

Production Situation of Glufosinate- ammonium in China 2022

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Executive summary

Glufosinate-ammonium is a non-selective herbicide and its quick effectiveness falls between paraquat's and glyphosate's. It is commonly used in orchards, vineyards, potato fields, and non-crop land for control of annual and perennial dicotyledonous weeds and gramineous weeds in China.

Since the outbreak of the COVID-19 pandemic, the ex-works price of Chinese glufosinate-ammonium has kept increasing. According to CCM price monitoring data, the ex-works price of 95% TC stood high in Nov. 2021 at USD50,162/t, up by 239.9% compared with that in Nov. 2019, driven by tight supply and rising costs of raw materials. In H1 2021, the overseas demand for China's glufosinate-ammonium grew, but the inventory was insufficient, which worsened due to limited production capacity of manufacturers and abnormal production of its raw material diethyl phosphite. Thanks to completion and operation of new capacities in China, the ex-works price started to go down in Dec. 2021 and dipped to USD30,736/t in April 2022, down 38.7% from the peak in Nov. 2021. However, the price recovered as a result of the sustained increase in the price of yellow phosphorus from April to June. From July until Dec., with the pesticide market gradually entering off-season and the continued release of production capacity, the ex-works price of glufosinate-ammonium continued to fall to USD25,455/t.

Regarding production, from 2018 to 2022, the capacity of glufosinate-ammonium TC in China showed a fast growth from 31,540 t/a to 64,695 t/a, with a CAGR of 15.5%. And the output rose from 10,545 tonnes to 29,640 tonnes in 2018–2022, at a CAGR of 23.0%, mainly driven by soaring demand at home and abroad and technology improvement. As of Dec. 2022, there were 60 active registrations of glufosinate-ammonium TC and 11 active registrations of glufosinate-ammonium TK in China, only part of which have production lines approved and operated.

In consumption of glufosinate-ammonium, overseas consumption currently plays an important part in China's glufosinate-ammonium. The export volume of glufosinate-ammonium (converted to 100% AI) in China saw continuous growth for years. However, a drop appeared as China and the world suffered from COVID-19 in early 2020. Due to China's effective measures against the epidemic and the robust overseas demand, the 2021 export volume recovered from 5,118 tonnes in 2020 to 9,408 tonnes, up 83.8% YoY. On the other hand, its high price made the domestic consumption in China not much compared with export. In 2022, as the impact of the COVID-19 epidemic diminished, glufosinate-ammonium producers gradually recovered their production capacity and global demand for glufosinate-ammonium continued to grow, with exports surging to 32,107 tonnes, up 241.3% YoY. In 2018–2022, consumption of glufosinate-ammonium in China increased from 1,910 tonnes to 5,565 tonnes, with a CAGR of 23.8%.

Introduction and methodology

The report is formulated by methods as follows:

1. Desk research

The sources of desk research are various, including published magazines, journals, government statistics, industrial statistics, customs statistics, seminars as well as information from the internet. A lot of work has gone into the compilation and analysis of the obtained information. When necessary, checks have been made with Chinese suppliers regarding production information.

2. Telephone interview

CCM has carried out extensive telephone interviews in order to survey the actual production and producers' situation of glufosinate-ammonium in China.

Interviewees include:

- Key producers
- Key traders
- Associations
- Experts

Data processing and presentation

The data collected and compiled are sourced from:

- CCM's database, ValoTracer
- Published articles from periodicals, magazines and journals, and third-party databases
- Statistics from governments and international institutes
- Telephone interviews with domestic producers, service suppliers, governments, etc.
- Third-party data providers
- Comments from industrial experts
- Professional databases from other sources
- Information from the internet

The data from various sources have been combined and cross-checked to make this report as precise and scientific as possible. Throughout the process, a series of internal discussions took place in order to analyse the data and draw conclusions from them.

Unit

RMB: currency unit in China, also called Yuan

USD: currency unit in the United States

Tonne: ton, equaling to metric ton in this report

t/a: tonne/annual or tonne/year

/t: per tonne

ha: hectare

Glossary

TC: Technical material

TK: Technical concentrate

AS: Aqueous solution

SL: Soluble concentrate

SG: Water soluble granule

MDP: Methylphosphonous dichloride

Table: USD/CNY exchange rate, Jan. 2018–Dec. 2022

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
2018	6.5079	6.3045	6.3352	6.2764	6.3670	6.4078	6.6157	6.8293	6.8347	6.8957	6.9670	6.9431	6.6070
2019	6.8482	6.7081	6.6957	6.7193	6.7344	6.8896	6.8716	6.8938	7.0883	7.0726	7.0437	7.0262	6.8826
2020	6.9614	6.9249	6.9811	7.0771	7.0690	7.1315	7.0710	6.9980	6.8498	6.7796	6.7050	6.5921	6.9284
2021	6.5408	6.4623	6.4754	6.5584	6.4895	6.3572	6.4709	6.4660	6.4680	6.4604	6.4192	6.3693	6.4615
2022	6.3794	6.3580	6.3014	6.3509	6.5672	6.6651	6.6863	6.7467	6.8821	7.0992	7.2081	7.1225	6.6972

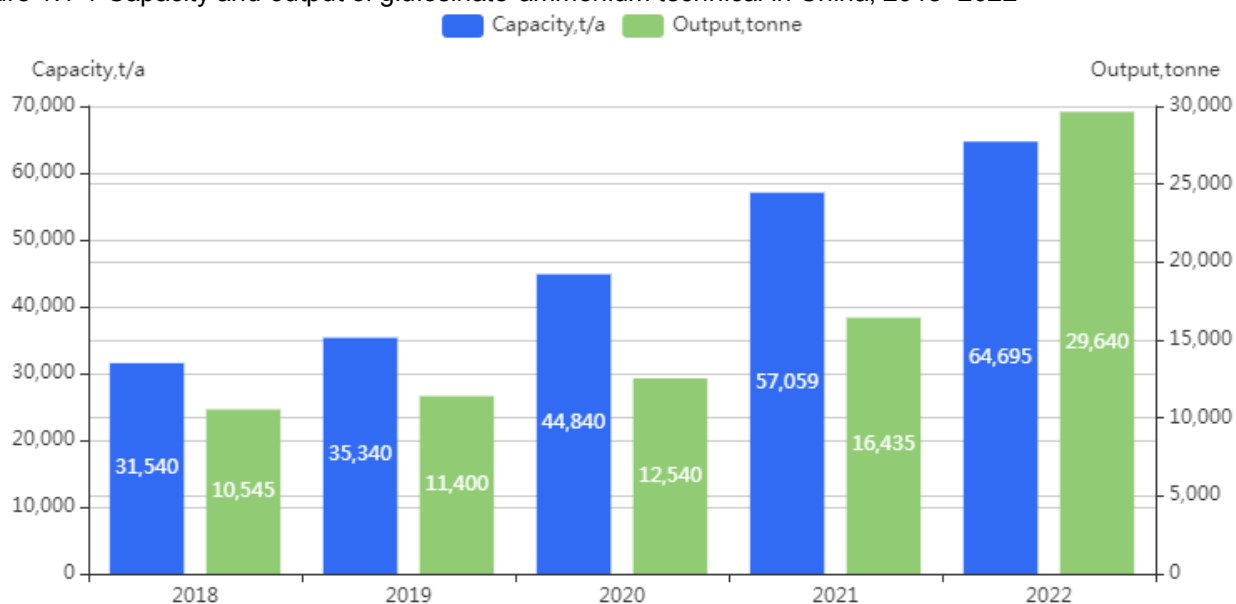
Source: The People's Bank of China

1 Production

Glufosinate-ammonium technicals produced in China include 95% technical (TC), 96% TC, 98% TC and 50% technical concentrate (TK), of which 95% TC is the main specification. And glufosinate-ammonium formulations include 100g/L AS, 150g/L AS, 180g/L AS, 200g/L AS, 50% AS, 150g/L SL, 180g/L SL, 200g/L SL, 280g/L SL, 80% SG and 88% SG, with 200g/L AS as the dominant formulation.

1.1 Production of glufosinate-ammonium technical in China, 2018–2022

Figure 1.1-1 Capacity and output of glufosinate-ammonium technical in China, 2018–2022



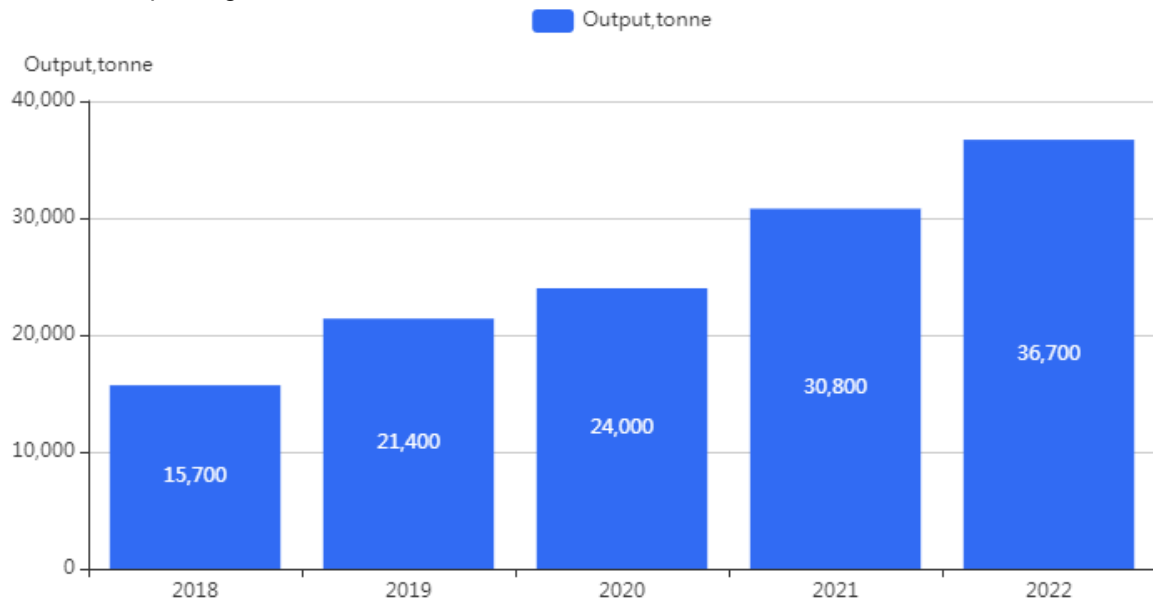
Note: Capacity and output here refer to the total amount converted to 95% TC of glufosinate-ammonium products including 95% TC, 96% TC, 98% TC and 50% TK.

Source: CCM

From 2018 to 2022, the capacity of glufosinate-ammonium TC in China showed a fast growth from 31,540 t/a to 64,695 t/a, with a CAGR of 15.5%. And the output rose from 10,545 tonnes to 29,640 tonnes in 2018–2022, at a CAGR of 23.0%, mainly driven by soaring demand at home and abroad and technology improvement. Meanwhile, domestic glufosinate-ammonium TC saw lower production costs and higher quality, making China's manufacturers increasingly competitive in the global market.

1.2 Production of glufosinate-ammonium formulations in China, 2018–2022

Figure 1.2-1 Output of glufosinate-ammonium formulations in China, 2018–2022



Note:1. Output here refers to the total amount of glufosinate-ammonium formulations including 100g/L AS, 150g/L AS, 180g/L AS, 200g/L AS, 50%AS, 150g/L SL, 180g/L SL, 200g/L SL, 280g/L SL, 80% SG and 88% SG. 2. The output data of Bayer CropScience (China) Co., Ltd., which did not disclose its glufosinate-ammonium formulation output, is excluded.
Source:CCM

From 2018 to 2022, China's output of glufosinate-ammonium formulations increased significantly from 15,700 tonnes to 36,700 tonnes, which was mainly boosted by the rocketing demand from both domestic and overseas markets, decreasing production cost and better product quality following technological improvements.

2 Producer

Table 2-1 Producers of glufosinate-ammonium TC in China, 2018–2022

No.	Producer	Abbr.	Status				
			2018	2019	2020	2021	2022
1	Lier Chemical Co., Ltd.	Lier Chemical	Active	Active	Active	Active	Active
2	Yongnong BioSciences Co., Ltd.	Yongnong BioSciences	Active	Active	Active	Active	Active
3	Hebei Veyong Bio-chemical Co., Ltd.	Hebei Veyong	Active	Active	Active	Active	Active
4	Ningxia Wynca Technology Co., Ltd.	Ningxia Wynca	/	/	/	/	Active
5	Shandong Eshung Industrial Co., Ltd.	Shandong Eshung	/	Active	Active	Active	Active
6	Fuhua Tongda Chemical Co., Ltd.	Fuhua Tongda	Active	Active	Active	Active	Active
7	Shijiazhuang Richem Co., Ltd.	Shijiazhuang Richem	Active	Active	Active	Active	Active
8	Nanjing Red Sun Biochemistry Co., Ltd.	Nanjing Red Sun	/	Active	Active	Active	Active
9	Jiangsu Sevencontinent Green Chemical Co., Ltd.	Jiangsu Sevencontinent	Idle	Idle	Idle	Active	Active
10	Inner Mongolia Jiaruimi Chemical Co., Ltd.	Inner Mongolia Jiaruimi	Active	Active	Active	Active	Active
11	Jiangsu Huifeng Bio Agriculture Co., Ltd.	Jiangsu Huifeng	Idle	Idle	Idle	Active	Active
12	Shandong Binnong Technology Co., Ltd.	Shandong Binnong	Active	Idle	Idle	Idle	Active
13	Rosi Chemical Co., Ltd.	Rosi Chemical	Active	Active	Active	Active	Idle
14	Jiangsu Huangma Agrochemicals Co., Ltd.	Jiangsu Huangma	Idle	Idle	Idle	Idle	Idle
15	Shandong Weifang Rainbow Chemical Co., Ltd.	Weifang Rainbow	Idle	Idle	Idle	Idle	Idle
16	Shandong Zhongshi Pesticide Co., Ltd.	Shandong Zhongshi	Idle	Idle	Idle	Idle	Idle
17	Shandong Weitian Fine Chemical Technology Co., Ltd.	Shandong Weitian	Idle	Idle	Idle	Idle	Idle

Source:CCM

2.1 Producers of glufosinate-ammonium technical in China, 2018–2022

Table 2.1-1 Capacity and output of glufosinate-ammonium technical producers in China, 2018–2022

No.	Producer	Capacity, t/a					Output, tonne				
		2018	2019	2020	2021	2022	2018	2019	2020	2021	2022
1	Lier Chemical	7,980	7,980	17,480	17,480	17,480	5,225	5,415	6,555	9,500	17,100
2	Yongnong BioSciences	2,850	2,850	2,850	6,080	6,080	2,280	2,280	2,280	2,850	5,700
3	Hebei Veyong	1,900	1,900	1,900	1,900	6,650	1,330	1,425	1,425	1,425	2,185
4	Ningxia Wynca	/	/	/	/	2,850	/	/	/	/	1,425

5	Shandong Eshung	/	950	950	950	950	/	285	475	475	855
6	Fuhua Tongda	5,700	5,700	5,700	5,700	5,700	285	475	475	475	760
7	Shijiazhuang Richem	1,425	1,425	1,425	1,425	1,425	760	855	665	665	760
8	Nanjing Red Sun	/	2,850	2,850	2,850	2,850	/	285	285	285	238
9	Jiangsu Sevencontinent	950	950	950	950	950	0	0	0	238	190
10	Shandong Binnong	1,900	1,900	1,900	10,925	10,925	190	0	0	0	190
11	Inner Mongolia Jiaruimi	570	570	570	570	570	190	238	238	238	143
12	Jiangsu Huifeng	4,750	4,750	4,750	4,750	4,750	0	0	0	143	95
13	Rosi Chemical	950	950	950	950	950	143	143	143	143	0
14	Jiangsu Huangma	950	950	950	950	950	143	0	0	0	0
15	Weifang Rainbow	950	950	950	950	950	0	0	0	0	0
16	Shandong Zhongshi	475	475	475	475	475	0	0	0	0	0
17	Shandong Weitian	190	190	190	190	190	0	0	0	0	0
Total		31,540	35,340	44,840	57,095	64,695	10,545	11,400	12,540	16,435	29,640

Note: Capacity and output here refer to the total amount converted to 95% TC of glufosinate-ammonium products including 95% TC, 96% TC, 98% TC and 50% TK.
Source: CCM

As of Dec. 2022, there were 60 active registrations of glufosinate-ammonium TC and 11 active registrations of glufosinate-ammonium TK in China, only part of which have production lines approved and operated.

In 2022, only 12 TC producers were active, as some industrial parks in Jiangsu Province were closed due to pollution concerns, causing some producers to stop production and upgrade their equipment and techniques to satisfy the environmental standards. Small producers found it difficult to survive the fierce competition. As the market demand increases, there will be newcomers in glufosinate-ammonium TC production in future, but it is still hard to change the situation where top producers dominate the glufosinate-ammonium market.

Long-term leading players

Lier Chemical, Yongnong BioSciences, Hebei Veyong and Fuhua Tongda have been the top suppliers in terms of capacity or output in China.

- Lier Chemical: With 10,000 t/a capacity newly added in 2020, Lier Chemical's capacity reached 18,400 t/a, boasting the world's largest glufosinate-ammonium production capacity; the 3,000 t/a glufosinate-P TC (Phase I) production line started construction in Jan. 2020 and went into production in Jan. 2022.
- Yongnong BioSciences: In the past few years, its capacity expansion fell far behind Lier Chemical. While in May 2021, after the overall upgrading and transformation of all glufosinate-ammonium TC production lines, its capacity was expanded to 6,400 t/a; its subsidiary in Ningxia Hui Autonomous Region proposed a 20,000 t/a glufosinate-ammonium TC plan in June 2019. The company also proposed a 3,000 t/a glufosinate-P TC project in Oct. 2020, and it was completed and put into production in April 2021.
- Hebei Veyong: It completed the 1,000 t/a glufosinate-ammonium TC project in Nov. 2017. On 25 October 2022, Hebei Veyong announced that the company completed the construction and equipment installation of the 5,000 t/a glufosinate-ammonium project. It has passed the expert review for trial production plan and entered the commissioning stage. And its capacity is 7,000 t/a now.
- Fuhua Tongda: It completed its first production line of 6,000 t/a glufosinate-ammonium TC in Sept. 2018, making it an up-and-coming powerhouse in the industry; its another 6,000 t/a glufosinate-ammonium TC project is in progress. On 7 July 2022, it signed a new 20,000 t/a glufosinate-ammonium and related ancillary projects.

Newcomers

- Shandong Eshung: As a new entrant with the 1,000 t/a glufosinate-ammonium TC production line completed in Jan. 2019, the company released the environmental impact assessment (EIA) report of the pesticide project including 20,000 t/a glufosinate-ammonium TC and 10,000 t/a glufosinate-P technical in Oct. 2020.
- Nanjing Red Sun: Its 3,000 t/a glufosinate-ammonium TC facilities were completed in Dec. 2018; another 20,000 t/a glufosinate-ammonium TC project is undergoing by its subsidiary Chongqing Huage Biochemistry Co., Ltd.
- Ningxia Wynca: In June 2022, it completed its first production line of 3,000 t/a glufosinate-ammonium TC; its another 3,000 t/a glufosinate-ammonium TC project is in progress.

Others

- Jiangsu Sevencontinent: Its subsidiary Sevencontinent Green Chemical (Jining) Co., Ltd. in Jining City, Shandong Province released the EIA report of the fine chemical project (10,000 t/a glufosinate-P TC included) in Dec. 2019 and held a groundbreaking ceremony in July 2020.
- Shijiazhuang Richem: The company expanded its glufosinate-ammonium TC capacity to 1,000 t/a in 2017 from 300 t/a, further increasing to 1,500 t/a in 2018. In August 2022, the People's Court of Zhao County, Hebei Province, issued a first instance judgment in a lawsuit between Jiangsu Huifeng and Shijiazhuang Richem: the 5,000 t/a glufosinate-ammonium project was confirmed as owned by the latter. However, in response to the deliberation Jiangsu Huifeng said that an appeal would be filed.
- Shandong Binnong: Its wholly-owned subsidiary Gansu Binnong Technology Co., Ltd. had the 22,000 t/a pesticide intermediate project (10,000 t/a glufosinate-ammonium TC included) put into production in Sept. 2021. However, the company's trial production has not gone too well and it was still in the production debugging stage until June this year.
- Shandong Weitian, Inner Mongolia Jiaruimi and Rosi Chemical: These three companies have owned production lines for years but produced in a very small quantity or had no operation in recent years.

2.2 Producers of glufosinate-ammonium formulations in China, 2018–2022

Table 2.2-1 Output of glufosinate-ammonium formulations producers in China, 2018–2022

No.	Producer	Output, tonne				
		2018	2019	2020	2021	2022
1	Yongnong BioSciences	7,000	8,000	9,000	11,800	13000
2	Jiangsu Sevencontinent	2,500	4,600	6,000	7,400	8500
3	Lier Chemical	2,600	3,600	4,000	5,200	7000
4	Hebei Veyong	1,500	2,000	2,000	2,500	3000
5	Weifang Rainbow	800	1,700	1,500	2,000	2500
6	Jiangsu Huifeng	300	500	500	700	700
Others		1,000	1,000	1,000	1,200	2000
Total		15,700	21,400	24,000	30,800	36700

Note:1. Output here refers to the total amount of glufosinate-ammonium formulations including 100g/L AS, 150g/L AS, 180g/L AS, 200g/L AS, 50%AS, 150g/L SL, 180g/L SL, 200g/L SL, 280g/L SL, 80% SG and 88% SG. 2. The output data of Bayer CropScience (China) Co., Ltd., which did not disclose its glufosinate-ammonium formulation output, is excluded.

Source:CCM

The registrations of glufosinate-ammonium formulations in China went up sharply. As of Dec. 2022, there have been 388 companies in China completing 679 active registrations, 271 of which are for the key specification, 200 g/L AS. Despite a large number of registrations, there are only 6 key glufosinate-ammonium formulation producers in China that have ability to produce glufosinate-ammonium formulations over 100 tonnes per year.

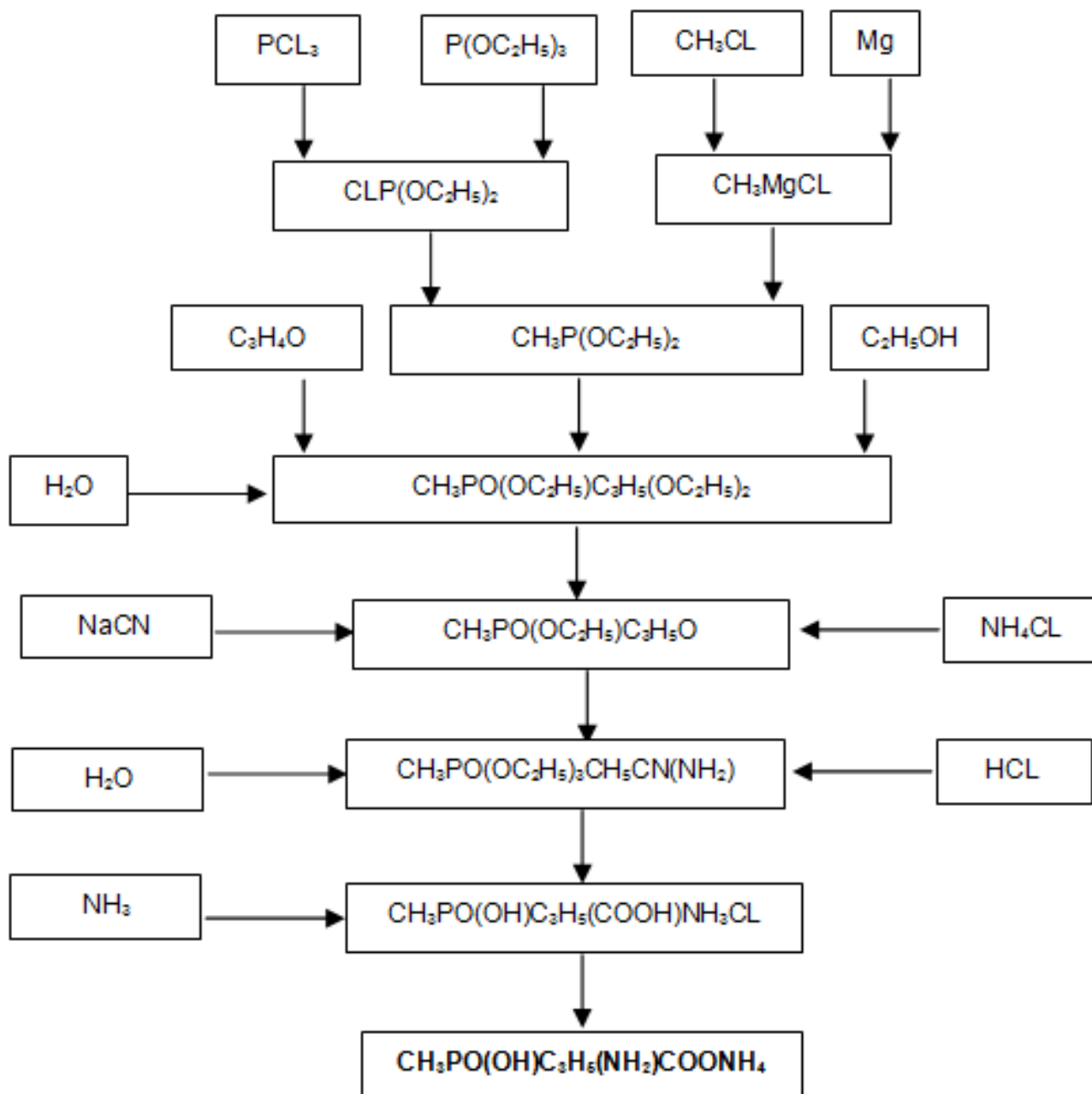
In 2020–2022, Lier Chemical, Jiangsu Sevencontinent and Yongnong BioSciences saw large increases in the output of formulations. Jiangsu Sevencontinent, in particular, has become one of the key producers of glufosinate-ammonium formulation in China, along with its vigorous promotion in the domestic market. However, in 2018, Jiangsu Huifeng suspended production for pollution issues from May but then resumed in Nov.

3 Production technology

There are two main routes for the industrial production of glufosinate-ammonium TC, namely Hoechst route and Strecker route. Hoechst route, which is mastered by Bayer CropScience AG, is of little pollution and low cost. But the majority of Chinese glufosinate-ammonium TC producers take Strecker route.

Strecker route has been the only route for glufosinate-ammonium production in China in recent years, which has remained complicated with many steps. Below are the key steps:

Figure 3-1 Flowchart of glufosinate-ammonium technical production in China



Source:CCM

The production technology of glufosinate-ammonium TC has been improving, and the ultimate yield is 60%–65% in China. Explosions have also been rare during production in recent years, because of Chinese producers' accumulated production experience and their efforts in technology improvement.

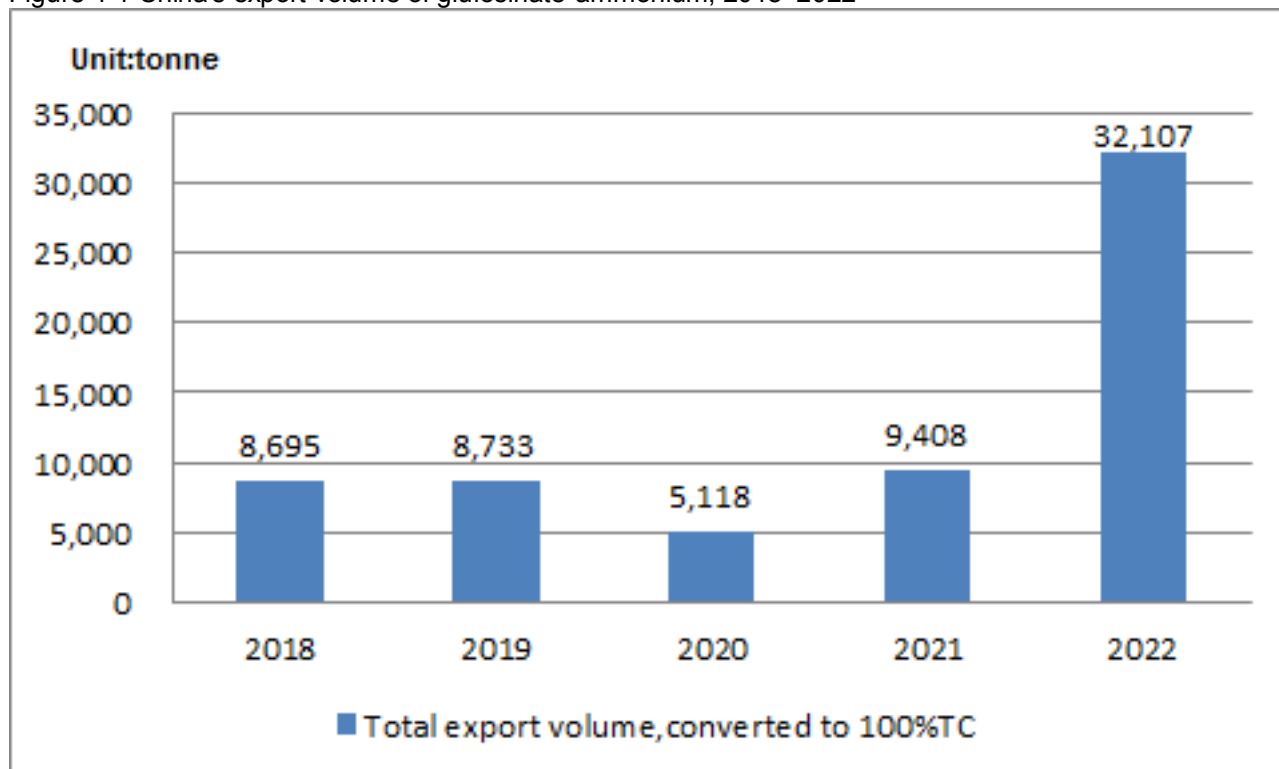
Chinese producers have made progress in their technology levels, having optimised the reaction conditions and parameters, reduced discharge of pollutants, lowered the unit consumption of raw materials and increased product yield, etc. For example, Lier Chemical developed a new method to compound methyldiethoxyphosphine, by taking natural gas and phosphorus trichloride to produce methyl

dichlorophosphite, which then reacts with ethanol and ammonium to make the desired substance.

Lier Chemical is the only Chinese producer that masters the Hoechst route. Its glufosinate-ammonium TC capacity was improved to 8,400 t/a in 2018 (still uses the Strecker route). It claimed in Feb. 2019 that its subsidiary Guang'an Lier Chemical Co., Ltd. would start a 15,000 t/a methylphosphonous dichloride (MDP) project, and announced at the end of Dec. 2019 that Guang'an Lier would suspend production for upgrading (consolidation of MDP and glufosinate-ammonium technical production lines) for at least three months. In 2021, Guang'an Lier continued to improve the MDP project. In March 2022, the company revealed that it will put the MDP project into full production this year.

4 Export

Figure 4-1 China's export volume of glufosinate-ammonium, 2018–2022



Note:1. After April 2020, data of exports are incomplete mainly caused by the changed sources. 2. All the volumes are calculated by 100% technical.

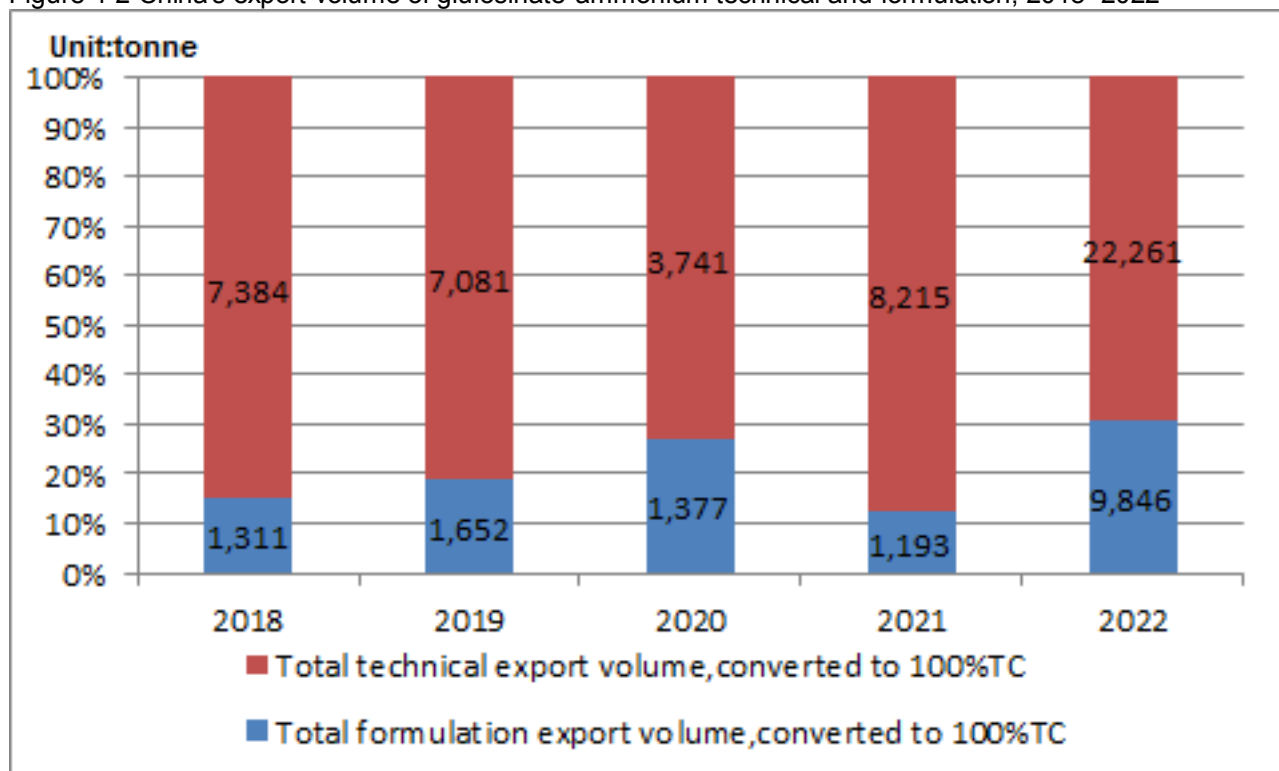
Source:Tranalysis

The export volume of glufosinate-ammonium (converted to 100% AI) in China saw continuous growth for years. However, a drop appeared as China and the world suffered from the outbreak of the COVID-19 epidemic in early 2020. Due to China's effective measures against the epidemic and the robust overseas demand, the 2021 export volume recovered, surging from 5,118 tonnes in 2020 to 9,408 tonnes, up 83.8% YoY. In 2022, as the impact of epidemic waned, global demand for glufosinate-ammonium continued to gain momentum and glufosinate-ammonium producers gradually recovered and increased their production, with exports surging to 32,107 tonnes, up 241.3% YoY.

Although glyphosate and paraquat remain the top two popular herbicides used widely in the global market, growing resistance to them, rising concerns over the carcinogenicity of glyphosate and the expanding bans on paraquat in more countries all give glufosinate-ammonium great opportunities to take up more market shares. The growing resistance of some weeds to glyphosate has led to the development of other herbicide-resistant transgenic crops. In recent years, the seeds of glufosinate-ammonium resistant transgenic crops have been approved worldwide. At present, glufosinate-ammonium resistant genes have been introduced into more than 20 crops such as rape, corn, cotton, wheat, and sugarcane.

In addition, in 2020 paraquat has been banned in Thailand from June and in Brazil from Sept. California state in the US also plans to ban paraquat and glyphosate in the future against their poisoning effects. Once banned, paraquat on the market will be replaced by the remaining herbicides, and glufosinate-ammonium is regarded as one of the best substitutes. Therefore, overseas demand for glufosinate-ammonium will further increase.

Figure 4-2 China's export volume of glufosinate-ammonium technical and formulation, 2018–2022



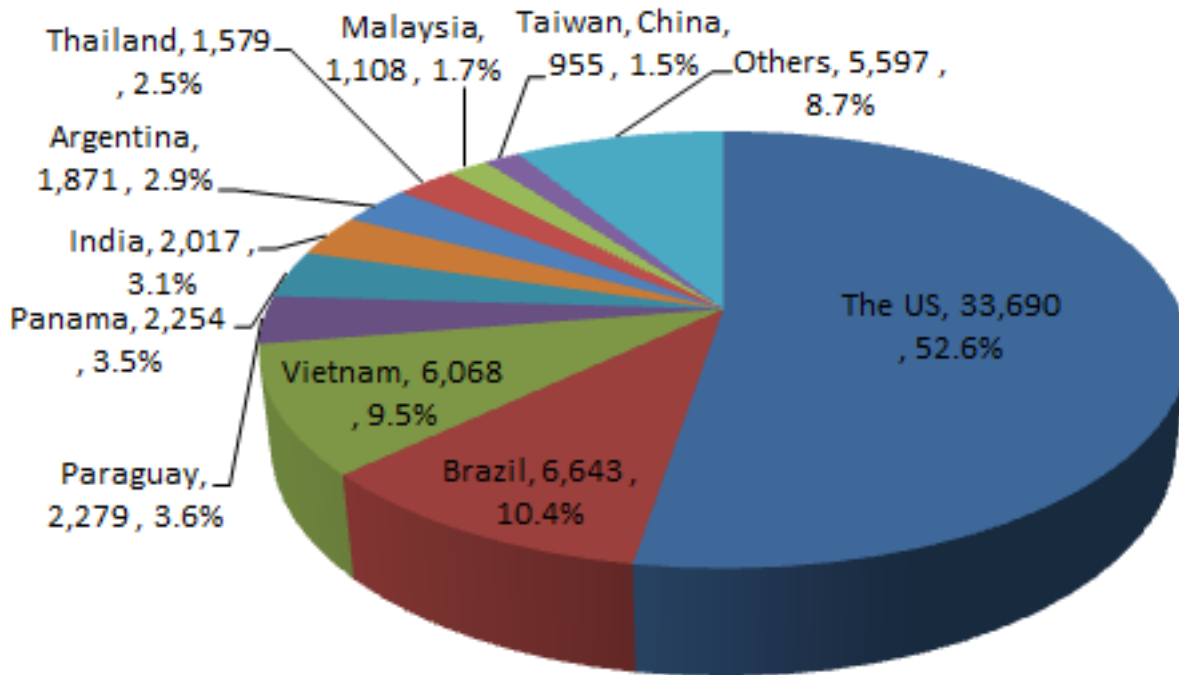
Note:1. After April 2020, data of exports are incomplete mainly caused by the changed sources. 2. All the volumes are calculated by 100% technical.

Source:Tranalysis

China exports both glufosinate-ammonium technical and formulation products. During 2018–2022, export volume of technical products has on average accounted for 76.0% of China's glufosinate-ammonium export. In 2020, as the total export volume decreased, share of formulations slightly increased and took up less than 27% of the total. In 2022, the technical export volume witnessed significant growth in share and accounted for 69.3%, leaving 30.7% for formulation.

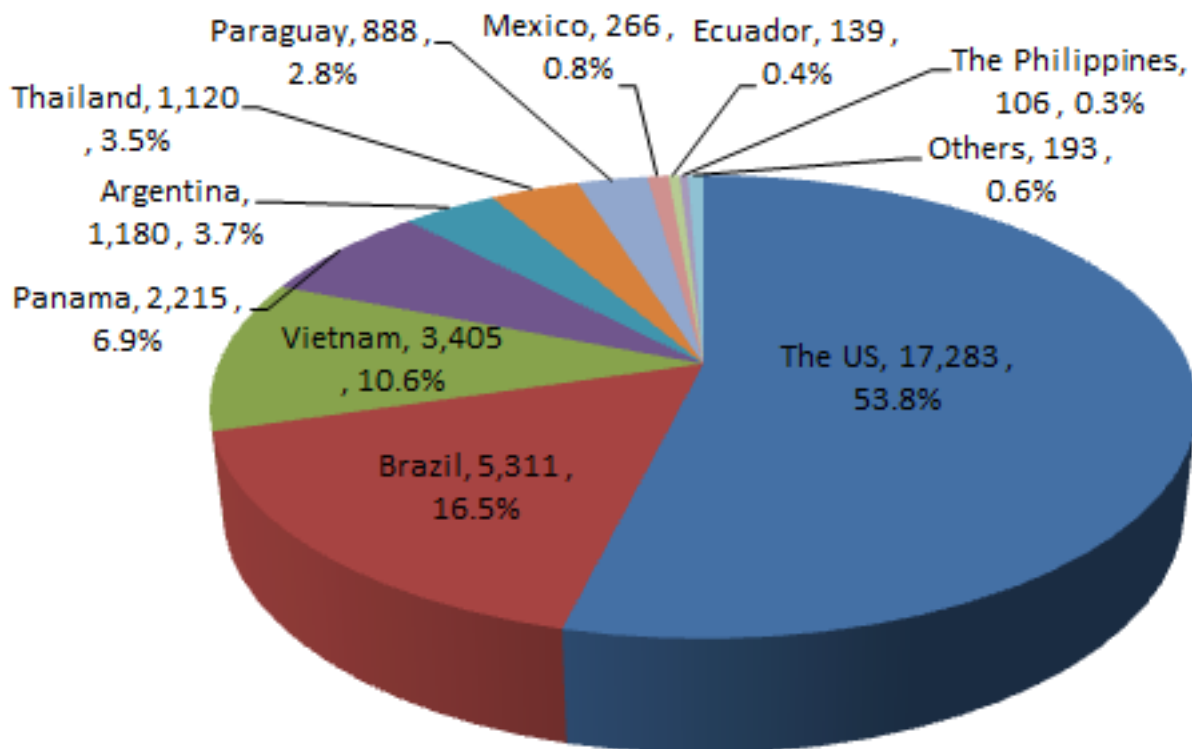
In 2022, producers have been more concentrated on 95% technical and 200g/L AS production, the dominant specifications of glufosinate-ammonium products exported from China.

Figure 4-3 Export destinations of China's glufosinate-ammonium by volume and share, 2018–2022, tonne



Note: All the volumes are calculated by 100% technical.
Source: Tranalysis

Figure 4-4 Export destinations of China's glufosinate-ammonium by volume and share, 2022, tonne



Note: 1. All the volumes are calculated by 100% technical. 2. Due to rounding, the total share may not equal 100%.
Source: Tranalysis

Among the export destinations of China's glufosinate-ammonium, the US, Brazil, Vietnam, Paraguay, and Panama were the top five in 2018–2022 by accumulated export volume, accounting for about 80% of the total amount.

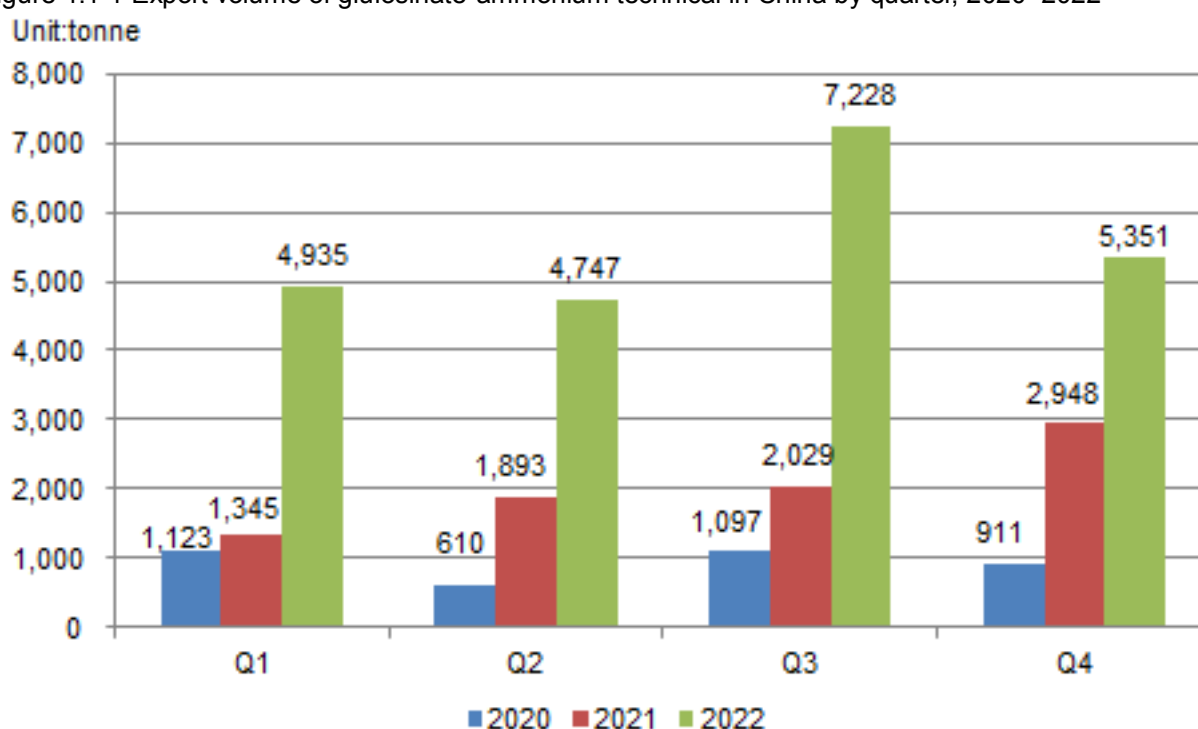
4.1 Export of glufosinate-ammonium technical in China, 2018–2022

Table 4.1-1 Export volume of glufosinate-ammonium technical in China by month, 2021–2022, tonne

Month	2021	2022	YoY change
Jan.	607.200	1,176.403	93.74%
Feb.	385.997	1,087.658	181.78%
March	352.097	2,670.608	658.49%
April	665.757	1,968.312	195.65%
May	605.521	888.447	46.72%
June	621.255	1,890.083	204.24%
July	817.841	2,814.411	244.13%
Aug.	708.117	1,829.092	158.30%
Sept.	503.404	2,584.612	413.43%
Oct.	614.066	1,641.135	167.26%
Nov.	1,361.090	1,669.568	22.66%
Dec.	972.983	2,040.584	109.72%
Total	8,215.329	22,260.913	170.97%

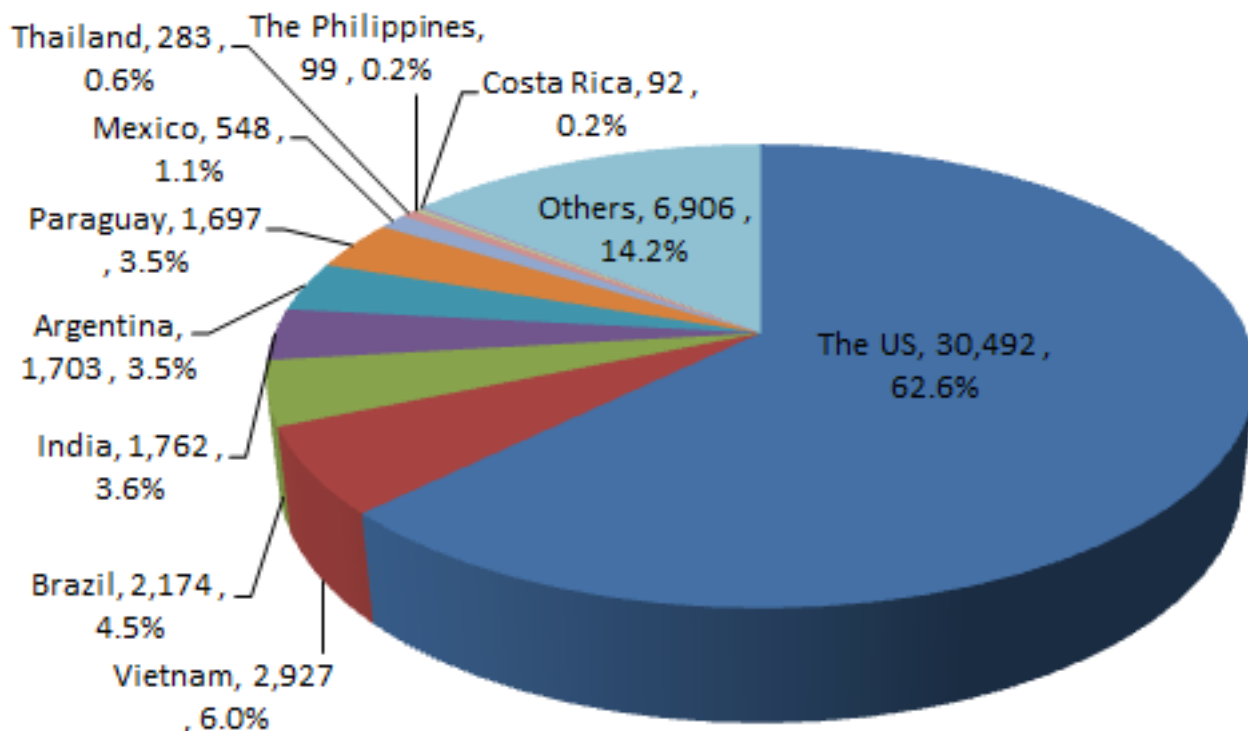
Note: 1. Export volume here refers to the total amount of four specifications, including 95% TC, 96% TC, 98% TC and 50% TK. All the volumes are calculated by 100% technical. 2. Since May 2020, China's export data are sourced from the customs of various destinations. 3. The data in Nov. and Dec. 2022 are estimated based on the average export data of the first ten months. Source: Tranalysis

Figure 4.1-1 Export volume of glufosinate-ammonium technical in China by quarter, 2020–2022



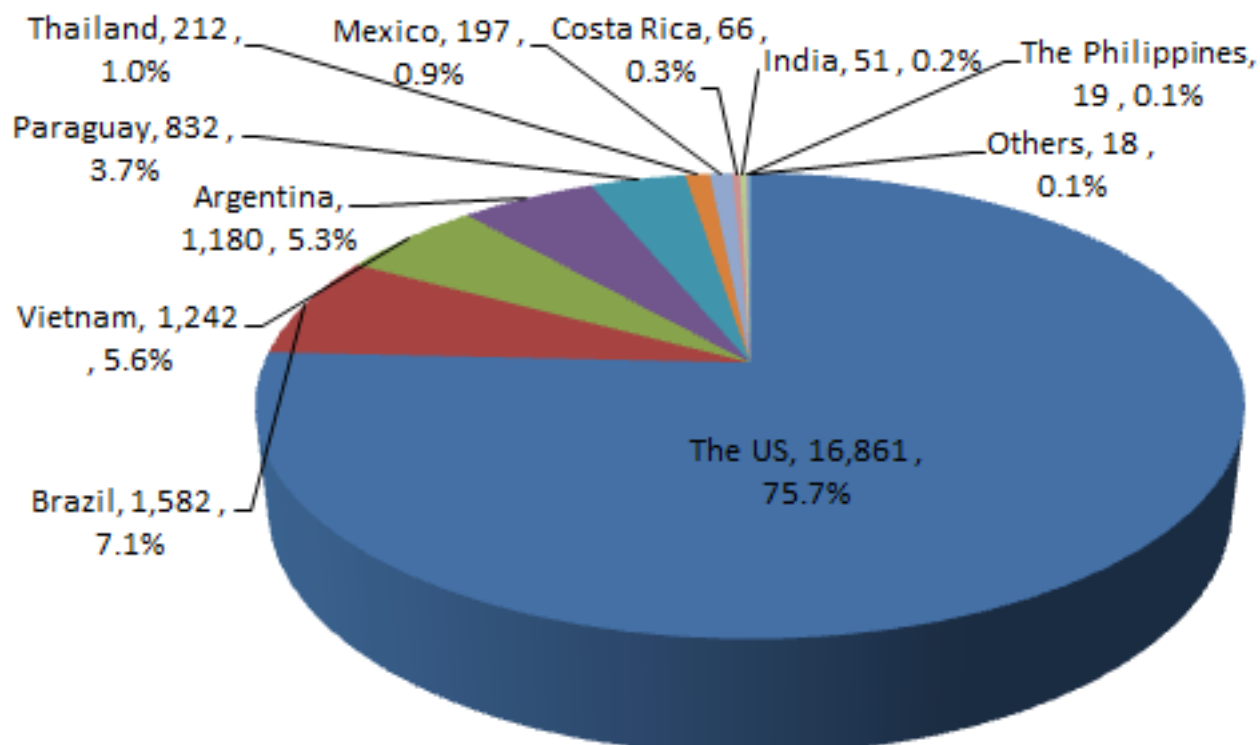
Note:1. Export volume here refers to the total amount of four specifications, including 95% TC, 96% TC, 98% TC and 50% TK. 2. Since May 2020, China's export data are sourced from data of the customs of various destinations. 3. All the volumes are calculated by 100% technical.
Source:Tranalysis

Figure 4.1-2 Export destinations of China's glufosinate-ammonium technical by volume and share, 2018–2022, tonne



Note:1. There are four specifications of glufosinate-ammonium technical produced in China, i.e. 95% TC, 96% TC, 98% TC and 50% TK. 2. All the volumes are calculated by 100% technical.
Source:Tranalysis

Figure 4.1-3 Export destinations of China's glufosinate-ammonium technical by volume and share, 2022, tonne



Note:1. There are four specifications of glufosinate-ammonium technical produced in China, i.e. 95% TC, 96% TC, 98% TC and 50% TK. 2. All the volumes are calculated by 100% technical.

Source:Tranalysis

The US, Brazil, Vietnam, Argentina and Paraguay were the top five export destinations in 2022, accounting for 97.4% of the total volume of exported glufosinate-ammonium technical.

4.2 Export of glufosinate-ammonium formulations in China, 2018–2022

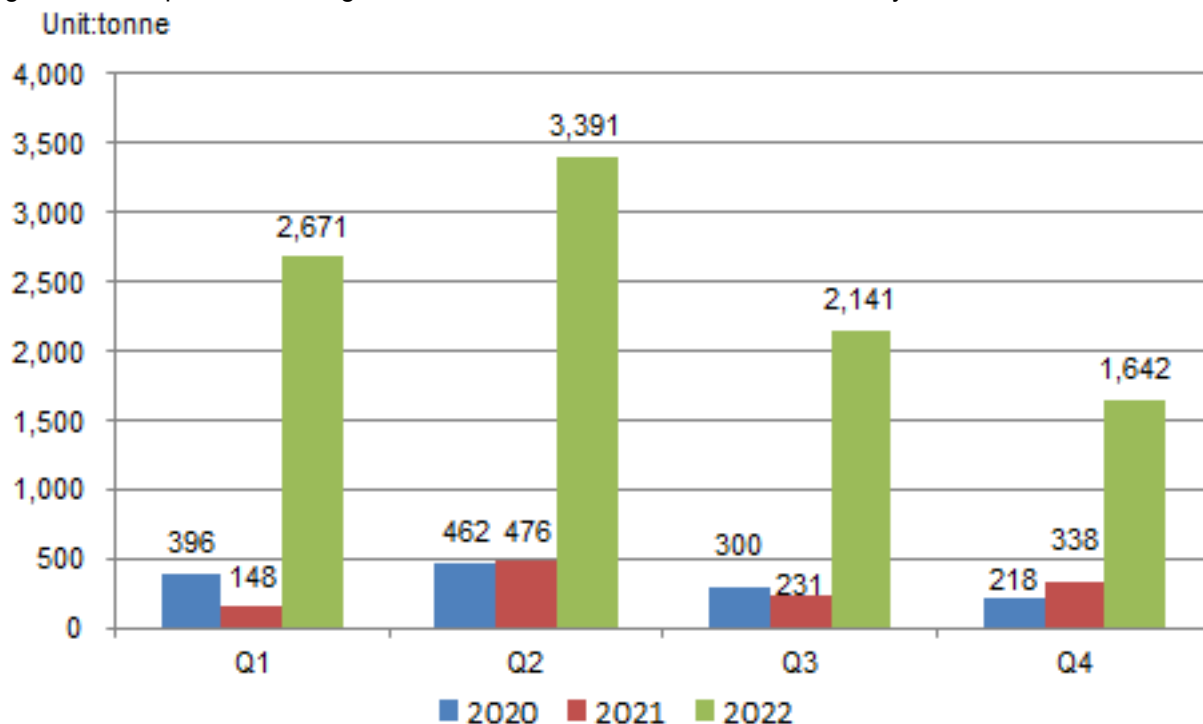
Table 4.2-1 Export volume of glufosinate-ammonium formulations in China by month, 2021–2022, tonne

Month	2021	2022	YoY change
Jan.	29.33	353.94	1106.60%
Feb.	43.74	497.14	1036.52%
March	74.48	1,820.40	2344.04%
April	138.73	1,025.69	639.34%
May	191.88	1,263.53	558.50%
June	145.85	1,101.44	655.16%
July	98.84	1,132.99	1046.28%
Aug.	50.35	397.34	689.14%
Sept.	82.27	610.80	642.39%
Oct.	135.18	329.59	143.82%
Nov.	135.27	738.42	445.89%
Dec.	67.14	574.33	755.43%
Total	1,193.08	9,845.60	725.23%

Note:1. Export volume here refers to the total amount of the formulations including 100g/L AS, 150g/L AS, 180g/L AS, 200g/L AS, 50%AS, 150g/L SL, 180g/L SL, 200g/L SL, 280g/L SL, 80% SG and 88% SG. All the volumes are calculated by 100% technical. 2. Since May 2020, China's export data are sourced from data of the customs of various destinations. 3. The data in Nov. and Dec. 2022 are estimated based on the average export data of the first ten months.

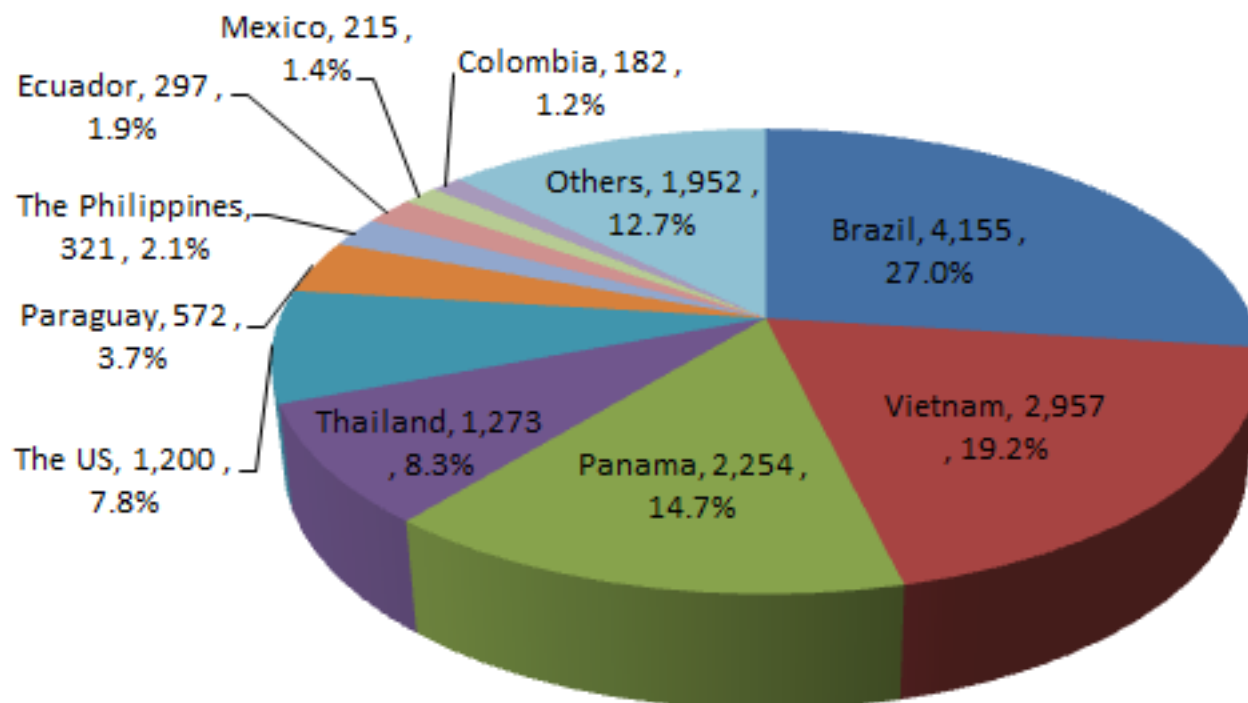
Source:Tranalysis

Figure 4.2-1 Export volume of glufosinate-ammonium formulations in China by month, 2020–2022



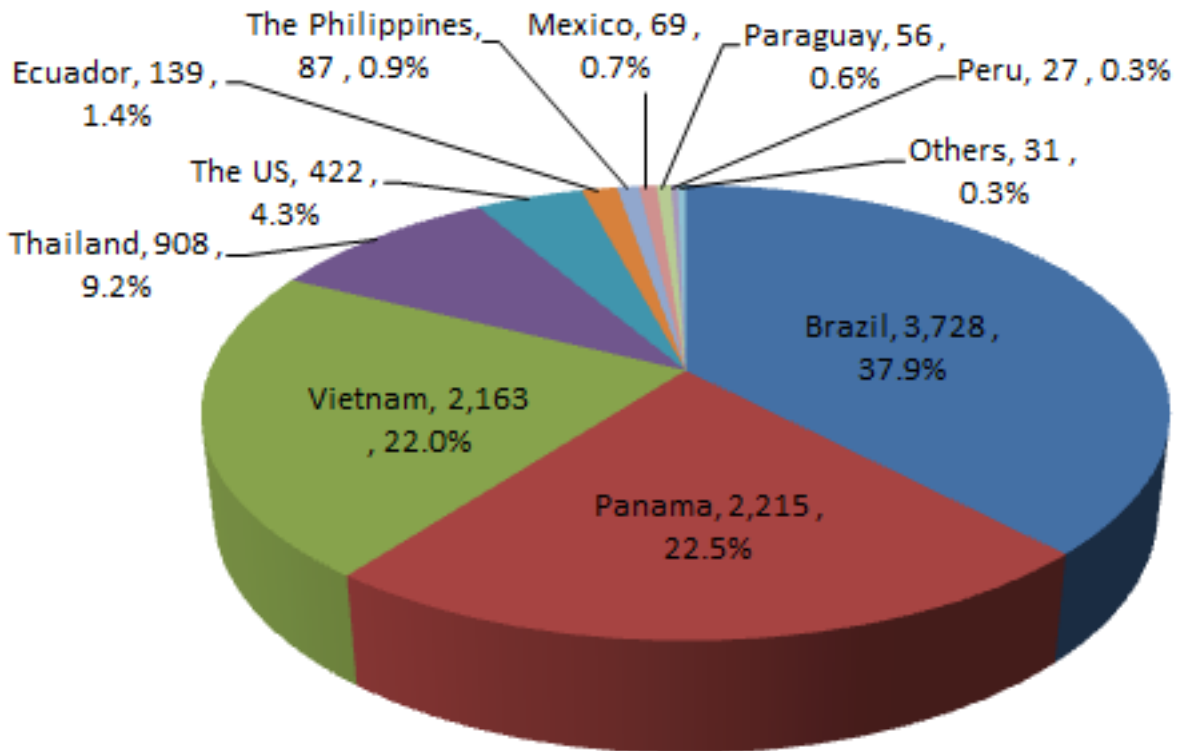
Note:1. Export volume here refers to the total amount of four formulations, including 100g/L AS, 150g/L AS, 180g/L AS, 200g/L AS, 50% AS, 150g/L SL, 180g/L SL, 200g/L SL, 280g/L SL, 80% SG and 88% SG. 2. Since May 2020, China's export data are sourced from data of the customs of various destinations. 3. All the volumes are calculated by 100% technical.
Source:Tranalysis

Figure 4.2-2 Export destinations of China's glufosinate-ammonium formulations by volume and share, 2018–2022, tonne



Note:1. Export volume here refers to the total amount of four formulations, including 100g/L AS,150g/L,AS 180g/L AS, 200g/L AS,50%AS,150g/L SL,180g/L SL,200g/L SL,280g/L SL,80% SG and 88% SG. 2. All the volumes are calculated by 100% technical.
Source:Tranalysis

Figure 4.2-3 Export destinations of China's glufosinate-ammonium formulations by volume and share, 2022, tonne

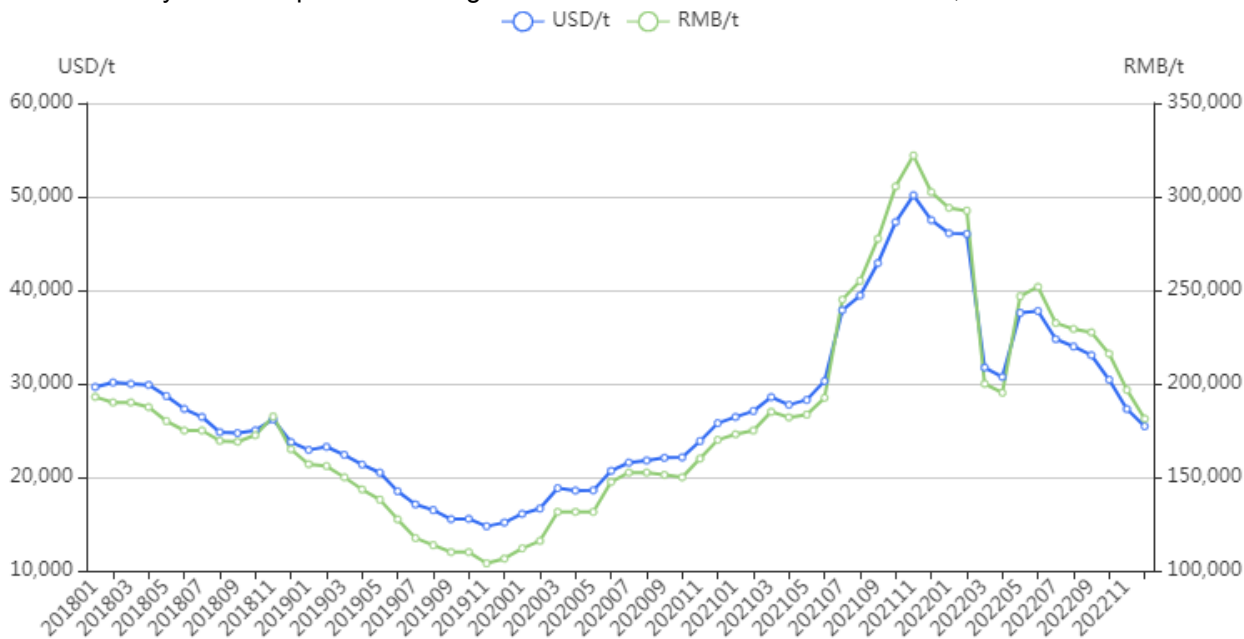


Note:1. Export volume here refers to the total amount of four formulations, including 100g/L AS,150g/L,AS 180g/L AS, 200g/L AS,50%AS,150g/L SL,180g/L SL,200g/L SL,280g/L SL,80% SG and 88% SG. 2. All the volumes are calculated by 100% technical. 3. Due to rounding, the total share may not equal 100%.
Source:Tranalysis

Brazil, Panama, Vietnam, Thailand and the US were the top five export destinations in 2022, accounting for 95.8% of the total volume of exported glufosinate-ammonium formulations.

5 Price

Figure 5-1 Monthly ex-works prices of 95% glufosinate-ammonium technical in China, 2018–2022



Source:CCM

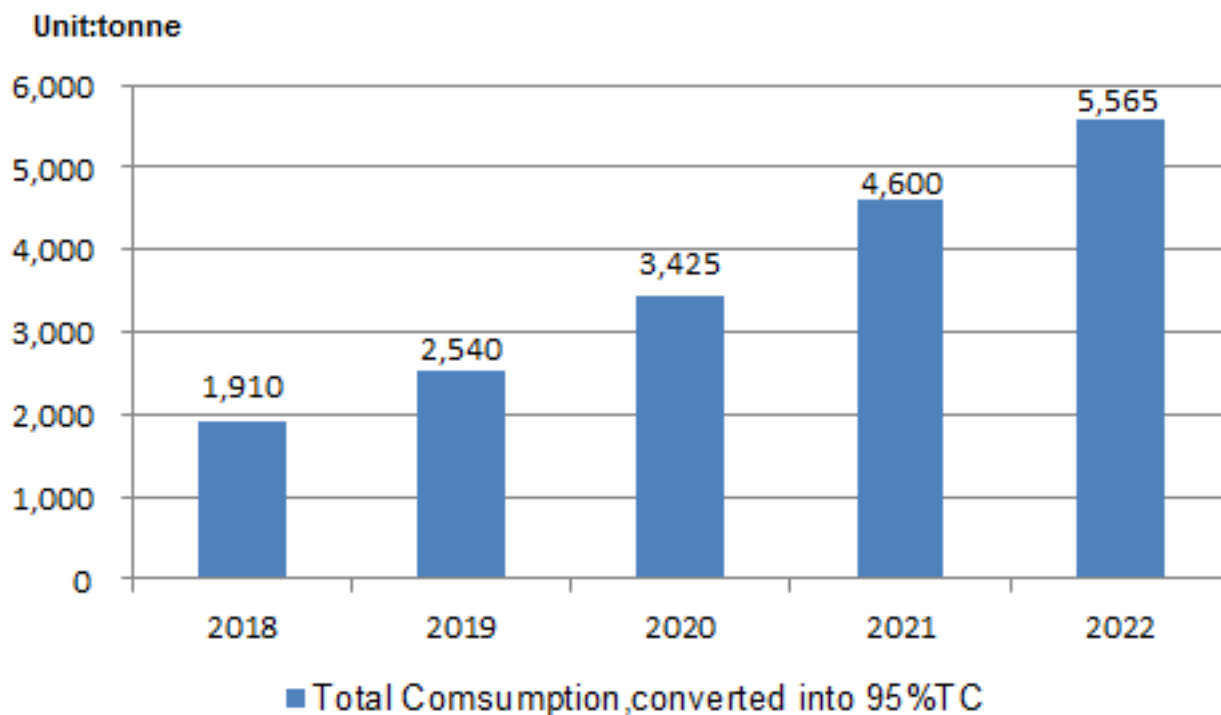
The ex-works price of glufosinate-ammonium has little change in 2018. During Nov. 2018–Nov. 2019, domestic ex-works price of glufosinate-ammonium was in a downtrend and slipped by about 44%, mainly caused by more glufosinate-ammonium capacity expansion worldwide.

Since the outbreak of the COVID-19 pandemic, the price has kept increasing. In H1 2021, the overseas demand for China's glufosinate-ammonium grew, but the inventory was insufficient, which worsened due to limited production capacity of manufacturers and unstable production of its raw material diethyl phosphite (DEP). The ex-works price of 95% TC stood high in Nov. 2021 at USD50,162/t, up 239.9% from Nov. 2019, driven by tight supply and rising costs of raw materials.

Thanks to the completion and operation of new capacities in China, the ex-works price started to go down in Dec. 2021 and dipped to USD30,736/t in April 2022, down 38.7% from the peak in Nov. 2021. However, the price recovered from April to June as a result of the sustained increase in the price of yellow phosphorus. From July to Dec., with the pesticide market gradually entering the off-season and the continued release of production capacity, the ex-works price of glufosinate-ammonium continued to fall to USD25,455/t.

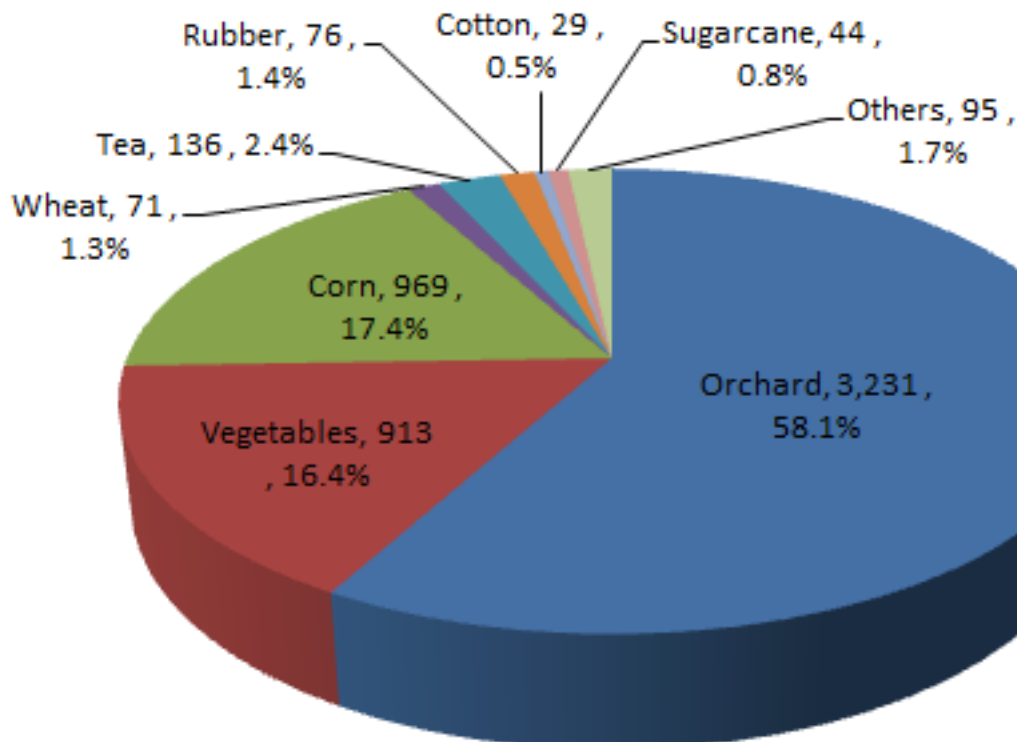
6 Domestic consumption

Figure 6-1 Consumption of glufosinate-ammonium in China, 2018–2022, tonne



Note:1. The consumption in this figure is all the specifications' consumption converted to 95% TC, including both technical and formulations of glufosinate-ammonium. 2. The consumption of the specification converted in 95% TC = the actual consumption of the specification * its content rate of active ingredient of glufosinate-ammonium / 0.95. 3. The resulting consumption is rounded up.
Source:CCM

Figure 6-2 Consumption pattern of China's glufosinate-ammonium by main target crops, 2022, tonne



Note:1. The consumption in this figure is all the specifications' consumption converted to 95% TC, including both technical and formulations of glufosinate-ammonium. 2. The consumption of the specification converted in 95% TC = the actual consumption of the specification * its content rate of active ingredient of glufosinate-ammonium / 0.95
Source:CCM

Glufosinate-ammonium is a non-selective herbicide and its quick effectiveness falls between paraquat's and glyphosate's. It is commonly used in orchards, vineyards, potato fields, and non-crop land for control of annual and perennial dicotyledonous weeds and gramineous weeds. In 2018–2022, consumption of glufosinate-ammonium in China increased from 1,910 tonnes to 5,565 tonnes, with a CAGR of 23.8%. However, its high price made the domestic consumption not much compared with export.

In China, glyphosate is the most consumed herbicide. In terms of the weeding effect, long-term use of glyphosate will generate the weeds' resistance to glyphosate, which will affect crop yields. Glyphosate is not as effective against *eleusine indica* and *conyza canadensis* as before, while there is no such problem in the use of glufosinate-ammonium. As a result, compound utilisation of these two herbicides is an inevitable trend. More and more Chinese producers start to produce glufosinate-ammonium and the production cost continuously goes down. Besides, in July 2016, China completely banned the sale and use of paraquat AS, which provides a good opportunity for glufosinate-ammonium's development.

Table 6-1 Planting areas of glufosinate-ammonium's main target crops in China, 2018–2022, '000 ha

Crop	2018	2019	2020	2021	2022
Orchard	11,875	12,277	12,646	12,962	13,547
Vegetables	20,439	20,863	21,485	21,744	22,356
Corn	42,130	41,284	41,264	43,320	43,066
Wheat	24,266	23,728	23,380	23,570	23,533
Tea	2,959	3,105	3,217	3,264	3,200
Rubber	1,177	1,143	1,010	1,217	1,133
Cotton	3,354	3,339	3,169	3,028	3,100
Sugarcane	1,406	1,391	1,353	1,326	1,340
Total planting area	107,606	107,129	107,524	110,431	111,275

Source: National Bureau of Statistics of China & CCM

Table 6-2 Application parameters of glufosinate-ammonium in main target crops in China, 2022

Crop	Annual application frequency	Usage, g(AI)/ha	Rate per application
Orchard	1	450	53.0%
Vegetables	1	430	9.5%
Corn	1	500	4.5%
Wheat	1	250	1.2%
Tea	1	250	17.0%
Rubber	1	250	27.0%
Cotton	1	250	3.8%
Sugarcane	1	500	6.6%

Source: CCM

Glyphosate, one of the sterilant herbicides, is generally not for the crops which have shallow roots or whose roots are exposed, such as vegetables, parsley, pepper, grapes, and papaya, while glufosinate-ammonium is

almost applicable to all crops. It is mainly registered for application in areas like non-crop land, rubber, tea, orchard and vegetables. However, because of the relatively high prices of glufosinate-ammonium products, the largest consumption field for glufosinate-ammonium is orchard with high economic value, and the second goes to corn.

Since glufosinate-ammonium eliminates grass by contact, its herbicidal effect is mainly influenced by three factors—humidity, temperature and light condition. Once under an environment with relatively high humidity and temperature, as well as good light conditions, it works better. In China, the agricultural planting structure is adjusted annually and thus the planting area of glufosinate-ammonium's main targets fluctuates. However, the growing resistance to glyphosate, prohibition of paraquat AS and the rising application rate of glufosinate-ammonium all make its domestic consumption increase rapidly.

7 Conclusions

In 2018–2022, China's glufosinate-ammonium production has been in a fast expansion period, with significant growth in capacity and output. However, the export volume saw fluctuations during this period, with growth slowing down in 2019 and even a large drop in 2020. Since the US is the No.1 importer of glufosinate-ammonium from China, the trade war and tariffs might explain the slowdown and decline.

In 2022, as the impact of the COVID-19 epidemic diminished, glufosinate-ammonium producers gradually recovered their production capacity and global demand for glufosinate-ammonium continued to grow, resulting in a significant increase in export volume. In the future, the market demand for glufosinate-ammonium is expected to remain robust for the reasons as follows:

- Expanding scale of paraquat prohibition at home and abroad;
- Development of glufosinate-ammonium and glyphosate fixed formulations;
- Increasing cultivation of glufosinate-ammonium tolerant crops, stacked glyphosate/glufosinate traits crops, and stacked glufosinate/dicamba traits crops.

China is still the biggest exporter of glufosinate-ammonium in the global market. In China, many producers intend to expand glufosinate-ammonium capacity in the next few years. However, the actual production capacity in future is uncertain due to relatively high costs, technology barriers and stricter environmental protection inspections. Therefore, the supply of glufosinate-ammonium will remain tight in the short term, and the ex-works price of glufosinate-ammonium will stabilise at a high level.

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