

PHOSPHATE ROCK

(Data in thousand metric tons unless otherwise noted)

Domestic Production and Use: In 2022, phosphate rock ore was mined by five companies at nine mines in four States and processed into an estimated 21 million tons of marketable product, valued at \$1.9 billion, free on board (f.o.b.) mine. Florida and North Carolina accounted for more than 75% of total domestic output; the remainder was produced in Idaho and Utah. Marketable product refers to beneficiated phosphate rock with phosphorus pentoxide (P₂O₅) content suitable for phosphoric acid or elemental phosphorus production. More than 95% of the phosphate rock mined in the United States was used to manufacture wet-process phosphoric acid and superphosphoric acid, which were used as intermediate feedstocks in the manufacture of granular and liquid ammonium phosphate fertilizers and animal feed supplements. About 25% of the wet-process phosphoric acid produced was exported in the form of upgraded granular diammonium phosphate (DAP) and monoammonium phosphate (MAP) fertilizer and merchant-grade phosphoric acid. The balance of the phosphate rock mined was for the manufacture of elemental phosphorus, which was used to produce phosphorus compounds for industrial applications, primarily glyphosate herbicide.

Salient Statistics—United States:	2018	2019	2020	2021	2022^e
Production, marketable	25,800	23,300	23,500	21,600	21,000
Sold or used by producers	23,300	23,400	22,600	21,900	21,000
Imports for consumption	2,770	2,140	2,520	2,460	2,400
Consumption, apparent ¹	26,000	25,500	25,100	24,400	24,000
Price, average value, f.o.b. mine, ² dollars per metric ton	70.80	68.00	75.90	83.10	90
Stocks, producer, yearend	10,600	9,830	11,000	10,700	10,000
Employment, mine and beneficiation plant, number ^e	1,900	1,900	1,800	2,000	2,000
Net import reliance ³ as a percentage of apparent consumption	2	11	5	11	12

Recycling: None.

Import Sources (2018–21): Peru, 95%; and Morocco, 5%.

Tariff:	Item	Number	Normal Trade Relations 12–31–22
	Natural calcium phosphates:		
	Unground	2510.10.0000	Free.
	Ground	2510.20.0000	Free.

Depletion Allowance: 14% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: Domestic production and consumption of phosphate rock were lower in 2022, owing to slightly lower production of elemental phosphorus and phosphoric acid. Domestic fertilizer production and consumption also were lower because of adverse weather conditions in some areas of the United States during the spring planting season, rail delays, high fertilizer costs, and hurricane damage to some production facilities. In Idaho, all three producers continued to develop new mines that will replace existing mines within the next decade.

World production of phosphate rock was estimated to have been slightly lower in 2022. The conflict between Russia and Ukraine caused some reduction of exports of phosphate rock and fertilizers from Russia. Although fertilizer materials were exempt from sanctions, some countries did not allow Russian ships in their ports.

In 2022, the global phosphate fertilizer market experienced supply disruptions, high fertilizer prices in the first half of the year, and lower consumption in some regions. The most significant supply disruption was from China placing restrictions on exports of DAP and MAP. This reduced Chinese exports by about 5 million tons. Other countries increased exports but were unable to compensate for the loss to the world market. Global consumption of P₂O₅ contained in fertilizers was estimated to have decreased slightly to about 48 million tons in 2022.

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World Mine Production and Reserves: Reserves for China and Tunisia were revised based on Government reports. Reserves for Israel were revised based on company reports.

	Mine production		Reserves⁴
	<u>2021</u>	<u>2022^e</u>	
United States	21,600	21,000	1,000,000
Algeria	^e 1,400	1,800	2,200,000
Australia	^e 2,500	2,500	⁵ 1,100,000
Brazil	^e 6,000	5,500	1,600,000
China ⁶	^e 90,000	85,000	1,900,000
Egypt	^e 5,000	5,000	2,800,000
Finland	990	1,000	1,000,000
India	^e 1,400	1,400	46,000
Israel	2,430	3,000	60,000
Jordan	10,000	10,000	1,000,000
Kazakhstan	^e 1,500	1,500	260,000
Mexico	488	450	30,000
Morocco	38,100	40,000	50,000,000
Peru	4,200	4,200	210,000
Russia	^e 14,000	13,000	600,000
Saudi Arabia	^e 9,200	9,000	1,400,000
Senegal	^e 2,100	2,600	50,000
South Africa	2,130	1,600	1,600,000
Togo	^e 1,000	1,500	30,000
Tunisia	3,730	4,000	2,500,000
Turkey	^e 600	800	50,000
Uzbekistan	^e 900	900	100,000
Vietnam	^e 4,500	4,500	30,000
Other countries	<u>1,950</u>	<u>1,600</u>	<u>2,600,000</u>
World total (rounded)	226,000	220,000	72,000,000

World Resources:⁴ Some world reserves were reported only in terms of ore tonnage and grade. Phosphate rock resources occur principally as sedimentary marine phosphorites. The largest sedimentary deposits are found in northern Africa, the Middle East, China, and the United States. Significant igneous occurrences are found in Brazil, Canada, Finland, Russia, and South Africa. Large phosphate resources have been identified on the continental shelves and on seamounts in the Atlantic Ocean and the Pacific Ocean. World resources of phosphate rock are more than 300 billion tons. There are no imminent shortages of phosphate rock.

Substitutes: There are no substitutes for phosphorus in agriculture.

^eEstimated.

¹Defined as phosphate rock sold or used by producers + imports. U.S. producers stopped exporting phosphate rock in 2003.

²Marketable phosphate rock, weighted value, all grades.

³Defined as imports ± adjustments for industry stock changes.

⁴See Appendix C for resource and reserve definitions and information concerning data sources.

⁵For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 124 million tons.

⁶Production data for large mines only, as reported by the National Bureau of Statistics of China.