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Present Situation of World Banana Production and Trade and Its Industrial Prospects

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Abstract Banana is an important cash crop and food crop in tropical and subtropical areas. It is the fruit with the largest production, trade volume and trade value among the fresh fruits in the world. The sustainable development of banana industry is of great significance to promote the rural revitalization in China and even the agricultural economic development in the tropical areas of the world. The main banana producing and exporting countries are mainly concentrated in Asia and America. In 2020, the harvested area and production of bananas in the world were 5.203 5 million ha and 119.833 7 million t, respectively, which increased by 24.58% and 72.57% compared with that in 2001. The main producing countries were India, China, Indonesia, Brazil and Ecuador. At present, there are about 200 countries or regions importing bananas in the world. In 2020, the world's banana import value and import quantity were 233 761 million t and 15.607 billion USD, respectively, increasing by 71.42% and 165.06% compared with 2001. The main importing countries are the United States of America, China, Russia, Germany and Finland. In 2020, the export volume and value of bananas in the world were 24.497 million t and 13.356 billion USD, respectively, increasing by 67.93% and 218.03% compared with 2001. The main exporting countries are Ecuador, Costa Rica, Guatemala, Colombia and the Philippines. China is the second largest banana producer and importer in the world. In 2020, the production and import volume of bananas were separately 11.872 6 million t and 1.819 2 million t, accounting for 9.91% and 7.78% of the world. According to the forecast of banana production and trade data of the FAO, the world banana production and trade volume are forecast to show a steady growth trend. And it is predicted that the world banana production, import and export volume will reach 159.644 8 million t, 31.051 4 million t and 32.194 1 million t, respectively in 2030, increasing by 33.22%, 32.83% and 31.42% compared with 2020. At the same time, the world banana industry is facing challenges such as global climate change, banana wilt and soil acidification in banana planting areas. Carrying out breeding cooperation of banana varieties with disease resistance, stress resistance and high yield, and strengthening joint research and development of green, high-quality and efficient banana production technology, will contribute to the sustainable development of banana industry and promote the banana quality safety and world food security.

Key words Banana, Main producing countries, Production, Trade, Quality and safety

1 Introduction

Banana (*Musa nana* Lour.) is an important cash crop and food crop in tropical and subtropical areas. Due to its nutritious, aromatic and delicious taste, banana is deeply loved by consumers and has become the fruit with the largest yield, trade volume and trade value among fresh fruits in the world. Asia, America and Africa are the core banana producing areas and play an important role in global banana production and supply. With the acceleration of world economic integration and the continuous breakthrough of relevant trade and technical barriers, as well as the economic rise of some developing countries, the world total trade volume and trade amount of bananas have shown a sustained and rapid growth

trend in the past 30 years. In addition, the increase in world banana prices has also continued to stimulate investment and production in the banana industry. The total banana harvest area and import and export trade volume have grown rapidly. The distribution of world banana production, import and export is affected by climate change, national policies, as well as supply and demand. The healthy development of the banana industry is conducive to the harmony and stability of tropical rural areas, economic growth and poverty alleviation, and is of great significance to alleviating global hunger and promoting social and economic development^[1–2].

China is one of the origins of bananas with a cultivation history of more than 3 000 years. Banana has become an important fruit industry in China's tropical and subtropical areas, playing an important role in economic and social development of rural areas^[3–4]. In 2020, China's banana yield ranked second in the world^[5]. However, in recent years, the organization, scale, mechanization and standardization of China's banana production are relatively low, the sales organization is weak, and the spread of banana blight has greatly restricted the development of China's banana industry. Influenced by natural disasters and banana

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blight, the key areas for banana planting in China are moving from the traditional Guangdong and Hainan to Guangxi, Yunnan and other regions. At present, under the guidance of the Belt and Road Initiative and the agricultural "going out" strategy, China's banana planting industry has expanded to ASEAN countries such as Laos, Myanmar, Vietnam and Cambodia. In terms of the banana trade, China's banana import channels are diversified. A large number of high-quality bananas from countries such as the Philippines, Ecuador, Thailand, and Mexico have flooded into the Chinese market, and the import volume and quality of bananas have increased year by year^[6-8]. The existing banana production and trade is changing the competition and market pattern of the world banana industry, and has brought new challenges to the advantageous planting areas, industrial marketing models and strategies of bananas. Therefore, paying attention to the development and trade of the global banana industry is of great significance to the sustainable development of both the world and China's banana industry.

2 General situation of world banana production

2.1 Banana harvested area The world banana planting areas are distributed in Asia, America, Africa, Oceania and Europe. In the world, there are about 120 banana producing countries and regions, mainly distributed in southern, southeastern and eastern Asia, southern, central and Caribbean regions of America, eastern, central and northern Africa, Melanesian Islands in Oceania and southern Europe. According to data released by the FAO^[5], in 2008–2020, the annual harvested area of bananas in the world exceeded 5 million ha, of which 5 477 600 ha in 2011, which was the highest in history. The world banana harvested area in 2020 was 5 203 500 ha, an increase of 24.58% over 2001, a steady growth rate of 0.09% year-on-year, and an average annual growth rate of 0.89% (Fig. 1). In 2020, the top ten countries of banana harvested area were India, Brazil, China, Tanzania, Congo (DRC), the Philippines, Rwanda, Burundi, Peru and Ecuador.

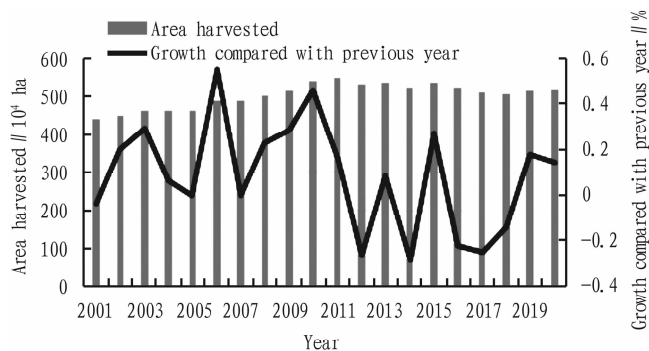
Table 1 Top five countries of banana harvested area in different regions in 2020

Ranking	Asia		Africa		America		Oceania	
	Country	Area harvested	Country	Area harvested	Country	Area harvested	Country	Area harvested
1	India	87.80	Tanzania	32.34	Brazil	45.50	Papua New Guinea	7.79
2	China	33.86	Congo (DRC)	22.61	Peru	16.07	Australia	1.23
3	Philippines	18.76	Rwanda	16.61	Ecuador	16.06	Samoa	0.31
4	Indonesia	15.81	Burundi	16.36	Colombia	9.94	Vanuatu	0.16
5	Vietnam	13.19	Angola	15.76	Guatemala	9.36	Kiribati	0.14

Note: Data from the FAO, the same below.

2.2 Banana yield With the rise in the banana harvested area and the continuous improvement in banana cultivation, management technology and standardization, the world banana yield is also increasing year by year. In 2020, the world banana yield reached 119.833 7 million t, a year-on-year increase of 0.20%, but an increase of 72.57% over 2001. The year-on-year growth rate increased steadily at an average of 0.30%, and the average

The banana harvested area of these ten countries reached 3.074 5 million ha, accounting for 59.09% of the world. Among them, the harvested areas of India, Brazil and China were 878 000, 455 000 and 338 600 ha, separately accounting for 16.87%, 8.74% and 6.51% of the world. In recent years, banana production has been mainly concentrated in Asian, African and American countries, and the harvested area of these countries accounted for more than 70% of the world. In 2020, the top five countries in Asia for banana harvested area were India, China, the Philippines, Indonesia and Vietnam (Table 1), the total banana harvested area of these five countries reached 1 694 200 ha, accounting for 32.56% of the world; the top five countries in Africa for banana harvested area were Tanzania, Congo (DRC), Rwanda, Burundi and Angola, the total banana harvested area of these five countries reached 1 036 700 ha, accounting for 19.92% of the world; the top five countries in the Americas for banana harvested area were Brazil, Peru, Ecuador, Colombia and Guatemala, the total banana harvested area of these five countries was 969 300 ha, accounting for 18.63% of the world; however, the sum of the banana harvested area of the top five countries in Oceania was only 1.85% of the world.



Note: Data from the FAO, the same below.

Fig. 1 Area harvested of banana in the world in 2001–2020

annual growth rate was 2.91%; in particular, the average annual growth rate from 2004 to 2010 remained at 6%, as shown in Fig. 2. In 2020, the top ten countries of world banana yield were India, China, Indonesia, Brazil, Ecuador, the Philippines, Guatemala, Angola, Tanzania and Costa Rica, their banana yield together accounted for 70.69% of the world total banana yield. Specifically, the banana yield of India, China and Indonesia was

31.504 0 million t, 11.872 6 million t and 8.182 8 million t, respectively, accounting for 26.29%, 9.91% and 6.83% of the world. Asia is the largest continent for banana production in the world, accounting for more than 50% of the world banana production. In 2020, the top five countries in Asia for the banana yield were India, China, Indonesia, the Philippines and Vietnam (Table 2), and their total banana yield was 59.706 million t, accounting for 49.82% of the world; the top 5 countries in America for banana yield were Brazil, Ecuador, Guatemala, Costa Rica and Mexico, with a total banana yield of 22.130 3 million t, accounting for 18.47% of the world; the top five countries in Africa for banana yield were Angola, Tanzania, Kenya, Egypt and Burundi, with a total banana yield of 12.054 1 million t, accounting for 10.06% of the

world; by contrast, the sum of the banana yield of the top 5 countries in Oceania only accounted for 1.40% of the world.

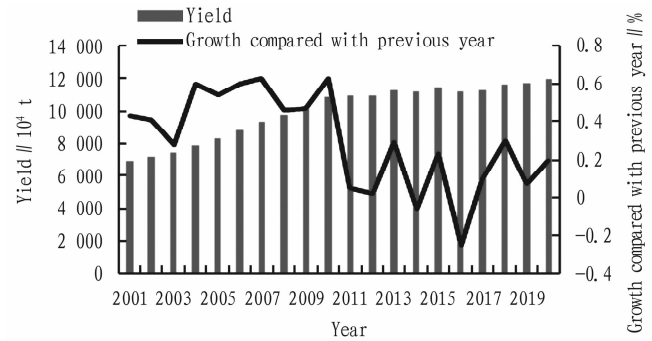


Fig. 2 World banana yield in 2001–2020

Table 2 Top five countries of banana yield in different regions in 2020

Ranking	Asia		America		Africa		Oceania	
	Country	Yield	Country	Yield	Country	Yield	Country	Yield
1	India	3 150.40	Brazil	663.73	Angola	411.50	Papua New Guinea	126.16
2	China	1 187.26	Ecuador	602.34	Tanzania	341.94	Australia	37.24
3	Indonesia	818.28	Guatemala	447.67	Kenya	185.67	Samoa	2.34
4	Philippines	595.53	Costa Rica	252.87	Egypt	138.30	Vanuatu	1.66
5	Vietnam	219.14	Mexico	246.42	Burundi	128.00	Fiji	0.88

10⁴ t

2.3 Banana yield rate Due to the promotion and application of standardized production technologies such as the cultivation and improvement of new banana varieties, high-quality cultivation management technologies, water-saving and fertilizer-saving technologies, harmless harvesting, and pest control, the yield rate (namely, the yield per unit area) of banana in the world has been significantly increased^[9–10]. In 2020, the average yield rate of banana in the world was 23.03 t/ha, with a year-on-year growth rate of 0.22% on average (Fig. 3). Compared with 2001, it increased by 45.85%, with an average annual growth rate of 2.01%. In 2020, the world top ten banana yield rate countries were Bhutan, Turkey, South Africa, Nicaragua, Honduras, Indonesia, Israel, Puerto Rico, Greece and Guatemala, with yield rates ranging from 30.27 to 66.88 t/ha^[5]. In 2020, the top five countries in Asia for banana yield rate were Bhutan, Turkey, Indonesia, Israel and Jordan (Table 3), with an average yield rate of 56.61 t/ha; the top five countries in America for banana yield rate were Nicaragua, Honduras, Puerto Rico, Guatemala and Costa Rica, with an aver-

age yield rate of 50.60 t/ha; the top five countries in Africa for banana yield rate were South Africa, Egypt, Côte d'Ivoire, Morocco and Malawi, with an average yield rate of 44.30 t/ha; the average yield rate of top five countries for banana yield in Oceania was 14.48 t/ha.

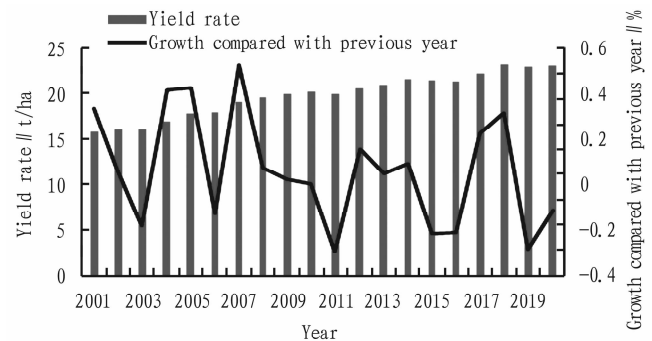


Fig. 3 World banana yield rate in 2001–2020

Table 3 Top five countries of banana yield in different countries in 2020

Ranking	Asia		America		America		Oceania	
	Country	Yield rate	Country	Yield rate	Country	Yield rate	Country	Yield rate
1	Bhutan	68.48	Nicaragua	56.27	South Africa	61.81	Australia	30.39
2	Turkey	65.28	Honduras	52.58	Egypt	44.81	Papua New Guinea	16.19
3	Indonesia	51.74	Peurto Rico	49.44	Cote d'Ivoire	44.74	Vanuatu	10.28
4	Israel	50.30	Guatemala	47.85	Morocco	38.81	Fiji	8.00
5	Jordan	47.24	Costa Rica	46.85	Malawi	31.31	Samoa	7.53

t/ha

2.4 Factors promoting the banana production In recent years, both the banana yield and trade volume in the world have both increased rapidly, and the fastest growing countries are India and China, both of which are major producing and consuming

countries, followed by Brazil and the Philippines. At the same time, some new banana-producing countries and regions emerged, such as Rwanda, Zambia, Burundi, Iran, Guinea – Bissau, Polynesia, Greece, and Italy. Africa is the third largest production

area of bananas in the world, and 70% – 80% are local varieties. As a local staple food, banana makes an important contribution to the food security of the Africa. There are three main factors promoting the banana production. (i) Rapid population growth in producing countries; Population growth brings increasing consumption demand, such as India and China. (ii) Expansion of world banana import demand; The improvement in people's income and health awareness has strongly promoted the growth of banana import markets, such as the European Union and Russia. (iii) Continuous improvement of the technical level and standardization of the banana industry. The application of banana irrigation system and the popularization of technologies such as green fertilizer and pesticide application reduction and high-efficiency production have greatly promoted the increase in world banana production and the sustainable development of the banana industry^[2,11].

3 International trade of banana

In 2020, the world banana trade volume reached 28.963 billion USD, about 15% of which were traded in the international market, and the rest of the bananas were consumed locally^[5]. The main banana producing countries are India, China, Brazil and some African countries that use bananas as staple food. The annual per capita banana consumption in some major banana producing countries reached 100 kg, especially in rural areas where 25% of the energy of the population came from bananas. Most banana exporting countries are low-income countries. Banana production and trade may seriously affect agricultural GDP. For example, the banana revenue of Ecuador and Guatemala accounted for 30% and 15% of their agricultural export revenue in 2018^[12–13].

3.1 Banana import The banana trade in the world is mainly trade of fresh banana, and about 200 countries or regions import bananas. In 2020, the world banana import volume was 23.376 1 million t, and the import amount was 15.607 billion USD^[5]. During 2001 and 2020, the world banana import volume and import amount both showed an increasing trend (Fig. 4), with an average annual growth rate of 2.88% and 5.26%, respectively.

In 2020, the top ten countries for banana import volume were the United States of America, China, Russia, Germany, Finland, Belgium, Japan, the United Kingdom, Italy and France, their banana imports totaled 15.302 9 million t, accounting for 65.64% of the world, with an average annual growth rate of 3.43%; the top

ten countries in of banana import amount were the United States of America, Belgium, Russia, the Netherlands, Germany, China, Japan, the United Kingdom, France and Italy, and their total import amount was 10.589 billion USD, accounting for 67.85% of the world, with an average annual growth rate of 6.10%. The United States of America ranked first in the world in terms of banana import volume and import amount, 4.671 4 million t and 2.550 billion USD, accounting for 19.98% and 16.34% of the world, with an annual growth rate of 1.04% and 3.41%, respectively. China's banana import volume and import amount separately ranked second and sixth in the world, with 1.819 2 million t and 991 million USD, respectively, accounting for 7.78% and 6.35% of the world total, with an average annual growth rate of 7.37% and 11.67%, respectively. Russia's banana import volume and import amount both ranked third in the world, with 1.515 7 million t and 1.117 billion USD, accounting for 6.48% and 7.16% of the world total, with an average annual growth rate of 4.87% and 10.30%, respectively. Belgium's banana import volume was 1.173 7 million t, ranking sixth in the world, but its import amount ranked second in the world at 1.129 billion USD (Table 4)^[5].

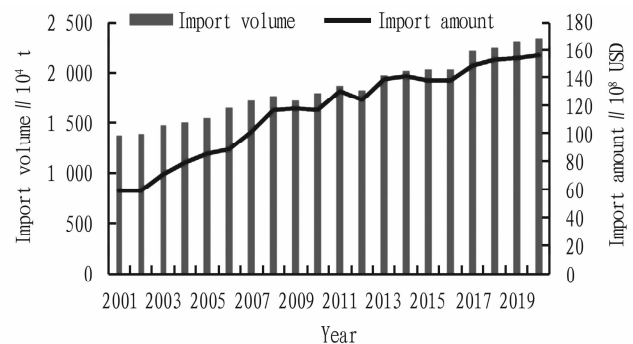


Fig. 4 World banana import volume and import amount in 2001 – 2020

Since the COVID-19 pandemic in January 2020, the world banana trade has been affected. Countries with decline of banana imports included China, the United Kingdom and the United States of America, with a year-on-year decrease of 9.70%, 3.16% and 0.12%, respectively. China, the United Kingdom, and Russia witnessed a decline in banana imports, with year-on-year decreases of 13.93%, 0.58% and 0.28%, respectively.

Table 4 Top 10 countries of banana import volume and import amount in 2020

Ranking	Import volume			Import amount				
	Country	Volume//10 ⁴ t	Percentage to the world//%	Average annual growth//%	Country	Volume//10 ⁴ t	Percentage to the world//%	Average annual growth//%
1	USA	467.14	19.98	1.04	USA	25.50	16.34	3.41
2	China	181.92	7.78	7.37	Belgium	11.29	7.23	4.92
3	Russia	151.57	6.48	4.89	Russia	11.17	7.16	10.30
4	Germany	132.34	5.66	1.15	Netherlands	10.25	6.57	13.58
5	Finland	127.48	5.45	11.88	Germany	10.09	6.47	2.56
6	Belgium	117.37	5.02	0.94	China	9.91	6.35	11.67
7	Japan	106.79	4.57	0.40	Japan	9.87	6.32	4.21
8	UK	97.94	4.19	1.51	UK	6.92	4.44	2.56
9	Italy	78.18	3.34	1.68	France	5.78	3.70	5.68
10	France	69.54	2.97	3.43	Italy	5.11	3.27	2.11

3.2 Banana export In 2020, the world banana export volume and export amount were 24.497 million t and 13.356 billion USD, respectively. Among them, South America and Asia were the largest banana export regions, accounting for about 75% of the world total export volume^[5]. During 2001 and 2020, both the export volume and export amount of banana showed a steady growth trend (Fig. 5), with an average annual growth rate of 2.77% and 6.28%, respectively. In particular, the year-on-year growth rate of export volume in 2017 was as high as 9.09% and the export volume and export amount in 2017 increased by 1.849 9 million t and 1.128 billion USD, respectively.

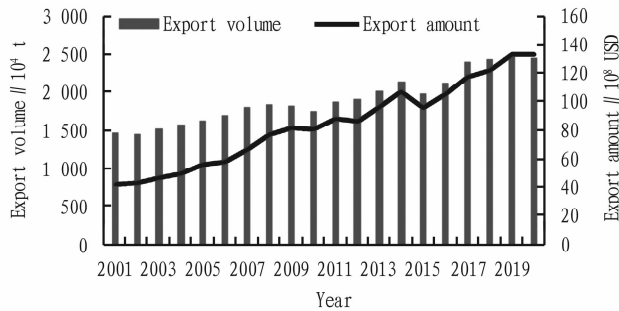


Fig. 5 World banana export volume and export amount in 2001 – 2020

Table 5 Top 10 countries of banana export volume and export amount in 2020

Ranking	Export volume				Export amount			
	Country	Volume//10 ⁴ t	Percentage to the world//%	Average annual growth//%	Country	Volume//10 ⁴ t	Percentage to the world//%	Average annual growth//%
1	Ecuador	703.98	28.74	3.03	Ecuador	35.77	26.78	8.00
2	Costa Rica	262.35	10.71	1.55	Philippines	16.08	12.04	9.29
3	Guatemala	251.38	10.26	5.72	Costa Rica	10.81	8.09	4.13
4	Colombia	203.40	8.30	2.20	Colombia	9.13	6.84	4.91
5	Philippines	186.56	7.62	-0.69	Guatemala	8.42	6.31	8.30
6	Belgium	100.67	4.11	0.19	Netherlands	8.16	6.11	16.82
7	Netherlands	87.94	3.59	15.23	Belgium	8.00	5.99	1.06
8	Panama	70.04	2.86	2.65	USA	4.28	3.20	5.24
9	USA	59.23	2.42	2.00	Cote d'Ivoire	2.66	1.99	7.26
10	Honduras	55.86	2.28	1.40	Honduras	2.53	1.89	1.30

In recent years, the rapid development of Cambodian banana production has benefited from the huge demand for bananas in China, Japan and South Korea. In 2018, China and Cambodia signed the *Agreement on Plant Inspection and Quarantine Requirements for Exporting Bananas to China*. In 2019, Cambodia began to export bananas to China, accounting for 17% of its total export volume, and the export volume rose to 93% of its total in 2020^[14]. For a long time, the banana trade has been monopolized by multinational companies such as Dole, Fresh Del Monte, and Chiquita. They occupied about 70% of the world banana market. In the past 10 years, with the entry of other competitors such as Goodfarmer Foods Holding (Group) Co., Ltd. and the direct connection of retailers such as supermarkets to banana plantations, the competition in the world banana industry market has become more intense.

As indicated in Table 5, in 2020, the top ten countries for banana export volume were Ecuador, Costa Rica, Guatemala, Colombia, the Philippines, Belgium, the Netherlands, Panama, the United States of America and Honduras. The total banana export volume of these ten countries was 19.814 1 million t, accounting for 80.88% of the world, with an average annual growth rate of 3.33%, of which the Netherlands had the highest average annual growth rate (15.23%). In the same year, the top ten countries in terms of banana export amount were Ecuador, the Philippines, Costa Rica, Colombia, Guatemala, the Netherlands, Belgium, the United States of America, Côte d'Ivoire and Honduras. Their banana export amount totaled 10.584 billion USD, accounting for 79.24% of the world total, with an average annual growth rate of 6.63%, of which the Netherlands still had the highest average annual growth rate (16.82%). As the world largest exporter of banana, Ecuador mainly exported bananas to countries such as the European Union and Russia, among which more than 90% of Russia's bananas came from Ecuador. Costa Rica, Ecuador, and Guatemala were the main sources of banana import of the United States of America. Philippine bananas were mainly exported to China. As a transit station for imported bananas in Europe, Belgium not only supplied banana for its own countries, but also exported bananas to other European countries through export trade.

4 Prospects of the world banana industry

4.1 Forecast of banana yield and trade volume With the rapid growth of the global population and the increase in demand for bananas, banana production and trade volume will increase steadily, and Asia will still be the largest banana producing area. According to the 2001 – 2020 banana production and trade data forecast released by the FAO, the world total banana yield will reach 138.314 2 million t and 159.644 8 million t, the import volume will be 26.941 8 million t and 31.051 4 million t, and the export volume will be 28.083 1 million t and 32.194 1 million t, respectively in 2025 and 2030. It is predicted that the world banana yield, import volume and export volume will increase by 33.22%, 32.83% and 31.42%, respectively in 2030 compared with 2020. China's banana harvested area and total banana yield will reach 5.478 million ha, 71.717 5 million t, and the banana

import volume will be 2.595 9 million t in 2025.

4.2 Opportunities and challenges for the development of banana industry

4.2.1 Opportunities. (i) There is an enormous global demand for bananas. Although the demand for bananas in many areas of the world is becoming increasingly saturated, and the dividend of population growth is gradually weakening, the rapid economic growth and changes in consumers' health and nutrition concepts in India and China will further drive the growth of banana production and demand. For example, the increase in banana planting area and output in Ecuador, the Philippines, Thailand, and Laos is mainly due to the increase in the amount of bananas imported by China. China's per capita banana consumption is expected to increase by about 1% annually. It is predicted that there are opportunities for demand-oriented banana trade expansion, and banana demand will increase moderately in 2030^[9].

(ii) The demand for banana deep processing and its multi-functional products is increasing. With the rapid increase in banana yield, the supply of fresh bananas will exceed demand. The whole body of banana is a treasure, and it integrates nutritional functions, not only has high nutritional value, but also has great processing potential. With the continuous improvement in the banana deep processing technology and the full exploration of banana functional value, banana products will be more diversified, which will further promote the sustainable development of banana industry^[15].

(iii) Demands for economic growth and poverty reduction in developing countries are increasing. Compared with other crops, bananas have a shorter planting cycle, high yield, quick results, and high benefits, and the banana industry is the pillar industry of agriculture in many places. In countries and regions suitable for growing bananas, in order to promote economic development, poverty alleviation and rural revitalization, promoting development of the banana industry will become an important measure.

4.2.2 Challenges. (i) Increased impact of environmental change on the banana industry. Changes in the environment, especially the increasing degree of soil acidification, as well as uncertain and destructive abnormal weather such as tropical storms, typhoons, droughts, waterlogging, and cold damage, will seriously affect the production potential and stable supply of bananas.

(ii) *Fusarium* wilt poses a great threat to global banana supply. The *Fusarium* wilt pathogen tropical race 4 (TR4) of banana spreads rapidly and causes severe damage, seriously affecting global banana supply. According to the forecast of FAO experts, by 2028, the global loss of banana production area due to TR4 infection will reach 160 000 ha, the banana production will decrease by 2.8 million t, the decline in world banana production will lead to a 9.2% increase in global banana prices and will cause unemployment of 240 000 banana industry workers^[7].

(iii) There are still barriers to international banana trade. The international banana trade still has problems related to plant quarantine restrictions, quality standards and pesticide residue limits, etc., leading to trade disputes and protectionism, and seriously affecting the smoothness and growth potential of international

banana trade, and causing instability in banana market supply and prices.

(iv) The continuous impact of the COVID-19 epidemic on the banana industry. The continuous epidemic of COVID-19 has affected to a certain extent the world banana industry's employment in banana gardens, supply of agricultural materials, transportation and trade, etc., which in turn has continued to affect the development of the banana industry.

4.3 Countermeasures and recommendations

4.3.1 Conducting research on the sustainable utilization of acidic soil and guiding the banana industry to "go global". The acidic soil in the world accounts for about 30% of the total land area, and the acidic soil in China accounts for about 22.7% of the total land area. Acidic soil is an important factor leading to serious banana diseases and low yield. In order to make the world and China's banana industry greater and stronger, it is necessary to vigorously strengthen the research on the sustainable use of acidic soil. In addition, it is recommended to actively guide the banana industry to "go global", establish large-scale international banana production bases in countries or regions with superior climate and rich land resources, and build an international banana industrialization management system of "big base + big logistics + big marketing".

4.3.2 Strengthening the research on comprehensive prevention and control of banana *Fusarium* wilt. Factors influencing the occurrence of banana *Fusarium* wilt include the degree of soil acidification, the number of pathogenic bacteria, banana varieties, seedling quality, plant cultivation management and growth status, irrigation water source and surrounding environmental conditions, etc. At present, there is still no single measure that can effectively prevent and control banana wilt. It is recommended to share research achievements with the world common prevention and use multidisciplinary research on comprehensive prevention and control technology centered on the selection of disease-resistant varieties and supplemented by biological, chemical and physical methods^[16-18].

4.3.3 Conducting in-depth research on banana quality and safety critical control points. In view of the key problems in the quality and safety of bananas in the world, it is recommended to conduct relevant technical research on the goals of "prospering agriculture with quality, promoting agriculture with green, strengthening agriculture with brand" and "safety in quality, good appearance and high quality", focus on accelerating the development and promotion of banana acidic soil improvement, breeding of new disease-resistant varieties, comprehensive prevention and control of *Fusarium* wilt, mechanized application of banana industry, and new technologies for green and fresh preservation, to promote the green, safe and sustainable development of the banana industry^[19-20].

4.3.4 Making innovation in banana production management and new technology promotion model. In order to efficiently promote the rapid development of the banana industry, it is recommended to make innovation in the research on banana production manage-

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ble and high-quality orchards, make progress in the logistics cost control and the improvement of logistics efficiency in e-commerce sales, and broaden the channels of tourism consumption market. Secondly, efforts should be made to develop the existing litchi regional public brands, give full play to the excellent variety advantages of local litchi in Huizhou, and realize the sustainable development of litchi industry chain characterized by "large-scale production, improved varieties, scientific management and industrial management" while ensuring the output and quality.

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ment and new technology promotion models according to the actual conditions of producing countries. For example, China may explore and establish a new model of "government + tropical standards committee + national banana industry system + leading enterprises + farmers" as the main body, and carry out the promotion of "new technology + standard procedures + clarification note + demonstration base". It is recommended to provide main technical standards of Chinese bananas for the countries along the Belt and Road for demonstration and promotion^[21-22], and establish "government + scientific research units + going global enterprises + banana farmers" as the main body. Besides, it is recommended to carry out cooperation and exchange of technical standards through "going global" and "inviting in", effectively improve the application and radiation range of main technical standards for bananas, improve the banana quality and increase the banana yield, and create a banana brand with world influence.

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