Committee of the Crop Science Society of China (QCCSSC) in 2015 has promoted the combination of policy-makers, researchers, manufacturers, and farmers related to quinoa. In 2018, the harvest area of quinoa in China increased to nearly 12,000 ha, with a total production of 20,000 tons distributed in 24 provinces. Through the collaboration of enterprise and research institutes, quinoa cultivation techniques were integrated into different eco-regions, and a series of stabilized breeding materials was gained. Additionally, 14 varieties were certified by provincial or municipal cultivar registration committees. Quinoa products, such as noodles, liquor, and yogurt, were developed based on nutritional and technological research. Thanks to the promulgation of the first Chinese industrial standard for quinoa, quinoa products are now available both in online shops and offline supermarkets. Above all, China is undergoing an adjustment of sustainable agricultural policy and increasing demands for more nutritional and diversified foods, demonstrating a great prospect for quinoa.

Keywords: Breeding, China, cultivation, market, product, quinoa.

Introduction

Quinoa, an important food of the Andean pre-historic inhabitants, has been cultivated in the Andes areas for at least 7,000 years (Bazile *et al.*, 2015; Zurita-Silva *et al.*, 2014). Quinoa has been rediscovered for its nutritional values, such as high protein content with balanced amino acid composition, abundant types of vitamins, min-

eral elements, and various flavonoids (Abugoch James, 2009; Fuentes and Bhargava, 2011; Stikic *et al.*, 2012; Wright *et al.*, 2002; Vega-Gálvez *et al.*, 2010; Yao *et al.*, 2014a; Yao *et al.*, 2014b). In addition, it exhibits the characteristics of cold, drought and salinity resistance, which is important to the sustainable development of agricultural ecosystems (González *et al.*, 2009; Jacobsen *et al.*, 2007; Jensen *et al.*, 2000).

Quinoa originates from South America, including Peru, Bolivia, Ecuador, Chile, etc. Since the 20th century, it has been introduced in Europe, North

America, Africa, and Asia (Bhargava *et al.*, 2006; Christensen *et al.*, 2007; Jacobsen 1997; Oyoo *et al.*, 2010). In the 1960s, quinoa germplasm was first introduced to China by cultivation experts from the former Institute of Crop Breeding and Cultivation, Chinese Academy of Agricultural Sciences (CAAS). However, the germplasm was only stored in the genebank without utilization. In 1988, the Tibet Agriculture and Animal Husbandry University introduced three quinoa varieties from Bolivia and started the first cultivation of quinoa in China (Gongbu *et al.*, 1994). During the following 10 years, some studies related to the evaluation of the biological characteristics, cultivation, breeding, and plant diseases of quinoa were gradually performed (Gongbu and Wang, 1995; Gongbu *et al.*, 1996; Wang *et al.*, 1995).

Since the Food and Agriculture Organization of the United Nations' (FAO) declaration of 2013 as the "International Year of Quinoa", quinoa has become well-known in China as an important crop with healthy benefits. In 2105, scientists from the Institute of Crop Sciences (ICS) at the CAAS collaborated with experts and entrepreneurs from domestic institutions, universities, and enterprises to establish an association called the Quinoa Committee of the Crop Science Society of China (QCCSSC). Under the promotion of QCCSSC, from 2015 to 2018, three nationwide quinoa summits were held, and two quinoa books were translated into Chinese. All these efforts received great attention from the central government and promoted quinoa to be listed in the crops guided by the Ministry of Agriculture and Rural Affairs of China. In 2018, the total cultivation area of quinoa in China was nearly 12,000 ha according to the statistical data from QCCSSC. In this study, the quinoa industry development in China will be summarized, including the cultivation and breeding, processing and marketing, as well as opportunities and challenges to provide information for quinoa industry participants all over the world and to promote its sustainable development.

Quinoa cultivation and breeding in China

Quinoa has been cultivated in different ecological environments from sea level to altitudes greater than 4,000 m in South America. In China, quinoa could also be cultivated in diversified ecological environments from the altitudes of 154 m below sea level (Turpan City, Xinjiang) to more than 5,000 m (Shangri-la City, Yunnan). Currently, Chinese quinoa is mainly cultivated in the provinces of Gansu, Inner Mongolia, Qinghai, Yunnan, Shanxi, Hebei, Jilin and Tibet (Fig. 1). Generally, in the northern regions of China, quinoa is often sown in the first ten days of May and harvested at the end of October. However, the sowing period is moved up to March or April in the southern regions of China due to the higher temperature. The total area and production in 2018 were approximately 12,000 ha and 20,000 tons, respectively. With the scaling up of quinoa production in China, variety registration and mechanized production have been achieved in several provinces.

Quinoa cultivation and breeding in Gansu Province

Gansu Province, located in northwest China, with an altitude of 1,000–3,400 m and scarce precipitation, has proven to be an excellent place to produce quinoa. In 2010, quinoa was first introduced here from Bolivia by the Animal Husbandry, Pasture and Green Agriculture Institute, Gansu Academy of Agricultural Sciences. After 5 years of effort, in 2015, this institute cultivated the first provincially registered quinoa variety in China, named "Longli-1" (Table 1). The growth period of this middle maturity variety is 128–140 d, which makes its cultivation practicable in many regions in Gansu, which has an altitude from 1,500 to 3,000 m (Yang, 2015). Another six quinoa varieties, named "Longli-2", "Longli-3", "Longli-4", "Tiaoli-1", "Tiaoli-2", and "Tiaoli-3", were subsequently approved in 2016. With the promotion of local enterprises and farms, these varieties rapidly



Figure 1. Distribution of quinoa in China.

Table 1. The official released varieties of quinoa in China[†].

Variety	EC	Yield (kg ha ⁻¹)	GD (d)	TKW (g)	Protein (g kg ⁻¹)	Plant height (cm)	Released year/province
Longli-1	White	2,007	128-140	2.40-3.46	171.5-187.8	181.2-223.6	2015/Gansu
Mengli-1	White	2,865	107-115	2.85-3.14	166.0	64.5	2015/Inner Mongolia
Longli-2	White	1,482	150	2.87	-	194	2016/Gansu
Longli-3	White	1,830	111	2.42	-	223	2016/Gansu
Longli-4	White	2,229	118	2.97	-	195	2016/Gansu
Tiaoli-1	White	2,699	124-132	2.85-3.45	147.2-170.4	158.0-182.0	2016/Gansu
Tiaoli-2	White	-	-	-	-	-	2016/Gansu
Tiaoli-3	Red	-	-	-	-	-	2016/Gansu
Qingli-1	White	5,270	120-150	3.30-3.70	148.0	170.0	2016/ Qinghai
Qingli-2	White	-	-	-	-	205.3	2017/Qinghai
Qingli-3	White	-	-	-	-	-	2017/Qinghai
Qingbaili-1	White	4,446	-	-	-	-	2018/Qinghai
Qaidam Red-1	Red	2,172	-	-	-	-	2018/Qinghai
Qaidam Black-1	Black	1,890	-	-	-	-	2018/Qinghai

[†]EC, episperm color; GD, growth duration; TKW, thousand kernels weight.

“-” data not available.



Figure 2. Different quinoa germplasms cultivated in Inner Mongolia.

spread to more than ten counties in Gansu, with a total growing area of approximately 3,300 ha in 2018. Gansu is now the largest quinoa-producing region in China.

Quinoa cultivation and breeding in Inner Mongolia Autonomous Region

The Inner Mongolia Autonomous Region straddles the three major regions of northeast China, north China and northwest China, as shown in Fig. 1. In 1988, the Inner Mongolia Agricultural University (IMAU) began to cultivate quinoa in Hohhot City (Ren *et al.*, 2015). Quinoa biological characteristics and high yield cultivation technology research were then performed with financial support from the Science and Technology Department of Inner Mongolia. In 2015, a local company, Inner Mongolia YIJI Biotechnology Company, started to grow 20 ha of quinoa in Hohhot. In 2016, with the support of Ulanqab Agriculture and Animal Husbandry Bureau, the company sowed 400 ha of quinoa in Ulanqab City. With

the cooperation of IMAU and ICS, many quinoa germplasms were introduced in Ulanqab (Fig. 2). In addition, a quinoa variety bred by ICS and the company, “Mengli-1”, was certified by the Hohhot Committee of Crop Variety Certification in 2015 (Table 1). This cultivar exhibited good drought resistance with 16.6% grain protein. In addition, the forage quality (straw protein content 28.7%, neutral detergent fiber content 36%, acid detergent fiber content 25%, saponin content 1.75 mg g⁻¹) indicated that during anthesis, the whole-plant straw is good for forage (unpublished data from the author). In addition, “Zhongli-1”, another cultivar used for forage was also selected. The planting area of quinoa in this province was approximately 2,300 ha in 2018. It is now the 2nd largest quinoa-producing province in China.

Quinoa cultivation and breeding in Qinghai Province

Qinghai is also a northwest province of China, characterized by high altitude with a cool climate,



Figure 3. Quinoa sowing and harvesting by machine in China.

wide diurnal temperature variation, dry environment and high illumination intensity. In this province, quinoa was first introduced from the USA to a small county called Minhe in 2013. In the next year, Qinghai Three Rivers Fertile Soil Eco-agricultural S&T Company cultivated 150 ha of quinoa in Wulan County. At the same time, large scale quinoa cultivation was also found in the cities of Delingha and Golmud. With the help of enterprisers from Shanxi and professors from the University of Buenos Aires in Argentina, the average yield of quinoa in Qinghai reached 2,400 kg ha⁻¹, with the highest yield of 6,138 kg ha⁻¹ in some fields (Li, 2015). In 2015, at least 9 cities or counties in Qinghai began to grow quinoa, with a total area of approximately 487 ha. In 2018, the production area of quinoa in Qinghai was approximately 1,700 ha. Six quinoa varieties, “Qingli-1”, “Qingli-2”, “Qingli-3”, “Qingbaili-1”, “Qaidam Red-1”, and “Qaidam Black-1” were successively approved by the Qinghai Seed Management Station from 2016 to 2018 (Huang *et al.*, 2018; Song *et al.*, 2017). Due to the large diurnal temperature variation, quinoa in Qinghai often exhibits large

size (Liu *et al.*, 2015). Machines for foxtail millet or wheat have been refitted and gradually used in quinoa sowing and harvesting to save manpower and improve efficiency (Fig. 3).

Quinoa cultivation in Yunnan Province

Yunnan is a southwest province of China, with a favorable temperature and altitude for quinoa cultivation. In 2015, Taimei Group Company successfully introduced quinoa to the northwest of Yunnan in a county called Yongsheng. The altitude of this county is from 1,000 to 3,900 m, with an annual mean temperature of 13.5 °C. The sowing dates here are usually the last ten days in April, and the harvest time is often around September 10. In 2016, with support from the Yunnan Academy of Agricultural Sciences, the cultivation area of quinoa in Yongsheng increased to 330 ha with an average yield of 3,000 kg ha⁻¹. In the past year, quinoa was spread to Dali, Lijiang, and Shangri-la City, with a total cultivation area of 1,700 ha.

Quinoa cultivation in Shanxi Province

Shanxi was the first province to grow quinoa on a large scale in 2008. With the encouragement of the local government and technological support from the enterprise, the quinoa area at Jingle, a small county in Shanxi, increased to 667 ha in 2013. It immediately became the largest quinoa production county in China and was therefore known as the “Hometown of Quinoa in China”. In this province, the cultivation technology research of quinoa was mainly conducted by enterprises. Agricultural research institutes and experimental stations, such as Shanxi Agricultural University, Shanxi Forestry Vocational Technical College, Shanxi Agricultural Seed Station, Xinzhou Soil and Fertilizer Station, etc. were also involved (Ma, 2015). Experience on quinoa sowing date, field management, and harvest technology was summarized. Several cultivars with different maturing times have been screened but without official certification (Liu and Fan, 2011). However, diseases of downy mildew, leaf spot and black rod disease showed adverse effects on the cultivation of quinoa from 2015 to 2016 in Shanxi (He, 2017). In 2018, the sowing area of quinoa in Shanxi was approximately 1,300 ha, with Xinzhou City and Shuozhou City as the main growing regions.

Quinoa cultivation in Hebei Province

Hebei is a major province for winter wheat and summer maize production. Since the maize price has declined over the years, it is urgent to find a rotation crop to substitute for maize. Quinoa should be a great candidate for this rotation. In 2013, the Zhangjiakou Academy of Agricultural Sciences (ZAAS) successfully introduced 4 quinoa cultivars from Shanxi province to Zhangjiakou City, and the experimental cultivation yield reached 3,637.35 kg ha⁻¹ (Zhou *et al.*, 2014). In 2014, the academy began to screen quinoa varieties from types of quinoa germplasm. At the same time, a quinoa seeder was developed by

cooperation between the academy and a farm machinery company. Cultivation technology, including sowing date, plant density, and fertilization, were all studied. In 2015, the Quinoa Institute of ZAAS was established, which is the first official institution for quinoa research in China. In 2018, the cultivation area in Hebei increased to 600 ha.

Quinoa cultivation in Jilin Province

Jilin is a northeast province of China with cold weather in spring and winter, concentrated precipitation in summer and rich soil conditions. The cultivation of quinoa in Jilin began in 2013 in the cities of Changchun City and Baicheng City conducted by Jilin BODA Oriental Company. In 2014, this company cultivated 67 ha of quinoa in Changchun City with an average yield of 3,000 kg ha⁻¹. In the next year, this company built a collaborative laboratory with ICS for quinoa breeding and processing. It is noteworthy that the “1st China Quinoa Industry Summit” was also held in Changchun under the financial support of the company. This summit largely promoted quinoa industry development in Jilin and in other provinces of China by combining expertise from FAO, Peru, Bolivia and Ecuador. In 2018, the quinoa area in Jilin was approximately 600 ha.

Quinoa cultivation in Tibet Autonomous Region

Tibet is the first region in China to begin quinoa research, starting in the 1990s. Quinoa was successfully cultivated in Linzhi City, although the tested materials exhibited a wide range of growth durations from 103 to 211 days (Gongbu *et al.*, 1994). However, during the first decade of the 21st century, the cultivation area here has not rapidly increased. This might have been caused by the shortage of research funds from the government and the absence of related enterprises. Tibet Agriculture and Animal Husbandry University (TAAHU) is the leading research unit

here, and at least ten lines of quinoa have been selected by this university (Ren *et al.*, 2015). In 2017, six quinoa lines selected by TAAHU were introduced to Lhasa City, with a growth duration from 127–142 days and an average yield from 975–2,610 kg ha⁻¹ (Mao *et al.*, 2017). In 2018, the quinoa area of Tibet was estimated to be approximately 600 ha.

Quinoa cultivation in other provinces of China

In addition to the above 8 provinces, 16 other provinces have begun quinoa cultivation, including Heilongjiang, Liaoning, Sichuan, Shandong, Jiangsu, Anhui, and Guizhou. These provinces are located from north to south or from west to east in China, which proves the wide adaption of quinoa. In Heilongjiang, quinoa was introduced to the cities of Daqing, Harbin, and Qitaihe in 2015. In Sichuan, Guizhou, Chongqing and Hunan provinces in southwest China, quinoa was often sowed in the first ten days of March, and the yield was approximately 3,000 kg ha⁻¹. The authors have tried to cultivate quinoa in Jiangsu and Anhui, two southeast provinces in China, but the high temperatures and heavy rainfall from June to August had negative effects on the growth of quinoa. It is noteworthy that a special quinoa germplasm collected from Taiwan is resistant to high temperatures and heavy rainfall. This germplasm might also be adapted to the climates of the southeast and south provinces in China.

Quinoa processing and market in China

Since the 21st century, the international demand for quinoa has been increased by the diversification of quinoa food and the positive actions from FAO. Quinoa processing in China has also developed with the scaling up of quinoa cultivation. There are an increasing number of companies engaged in quinoa cultivation and processing. Many quinoa products are available in domestic markets.

Quinoa companies in China

In recent years, there has been a rapid increase in the number of quinoa companies in China. According to the statistical data of the National Enterprise Credit Information Publicity System, there are more than 100 registered quinoa companies as of December 2018. Approximately 80% of them are located in Shanxi, Gansu and Qinghai provinces due to their long cultivation history and large growing areas. There are some typical companies that have played important roles in the development of the Chinese quinoa industry (Table 2).

As shown in the table, Shanxi JIAQI Quinoa Development Company introduced quinoa into Shanxi Province and selected several stable lines for the local climate with the help of experts from Argentina. Qinghai Three Rivers Fertile Soil Eco-

Table 2. Typical quinoa companies and products in China.

No	Company name	Location	Major products
1	Shanxi JIAQI Quinoa Development Company	Taiyuan City, Shanxi	Pearled grain, quinoa flour, quinoa noodles
2	Qinghai Three Rivers Fertile Soil Eco-Agricultural S&T Company	Wulan County, Qinghai	Pearled grain, quinoa flour, baked-quinoa tea
3	Jilin BODA Oriental Quinoa Development Company	Changchun City, Jilin	Pearled grain, quinoa flour, baked-quinoa tea
4	Shanxi YILONG Quinoa Development Company	Jingle County, Shanxi	Pearled grain, flakes, puffed quinoa powder
5	Inner Mongolia YIJI Biotechnology Company	Hohhot City, Inner Mongolia	Pearled grain, quinoa flour
6	Gansu Yuanda Investment Group Company	Lanzhou City, Gansu	Pearled grain, quinoa yellow wine, quinoa biscuit

agricultural S&T Company is the leading company in Qinghai Province, with businesses involved in quinoa growing and processing. Jilin BODA Oriental Quinoa Development Company is engaged in quinoa growing and held the “1st China Quinoa Industry Summit” in cooperation with the QCCSSC in 2015. Shanxi YILONG Quinoa Development Company, one of the quinoa processing companies, has a production line that can produce 3,000 tons of pearled quinoa per year, as well as a production line for puffed quinoa foods. Inner Mongolia YIJI Biotechnology Company is the largest quinoa cultivation company in the region and carried out the “2nd China Quinoa Industry Summit”. Gansu Yuanda Investment Group Company established the Sino-Quinoa Joint Research Center for Quinoa with ICS to support planting of 2,250 ha of quinoa in Gansu Province in 2018.

Quinoa products

Quinoa products have been diversified each year in international markets. In addition to pearled quinoa, products of quinoa sprouts, noodles, and cakes are now welcomed by citizens in developed countries. Quinoa was a new food resource in China, so it had to obtain market permission from the food administration. However, there was no national or industrial standard for quinoa permission. In 2015, the first industrial standard for quinoa in China (Milled quinoa, LS/T 3245-2015), drafted by ICS, was approved by the State Administration of Grain. This standard specifies the quality control of pearled quinoa and is meaningful for promotion of the quinoa market.

With the increase of quinoa production and permission of market entry, quinoa food products have been greatly diversified. At present, in addition to the primary products of quinoa grain and flour, many other foods, such as noodles, Chinese steamed bread, flakes, cakes, and biscuits can also be found in the domestic market (Li *et al.*, 2018a; Liu *et al.*, 2018). Quinoa is also used

for beverages, yogurt, yellow wine, and liquor production (Li *et al.*, 2018b). In addition, a quinoa diet is now provided in KFC, Yoshinoya, and some local restaurants in China.

Quinoa market in China

Quinoa products in the Chinese market are mainly sold on the internet due to the developed and convenient e-commerce platform, such as “Taobao.com” and “JD.COM”. However, the price of quinoa products is still not unified. For example, the price of pearled quinoa ranged from 3.5 to 23 U.S. dollars per kilogram according to different quality and brand. One kilo of quinoa noodles is often priced from 11 to 31 dollars. It is obvious that food processing could improve the value of quinoa. This is further reflected in the price of quinoa liquor at 80 dollars per 500 mL bottle.

Generally, the quinoa grain (unpeeled) harvested from the field by farmers can be sold to a company at a price of 1.15 to 2.25 U.S. dollars per kilogram. However, after processing and packaging, the price increases by several and even ten times. The high prices of some companies could be partly due to high publicity expenses, such as TV advertisements for improving consumer awareness of quinoa. Since 2017, quinoa products have been available in some supermarkets, such as Carrefour and Walmart, as well as exclusive stores for grains.

Referring to the price from Amazon (www.amazon.com), organic pearled quinoa is approximately 8–12 U.S. dollars kg⁻¹. Compared with Amazon, the price for formal quinoa products in China is too high, since the most of them are non-organic. However, more efforts have been made to produce organic quinoa in Gansu, Inner Mongolia, and Hebei since 2014. Plentiful organic quinoa products will soon come into the domestic market.



Figure 4. Quinoa products developed in China. Pearled quinoa (a), quinoa flour (b), quinoa liquor (c), puffed quinoa powder (d), quinoa noodle (e), and quinoa yogurt (f).

Opportunities and challenges of quinoa in China

Opportunity to develop quinoa in China

In recent years, the price of imported corn has been largely decreased, and maize has become uneconomical to grow in China. In 2015, the Ministry of Agriculture and Rural Affairs of China held a meeting in Inner Mongolia to arrange the task of decreasing the cultivation area of maize by more than 3,460,000 ha in the provinces of Heilongjiang, Jilin, Liaoning, Inner Mongolia, etc. The decrease of maize cultivation area provides a great opportunity for quinoa development, especially in Gansu, Shanxi, Jilin and Inner Mongolia, where they have successfully cultivated quinoa on a large scale.

At the same time, quinoa is also applicable in the crop rotation of potatoes. In China, there are at least 5,000,000 ha of potatoes, and most fields need to be rotated to restore soil and maintain a stable yield

(Cui, 2018). Generally, oats, buckwheat, and flax are widely used rotation crops for potato. However, their economic returns have not been favorable over the years. Quinoa can bring more economic benefits for farmers because of the satisfactory price in both domestic and international markets. Therefore, it is the great chance to develop quinoa in China, especially under the policies of “Poverty Relief” and “Rural Revitalization”.

Challenges in quinoa development

Although it is the right time to develop quinoa in China, some challenges are particularly worthy of attention. The first point is the lack of good variety. After several years of research, there are only 14 registered varieties in China. Good varieties with high yield, high protein, large seed size, low saponin, and resistance to biotic stresses are strongly needed. Therefore, it is very important to introduce quinoa varieties or various germplasms from the original countries.

Second, cultivation technology, including fertilization, weeding, irrigation, pest control, and disease control, should be studied to improve the yield and quality of quinoa. Additionally, organic quinoa certification should be accelerated to improve competitiveness in the international market. At the same time, the specialization of machines for sowing, weeding, and harvest of quinoa and according to the characteristics of quinoa variety and local environment is urgently needed.

Finally, product diversification and marketing are the terminal points of the quinoa industrial chain. In China, specialized quinoa processing machines should be imported from abroad. Products such as instant food, infant food, and functional food must be developed based on research on quinoa nutrition and health benefits. In addition, the product chain of quinoa should be lengthened by developing daily cosmetic products, such as saponin for antibacterial products (Stuardo and Martín, 2008; Zhao *et al.*, 2018).

China is a country with a large population. Food production and safety have always been basic and vital issues for the Chinese government, which can be witnessed from the annual Document NO.1 of the Central Government. As

a food crop with great nutrition and resistance to biotic stresses, quinoa will certainly play an important role in crop structure adjustment. Quinoa produced here will hopefully bring health benefits for everyone in this country and all over the world.

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Resumen

Y. Xiu-shi, Q. Pei-you, G. Hui-min, y R. Gui-xing. 2019. Desarrollo de la Industria de la Quinoa en China. Cien. Agr. 46(2): 208-219. La quinua, un cultivo alimenticio originario de América del Sur, ahora está ganando mucha atención en China. La quinua se introdujo en China en la década de 1960; sin embargo, solo se distribuyó en distritos dispersos hasta 2008. La fundación del Comité de Quinoa de la Sociedad de Ciencia de Cultivos de China (QCCSSC) en 2015 ha promovido la combinación de creadores de políticas, investigadores, fabricantes y agricultores relacionados con la quinua. En 2018, el área de cosecha de la quinua en China aumentó a casi 12,000 ha, con una producción total de 20,000 toneladas distribuidas en 24 provincias. A través de la colaboración de empresas e institutos de investigación, las técnicas de cultivo de quinua se integraron en diferentes ecorregiones y se obtuvo una serie de materiales de reproducción estabilizados. Adicionalmente, 14 variedades fueron certificadas por comités de registro de cultivos provinciales o municipales. Los productos de la quinua, como los fideos, el licor y el yogur, se desarrollaron a partir de investigaciones nutricionales y tecnológicas. Gracias a la promulgación del primer estándar industrial chino para la quinua, los productos de quinua ahora están disponibles tanto en las tiendas en línea como en los supermercados fuera de

línea. Por encima de todo, China está experimentando un ajuste de la política agrícola sostenible y la creciente demanda de alimentos más nutritivos y diversificados, lo que demuestra una gran perspectiva para la quinua.

Palabras clave: China, cultivo, cría, mercado, producto, quinua.

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