PHOSPHATE ROCK

(Data in thousand metric tons unless otherwise noted)

Domestic Production and Use: In 2019, phosphate rock ore was mined by five firms at 10 mines in four States and processed into an estimated 23 million tons of marketable product, valued at $1.6 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 (P_2O_5) 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. Approximately 50% of the wet-process phosphoric acid produced was exported in the form of upgraded granular diammonium (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:	2015	2016	2017	2018	2019[e]
Production, marketable	27,400	27,100	27,900	25,800	23,000
Sold or used by producers	26,200	26,700	26,300	23,300	23,000
Imports for consumption	1,960	1,590	2,470	2,770	2,000
Consumption, apparent[1]	28,100	28,200	28,800	26,000	25,000
Price, average value, dollars per ton, f.o.b. mine[2]	72.41	76.90	73.67	70.77	70.00
Stocks, producer, yearend	6,730	7,450	8,440	10,600	10,000
Employment, mine and beneficiation plant, number[e]	2,000	2,000	2,000	2,000	2,000
Net import reliance[3] as a percentage of apparent consumption	4	4	5	2	10

Recycling: None.

Import Sources (2015–18): Peru, 79%; Morocco, 20%; and other, 1%.

Tariff: Item	Number	Normal Trade Relations 12–31–19
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 phosphate rock production was lower in 2019 owing to the temporary closure of one mine in Florida and companies reducing stocks of phosphate rock. Domestic consumption was 4% lower because of lower production of phosphoric acid and fertilizers. Imports were lower as the result of the permanent closure at the end of 2018 of a phosphoric acid plant in Louisiana that used imported phosphate rock and the temporary closure of another plant in Louisiana in the fourth quarter of 2019.

The leading phosphate rock producer in the United States permanently closed a phosphoric acid and fertilizer plant in June 2019 as part of corporate restructuring. The facility had been idled since 2017 and the phosphate rock mine that supplied the plant closed in late 2018. Another company planned to use the facility to manufacture organic fertilizers.

The only U.S. producer of elemental phosphorus received approval for a new phosphate rock mine in Idaho. The new mine would replace the current mine when the ore is depleted in about 10 years. U.S. phosphate rock annual mine production capacity was expected to remain at 31.1 million tons in 2020.

According to industry analysts, the rated capacity of global phosphate rock mines was projected to increase to 177 million tons in 2023 from 157 million tons in 2019, not including official capacity data for China. Production of marketable phosphate rock in China was thought to be between 80 and 85 million tons per year, compared with official production statistics of 110 million tons per year that included some crude ore production. Most of the increases in production capacity were planned for Africa and the Middle East, where major expansion projects were in progress in Jordan, Morocco, Saudi Arabia, Senegal, and Togo.

Prepared by **Stephen M. Jasinski [(703) 648–7711, sjasinsk@usgs.gov]**

PHOSPHATE ROCK

A Russian company restarted production of phosphate rock in Syria in 2018. The mine had been closed since late 2015 because of the conflicts in the region. The Russian company signed a 50-year operating agreement with the Government of Syria to operate the mine. The company planned to produce about 2.2 million tons per year. Production data for Syria have not been verified.

World consumption of P_2O_5, contained in phosphoric acid, fertilizers, and other products, was projected to increase to 50 million tons in 2023 from 47 million tons in 2019. Africa, India, and South America accounted for about 75% of the projected growth. U.S. consumption of P_2O_5 was expected to remain between 4.0 and 4.5 million tons per year.

World Mine Production and Reserves: Reserves for Israel, Peru, and South Africa were revised based on industry reports. Reserves for Australia were revised based on Government information.

	Mine production		Reserves[4]
	2018	2019[e]	
United States	25,800	23,000	1,000,000
Algeria	1,200	1,200	2,200,000
Australia	2,800	2,700	[5]1,200,000
Brazil	5,740	5,300	1,700,000
China[6]	120,000	110,000	3,200,000
Egypt	5,000	5,000	1,300,000
Finland	989	1,000	1,000,000
India	1,600	1,600	46,000
Israel	3,550	3,500	62,000
Jordan	8,020	8,000	1,000,000
Kazakhstan	1,300	1,300	260,000
Mexico	1,540	1,500	30,000
Morocco and Western Sahara	34,800	36,000	50,000,000
Peru	3,900	3,700	210,000
Russia	14,000	14,000	600,000
Saudi Arabia	6,090	6,200	1,400,000
Senegal	1,650	1,600	50,000
South Africa	2,100	1,900	1,400,000
Syria	100	2,000	1,800,000
Togo	800	800	30,000
Tunisia	3,340	3,000	100,000
Uzbekistan	900	900	100,000
Vietnam	3,300	5,500	30,000
Other countries	970	1,000	770,000
World total (rounded)	249,000	240,000	69,000,000

World Resources: 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, China, the Middle East, 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.

[e]Estimated.

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

[2]Marketable phosphate rock, weighted value, all grades.

[3]Defined as imports + adjustments for industry stock changes.

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

[5]For Australia, Joint Ore Reserves Committee-compliant reserves were 81 million tons.

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