

Production Situation of Glufosinate- ammonium in China 2021

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Kcomber Inc.

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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 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.

Regarding production, from 2017 to 2021, the capacity of glufosinate-ammonium TC in China showed a fast growth from 21,800 t/a to 60,100 t/a, with a CAGR of 28.9%. And the output rose from 7,800 tonnes to 17,300 tonnes in 2017–2021, at a CAGR of 22.0%, mainly driven by soaring demand at home and abroad and technology improvement. As of June 2022, there were 66 active registrations of glufosinate-ammonium TC and 10 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 growths for years. However, a drop appeared as China and the world suffered from the outbreak of COVID-19 pandemic 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. On the other hand, its high price made the domestic consumption in China not much compared with export. In 2017–2020, consumption of glufosinate-ammonium in China increased from 1,420 tonnes to 3,425 tonnes, with a CAGR of 34.1%.

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

MDP: Methylphosphonous dichloride

Table: USD/CNY exchange rate, Jan. 2017–July 2022

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
2017	6.8918	6.8713	6.8932	6.8845	6.8827	6.8019	6.7772	6.7148	6.5909	6.6493	6.6300	6.6067	6.7662
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	-	-	-	-	-	-

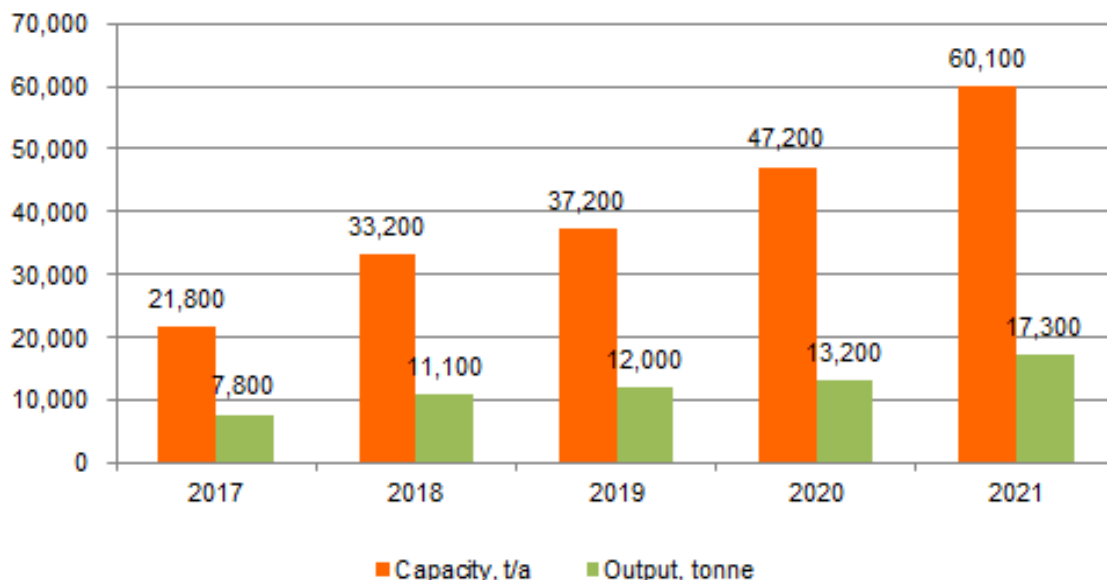
Source: The People's Bank of China

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, 180g/L AS, 200g/L AS and 280g/L SL, with 200g/L AS as the dominant formulation.

1.1 Production of glufosinate-ammonium technical in China, 2017–2021

Figure 1.1-1 Capacity and output of glufosinate-ammonium technical in China, 2017–2021

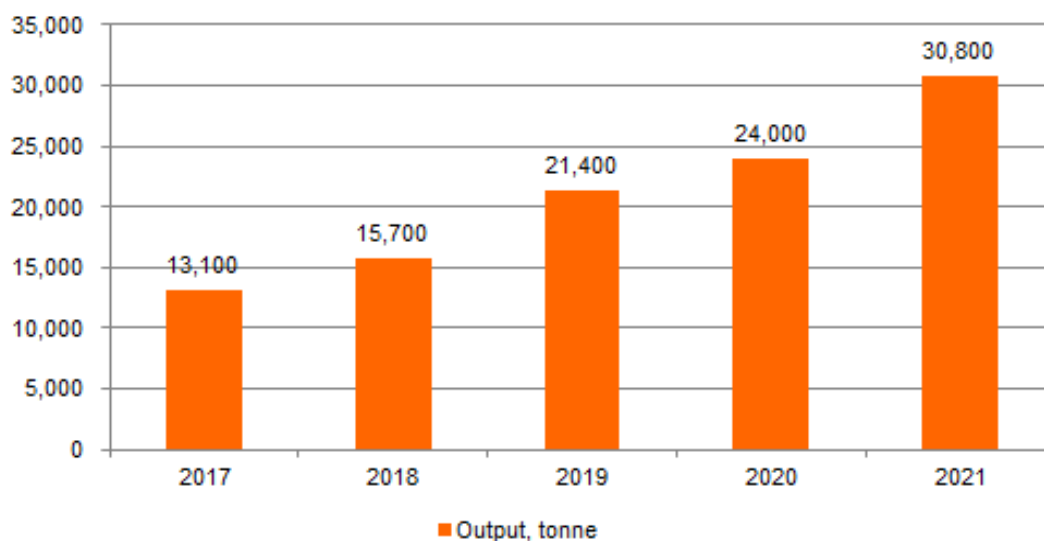


Note: Output here refers to the total amount of 95% TC and three specifications (96% TC, 98% TC and 50% TK) converted to 95% TC.
Source:CCM

From 2017 to 2021, the capacity of glufosinate-ammonium TC in China showed a fast growth from 21,800 t/a to 60,100 t/a, with a CAGR of 28.9%. And the output rose from 7,800 tonnes to 17,300 tonnes in 2017–2021, at a CAGR of 22.0%, 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, 2017–2021

Figure 1.2-1 Output of glufosinate-ammonium formulations in China, 2017–2021



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

From 2017 to 2021, China's output of glufosinate-ammonium formulations increased significantly from 13,100 tonnes to 30,800 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, 2017–2021

No.	Producer	Abbr.	Status				
			2017	2018	2019	2020	2021
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	Shijiazhuang Richem Co., Ltd.	Shijiazhuang Richem	Active	Active	Active	Active	Active
5	Sichuan Leshan Fuhua Tongda Agro-chemical Technology Co., Ltd.	Fuhua Tongda	/	Active	Active	Active	Active
6	Shandong Eshung Industrial Co., Ltd.	Shandong Eshung	/	/	Active	Active	Active
7	Nanjing Red Sun Biochemistry Co., Ltd.	Nanjing Red Sun	/	/	Active	Active	Active
8	Inner Mongolia Jiaruimi Chemical Co., Ltd.	Inner Mongolia Jiaruimi	Active	Active	Active	Active	Active
9	Jiangsu Sevencontinent Green Chemical Co., Ltd.	Jiangsu Sevencontinent	Active	Idle	Idle	Idle	Active
10	Rosi Chemical Co., Ltd.	Rosi Chemical	Active	Active	Active	Active	Active
11	Jiangsu Huifeng Bio Agriculture Co., Ltd.	Jiangsu Huifeng	Active	Idle	Idle	Idle	Active
12	Jiangsu Huangma Agrochemicals Co., Ltd.	Jiangsu Huangma	Active	Idle	Idle	Idle	Idle
13	Shandong Binnong Technology Co., Ltd.	Shandong Binnong	Idle	Active	Idle	Idle	Idle
14	Shandong Weifang Rainbow Chemical Co., Ltd.	Weifang Rainbow	Idle	Idle	Idle	Idle	Idle
15	Shandong Zhongshi Pesticide Co., Ltd.	Shandong Zhongshi	Idle	Idle	Idle	Idle	Idle
16	Shandong Weitian Fine Chemical Technology Co., Ltd.	Shandong Weitian	Active	Idle	Idle	Idle	Idle

Source:CCM

2.1 Producers of glufosinate-ammonium technical in China, 2017–2021

Table 2.1-1 Capacity and output of glufosinate-ammonium technical producers in China, 2017–2021

No.	Producer	Capacity, t/a					Output, tonne				
		2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
1	Lier Chemical	5,600	8,400	8,400	18,400	18,400	3,600	5,500	5,700	6,900	10,000
2	Yongnong BioSciences	2,400	3,000	3,000	3,000	6,400	2,000	2,400	2,400	2,400	3,000
3	Hebei Veyong	1,500	2,000	2,000	2,000	2,000	940	1,400	1,500	1,500	1,500
4	Shijiazhuang Richem	1,000	1,500	1,500	1,500	1,500	380	800	900	700	700
5	Fuhua Tongda	/	6000	6,000	6,000	6,000	/	300	500	500	500

No.	Producer	Capacity, t/a					Output, tonne				
		2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
6	Shandong Eshung	/	/	1,000	1,000	1,000	/	/	300	500	500
7	Nanjing Red Sun	/	/	3,000	3,000	3,000	/	/	300	300	300
8	Inner Mongolia Jiaruimi	600	600	600	600	600	150	200	250	250	250
9	Jiangsu Sevencontinent	1,000	1,000	1,000	1,000	1,000	200	0	0	0	250
10	Rosi Chemical	1,000	1,000	1,000	1,000	1,000	100	150	150	150	150
11	Jiangsu Huifeng	5,000	5,000	5,000	5,000	5,000	100	0	0	0	150
12	Jiangsu Huangma	1,000	1,000	1,000	1,000	1,000	300	150	0	0	0
13	Shandong Binnong	1,000	2,000	2,000	2,000	11,500	0	200	0	0	0
14	Weifang Rainbow	1,000	1,000	1,000	1,000	1,000	0	0	0	0	0
15	Shandong Zhongshi	500	500	500	500	500	0	0	0	0	0
16	Shandong Weitian	200	200	200	200	200	30	0	0	0	0
Total		21,800	33,200	37,200	47,200	60,100	7,800	11,100	12,000	13,200	17,300

Source:CCM

As of June 2022, there were 66 active registrations of glufosinate-ammonium TC and 10 active registrations of glufosinate-ammonium TK in China, only part of which have production lines approved and operated.

In 2021, only 11 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. And its capacity is 2,000 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.

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.

Others

- Jiangsu Sevencontinent: Its subsidiary Sevencontinent Green Chemical (Jining) Co., Ltd. in Jining City, Shandong Province released 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.
- Shandong Weitian, Inner Mongolia Jiaruimi and Shandong Binnong: These three companies have owned production lines for years but produced in a very small quantity or had no operation in recent years. Among them, Shandong Binnong's wholly-owned subsidiary Gansu Binnong Technology Co., Ltd. had its 22,000 t/a pesticide intermediate project (including 10,000 t/a glufosinate-ammonium TC) put into production at one time in Sept. 2021, while the project is still in the production debugging stage at present.

2.2 Producers of glufosinate-ammonium formulations in China, 2017–2021

Table 2.2-1 Output of glufosinate-ammonium formulations producers in China, 2017–2021

No.	Producer	Output, tonne				
		2017	2018	2019	2020	2021
1	Yongnong BioSciences	6,000	7,000	8,000	9,000	11,800
2	Jiangsu Sevencontinent	2,000	2,500	4,600	6,000	7,400
3	Lier Chemical	1,700	2,600	3,600	4,000	5,200
4	Hebei Veyong	1,000	1,500	2,000	2,000	2,500
5	Weifang Rainbow	1,100	800	1,700	1,500	2,000
6	Jiangsu Huifeng	500	300	500	500	700
	Others	800	1,000	1,000	1,000	1,200
	Total	13,100	15,700	21,400	24,000	30,800

Note: Output here refers to the total amount of glufosinate-ammonium formulations including 100g/L AS, 180g/L AS, 200g/L AS and 280g/L SL.

Source: CCM

The registrations of glufosinate-ammonium formulations in China went up sharply. As of June 2022, there have been 388 companies in China completing 709 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.

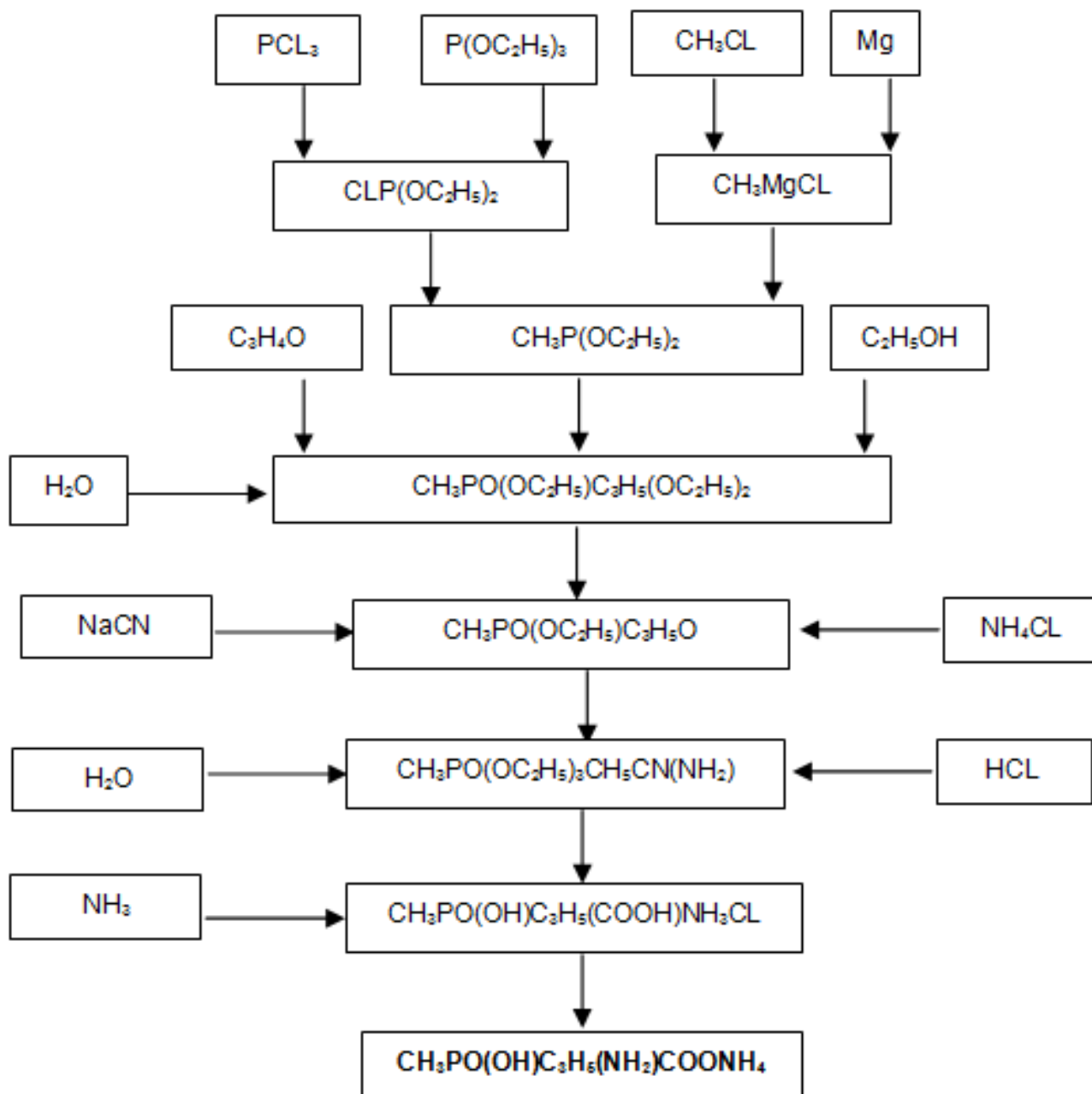
In 2020–2021, Lier Chemical, Jiangsu Sevencontinent and Yongnong BioSciences saw large increases in the output of formulations. Jiangsu Sevencontinent, in particular, has become one of key producers of glufosinate-ammonium formulation in China, along with its vigorous promotion in the domestic market. 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.

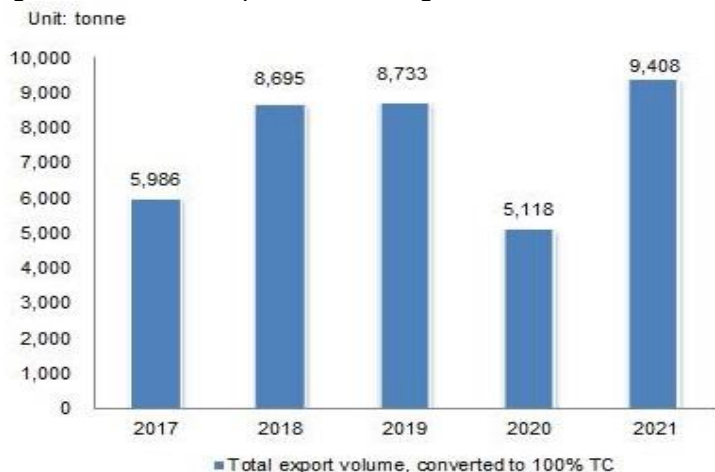
Chinese producers have made progress in their technology levels, having optimised the reaction conditions and parameters, reduced discharge of pollutants, lowered the unit consumption of raw materials and increased product yield, etc. For example, Lier Chemical developed a new method to compound methyldiethoxyphosphine,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

4 Export

Figure 4-1 China's export volume of glufosinate-ammonium, 2017–2021



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.

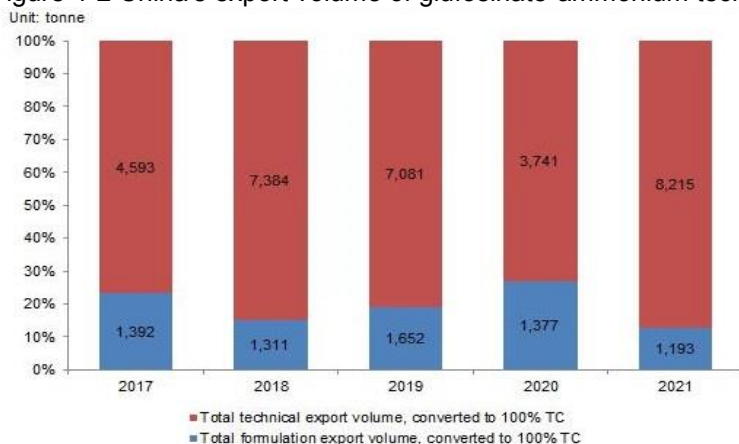
Source:Tranalysis

The export volume of glufosinate-ammonium (converted to 100% AI) in China saw continuous growths for years. However, a drop appeared as China and the world suffered from the outbreak of 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.

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, Thailand cancelled the use of paraquat since 1 Dec., 2019; Brazil banned paraquat from Sept. 2020. The California state in the US also plans to ban paraquat and glyphosate in the future against their poison effects. Once paraquat gets banned, its 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, 2017–2021



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.

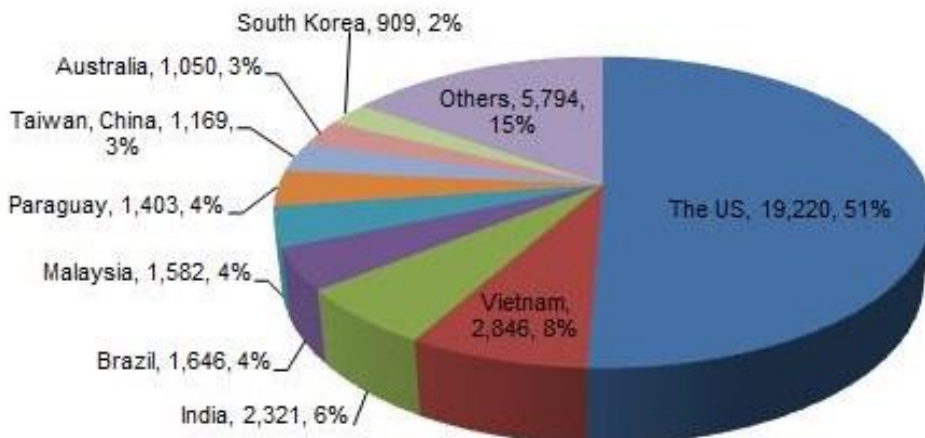
Source:Tranalysis

China exports both glufosinate-ammonium technical and formulation products. During 2017–2021, export volume of technical products has on average accounted for 81% 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 2021, export volume of technical witnessed a remarkable growth, with a share of about 87.3% and 12.7% for formulation.

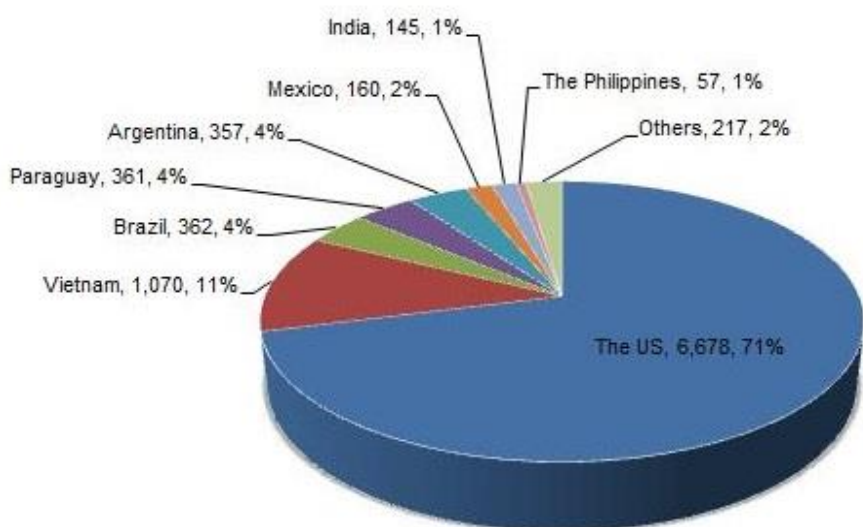
In 2021, producers have been more concentrated on 95% technical and 200g/L AS production, the dominant specifications of glufosinate-ammonium products exported from China.

Figure 4-3 Export destinations of China's glufosinate-ammonium by volume and share, 2017–2021, 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, 2021, tonne



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

Among the export destinations of China's glufosinate-ammonium, the US, Vietnam, India, Brazil and Malaysia were the top five in 2017–2021 by accumulated export volume, accounting for about 73% of the total amount.

4.1 Export of glufosinate-ammonium technical in China, 2017–2021

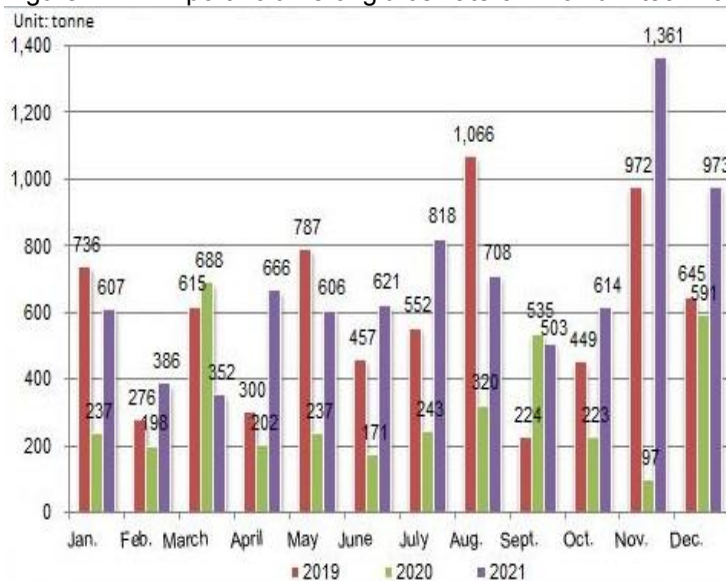
Table 4.1-1 Export volume of glufosinate-ammonium technical in China by month, 2020–2021, tonne

Month	2020	2021	YoY change
Jan.	237.447	607.200	155.72%
Feb.	198.150	385.997	94.80%
March	687.645	352.097	-48.80%
April	201.959	665.757	229.65%
May	236.845	605.521	155.66%
June	170.905	621.255	263.51%
July	242.749	817.841	236.91%
Aug.	319.555	708.117	121.59%
Sept.	535.119	503.404	-5.93%
Oct.	223.493	614.066	174.76%
Nov.	96.663	1,361.090	1,308.09%
Dec.	590.708	972.983	64.71%
Total	3,741.238	8,215.329	119.59%

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

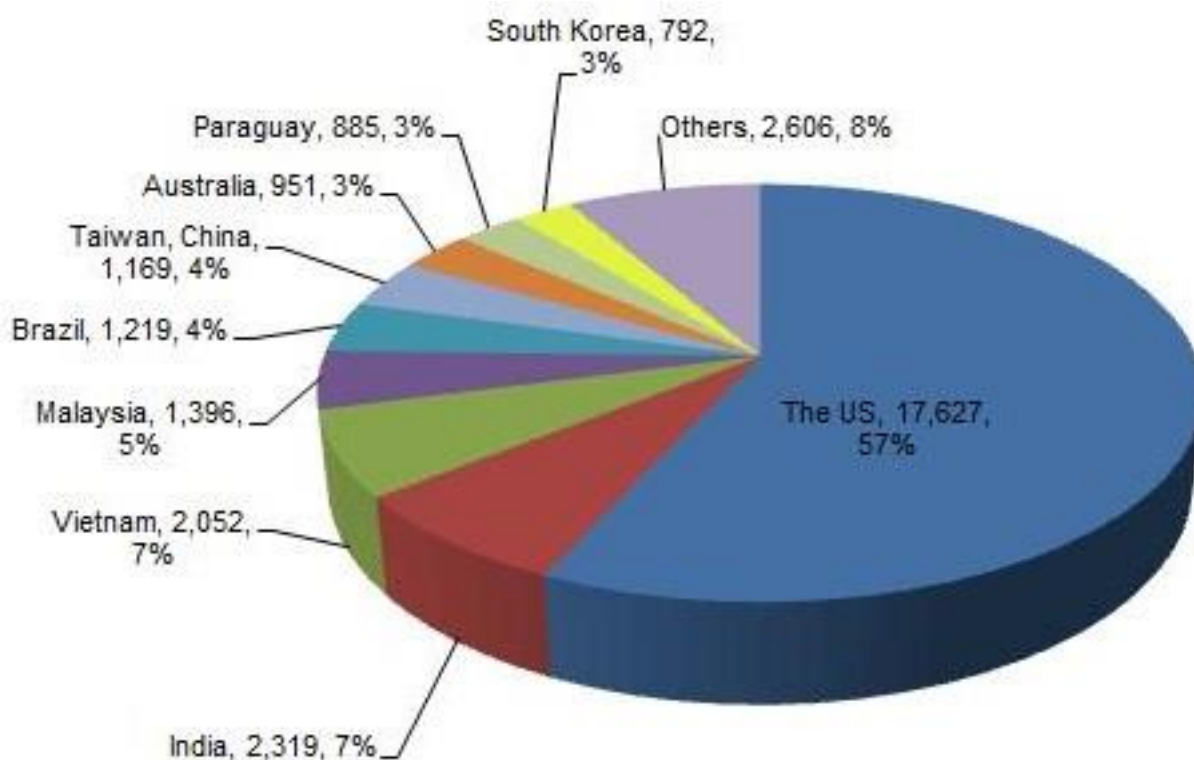
Figure 4.1-1 Export volume of glufosinate-ammonium technical in China by month, 2019–2021



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.

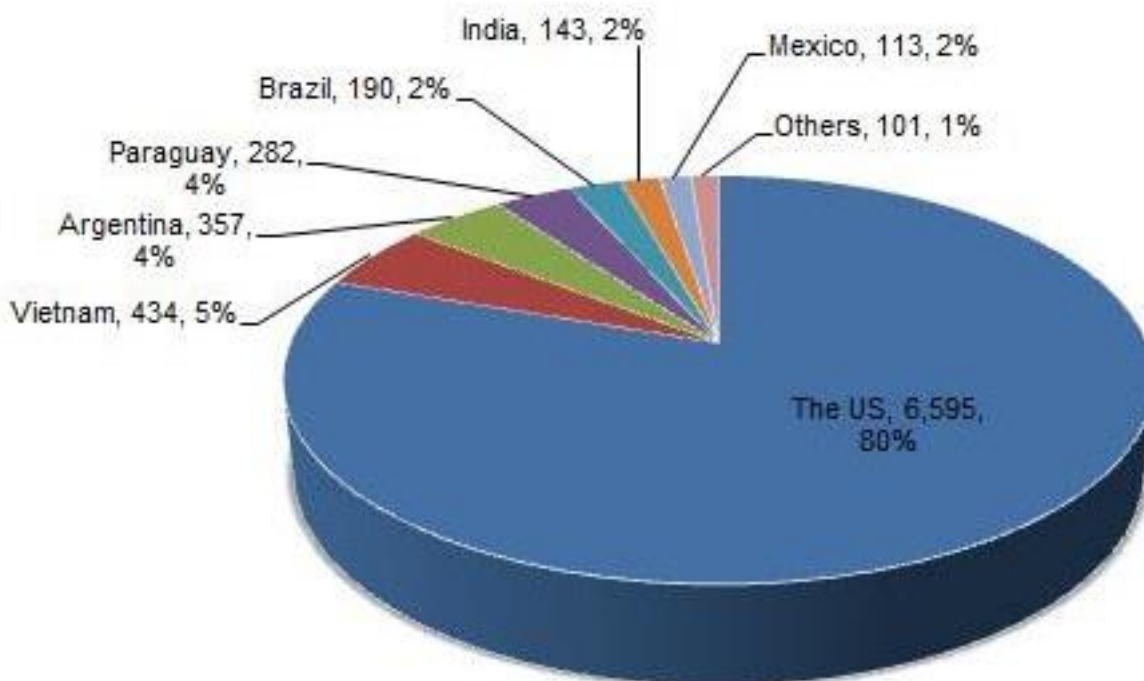
Source:Tranalysis

Figure 4.1-2 Export destinations of China's glufosinate-ammonium technical by volume and share, 2017–2021, 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, 2021, 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, Vietnam, Argentina, Paraguay and Brazil were the top five export destinations in 2021, accounting for 95.6% of the total volume of exported glufosinate-ammonium technical.

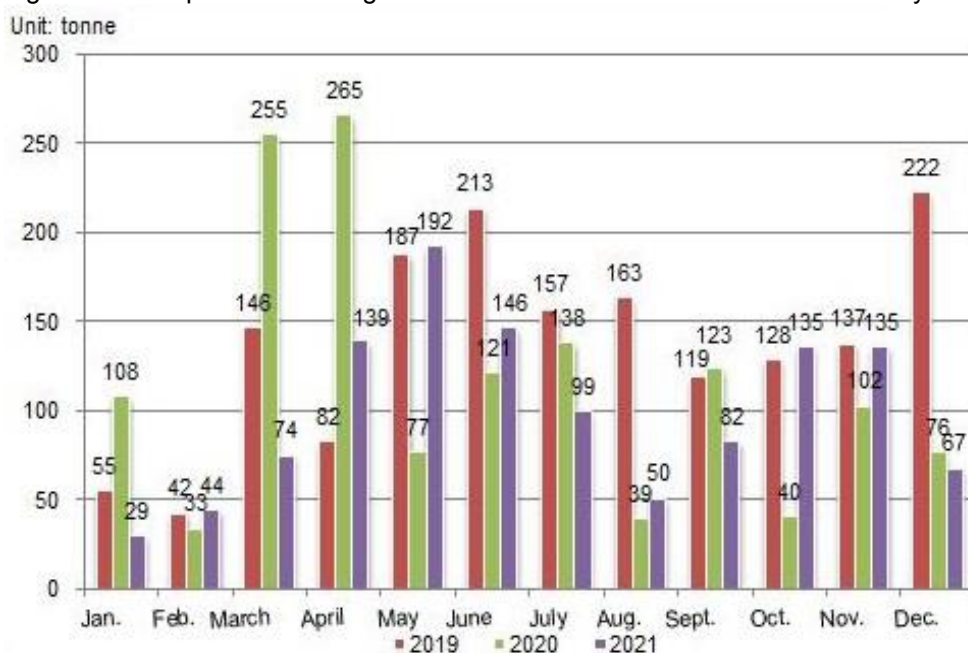
4.2 Export of glufosinate-ammonium formulations in China, 2017–2021

Table 4.2-1 Export volume of glufosinate-ammonium formulations in China by month, 2020–2021, tonne

Month	2020	2021	YoY change
Jan.	107.680	29.334	-72.76%
Feb.	33.374	43.743	31.07%
March	254.802	74.483	-70.77%
April	265.173	138.730	-47.68%
May	76.518	191.880	150.76%
June	120.731	145.855	20.81%
July	138.000	98.841	-28.38%
Aug.	39.035	50.350	28.99%
Sept.	123.317	82.275	-33.28%
Oct.	39.775	135.178	239.86%
Nov.	102.176	135.269	32.39%
Dec.	76.286	67.139	-11.99%
Total	1,376.867	1,193.076	-13.35%

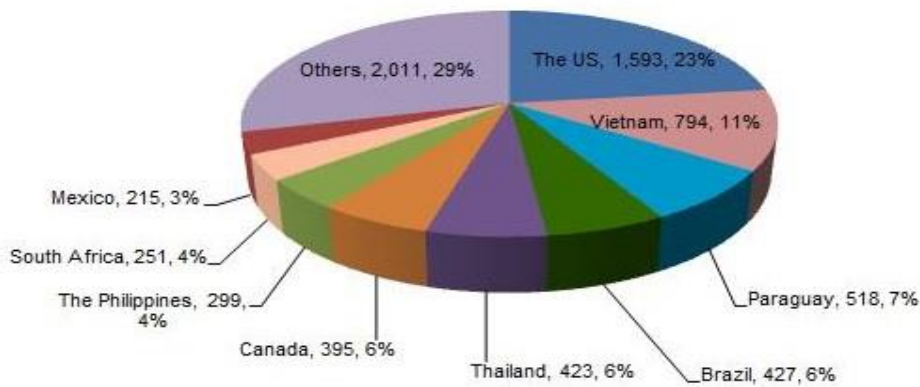
Note:1. Export volume here refers to the total amount of four formulations, including 150g/L AS, 180g/L AS, 200g/L AS and 280g/L SL.
 2. Since May 2020, China's export data are sourced from data of the customs of various destinations. 3. All the volumes are calculated by 100% technical.
 Source:Tranalysis

Figure 4.2-1 Export volume of glufosinate-ammonium formulations in China by month, 2019–2021



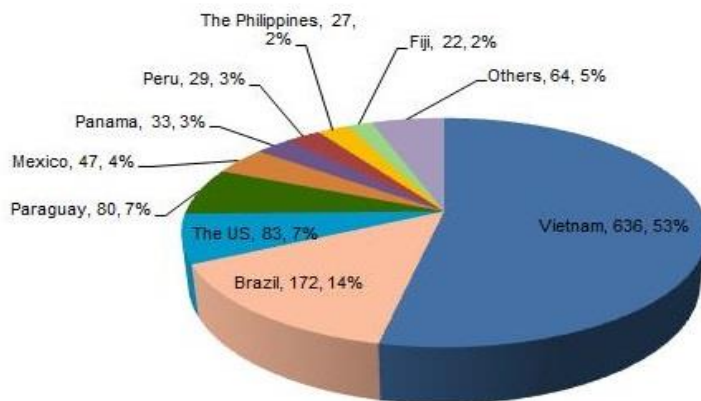
Note:1. Export volume here refers to the total amount of four formulations, including 150g/L AS, 180g/L AS, 200g/L AS and 280g/L SL.
 2. Since May 2020, China's export data are sourced from data of the customs of various destinations. 3. All the volumes are calculated by 100% technical.
 Source:Tranalysis

Figure 4.2-2 Export destinations of China's glufosinate-ammonium formulations by volume and share, 2017–2021, tonne



Note:1. Export volume here refers to the total amount of four formulations, including 150g/L AS, 180g/L AS, 200g/L AS and 280g/L SL.
 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, 2021, tonne

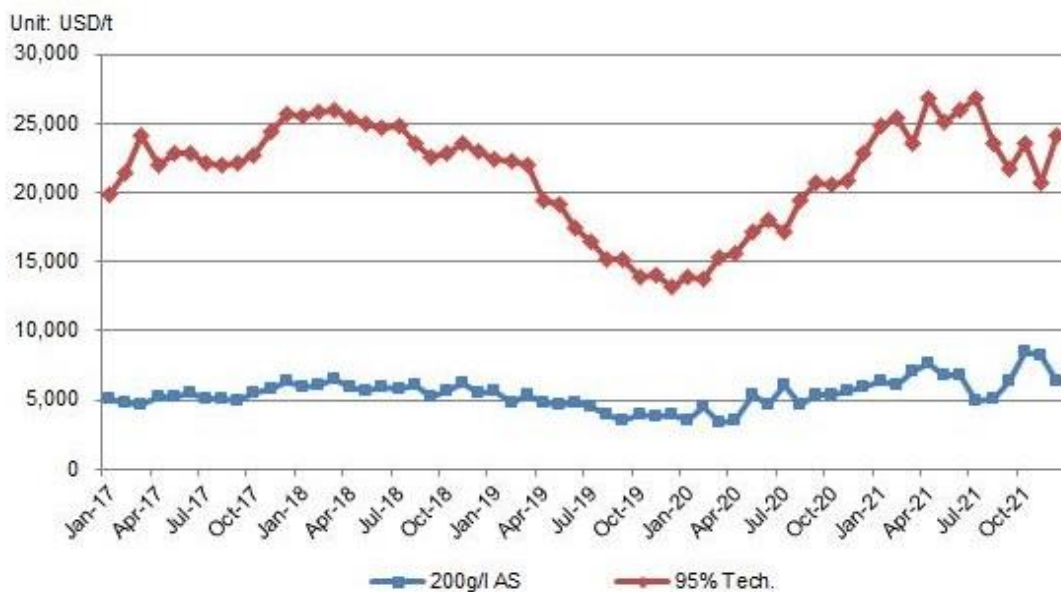


Note:1. Export volume here refers to the total amount of four formulations, including 150g/L AS, 180g/L AS, 200g/L AS and 280g/L SL.
 2. All the volumes are calculated by 100% technical.
 Source:Tranalysis

Vietnam, Brazil, the US, Paraguay and Mexico were the top five export destinations in 2021, accounting for 85% of the total volume of exported glufosinate-ammonium formulations.

5 Price

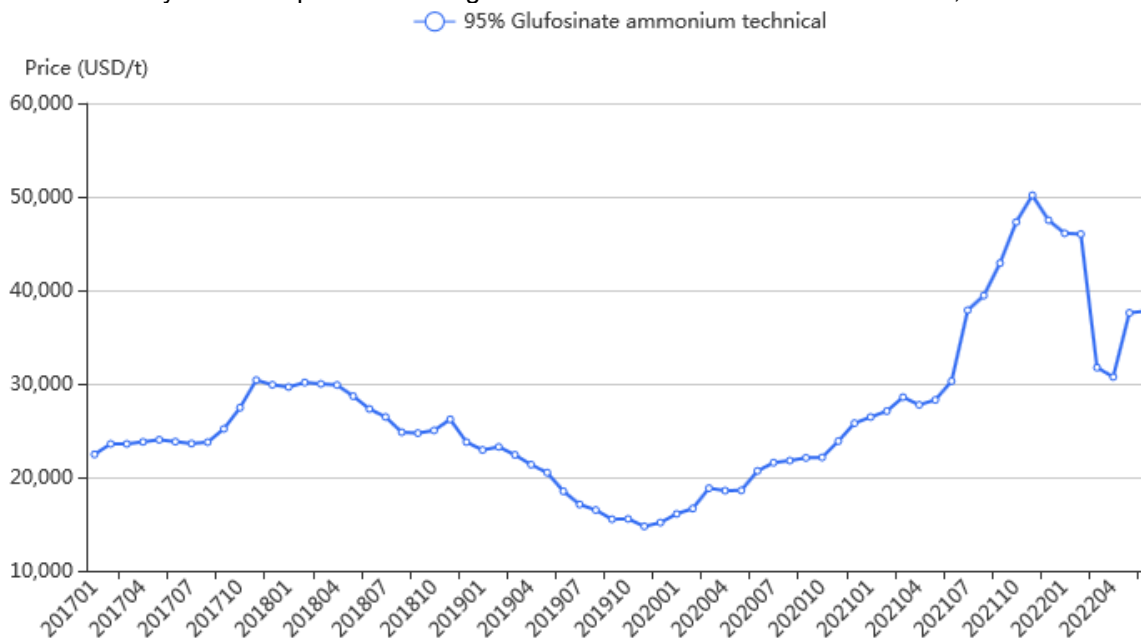
Figure 5-1 Monthly export prices of 95% glufosinate-ammonium technical and glufosinate-ammonium 200g/L AS in China, Jan. 2017–Dec. 2021



Note:1. The price in total is weighted average price. 2. These data are obtained by CCM's analysis on 8 digit HS code of China Customs data. The Customs data consist of many shipments, and the prices can be FOB prices, C&F prices or CIF prices. However, it is very hard to distinguish which shipment is FOB price, C&F price or CIF price as there is no precise explanation in 8 digit HS code Customs data. So the prices in above figure are weighted average prices of FOB prices, CIF prices and C&F prices, and the relevant weight is the export volume of each shipment. Here is the calculation formula: Weighted average prices = (export volume1×price1 + export volume 2×price2+...+ export volume n× price n) / (export volume1+export volume2+...+ export volume n). 3. 95% TC is the dominant specification of glufosinate-ammonium technical produced and exported in China, while 200g/L AS is the dominant specification of Chinese glufosinate-ammonium formulations.

Source:China Customs & Tranalysis

Figure 5-2 Monthly ex-works prices of 95% glufosinate-ammonium technical in China, Jan. 2017–June 2022



Source:China Customs & CCM

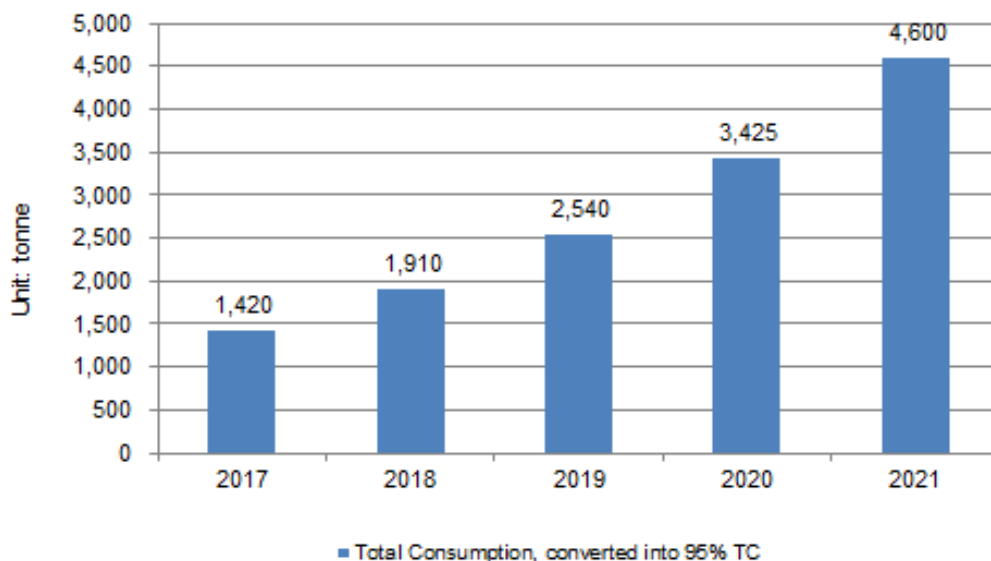
China has banned paraquat AS since July 2016, which led to increasing demand for glufosinate-ammonium. Meanwhile, low operating rates forced by stricter environmental protection inspections, jointly caused the tight supply in glufosinate-ammonium market. Therefore, the export price and ex-works price of glufosinate-ammonium rose again before 2018. During Nov. 2018–Nov. 2019, domestic ex-works price of glufosinate-ammonium was in a downtrend, slipping by about 44% mainly caused by more glufosinate-ammonium capacity expansion news heard worldwide.

Since the outbreak of COVID-19 pandemic, domestic ex-works price of glufosinate-ammonium 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 abnormal production of its raw material diethyl phosphite (DEP). 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.

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, considering the price hikes of yellow phosphorus since 26 April, the price is expected to stay at a high level in the near future.

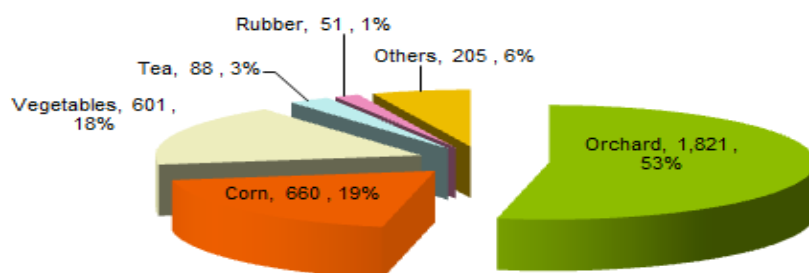
6 Domestic consumption

Figure 6-1 Consumption of glufosinate-ammonium in China, 2017–2021, 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, 2020, 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 2017–2020, consumption of glufosinate-ammonium in China increased from 1,420 tonnes to 3,425 tonnes, with a CAGR of 34.1%. 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, 2017–2020, '000 ha

Crop	2017	2018	2019	2020
Orchard	11,149	11,875	12,277	12,646
Vegetables	19,981	20,439	20,863	21,485
Corn	42,399	42,130	41,284	41,264
Wheat	24,478	24,266	23,728	23,380
Tea	2,849	2,959	3,105	3,217
Rubber	1,176	1,177	1,143	1,010
Cotton	3,195	3,354	3,339	3,169
Sugarcane	1,371	1,406	1,391	1,353
Total planting area	106,598	107,606	107,129	107,524

Source: National Bureau of Statistics of China & CCM

Table 6-2 Application parameters of glufosinate-ammonium in main target crops in China, 2020

Crop	Annual application frequency	Usage, g(AI)/ha	Rate per application
Orchard	1	450	32.0%
Vegetables	1	430	6.5%
Corn	1	500	3.2%
Wheat	1	250	0.8%
Tea	1	250	11.0%
Rubber	1	250	20.0%
Cotton	1	250	3.6%
Sugarcane	1	500	5.5%

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 2017–2021, China's glufosinate-ammonium production has been in a fast expansion period, with significant growths 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.

Affected by the spread of the COVID-19 pandemic worldwide, the oversea market demand for China's pesticides soared in 2021. In the future, the market demand for glufosinate-ammonium is expected to remain robust for several reasons:

- 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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