



# 2019 Minerals Yearbook

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## PHOSPHATE ROCK [ADVANCE RELEASE]

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# PHOSPHATE ROCK

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In 2019, domestic production of marketable phosphate rock was 23.3 million metric tons (Mt) valued at \$1.58 billion, which was 10% less in quantity and 13% less in value than that in 2018 (table 1). Reported domestic phosphate rock sold or used by producers increased slightly to 23.4 Mt compared with 23.3 Mt in 2018, and U.S. consumption of phosphate rock was slightly lower at 25.5 Mt compared with 26.0 Mt in 2018. Producer stocks of phosphate rock decreased to 9.8 Mt, which was 7% lower than that at yearend 2018. Global phosphate rock production was estimated to be 227 Mt, a slight decrease from that in 2018 (table 10).

The 2019 spring planting season in the United States was affected by record rainfall and flooding that reduced the planted crop area by more than 4 million hectares. These conditions resulted in phosphate fertilizer inventories increasing and fertilizer prices declining in the first half of the year (Fertilizer International, 2020b). U.S. fertilizer producers reduced output in response to these market conditions (Green Markets, 2019d). Fertilizer consumption returned to near normal levels in the second half of the year.

Phosphorus is an essential element for plant and animal nutrition and is consumed primarily as a principal component of nitrogen-phosphorus-potassium fertilizers. Phosphate rock minerals are the only significant global source of phosphorus. In this chapter (unless noted otherwise), mine production is reported in terms of marketable production, which refers to beneficiated phosphate rock with a phosphorus pentoxide ( $P_2O_5$ ) content suitable for wet-process phosphoric acid or elemental phosphorus manufacturing. Percentages have been calculated using unrounded data.

In 2019, domestic production of phosphoric acid for agricultural use decreased by 5% to 6.31 Mt of  $P_2O_5$  from 6.65 Mt in 2018. Combined production of diammonium phosphate (DAP) and monoammonium phosphate (MAP), the major fertilizer products manufactured from phosphoric acid, was 3.7 Mt of  $P_2O_5$ , which was slightly higher than that in 2018 (Fertilizer Institute, The, 2020).

## Production

The U.S. Geological Survey obtained domestic phosphate rock production data from monthly and semiannual voluntary canvasses of the five companies that mined phosphate rock in the United States. Four companies responded to the canvasses, representing 95% of production data. Estimated data were based on company reports. In 2019, phosphate rock was produced at four mines in Florida, four in Idaho, one in North Carolina, and one in Utah (table 2).

The U.S. phosphate rock industry was concentrated in central Florida in the counties of Hardee, Hillsborough, Manatee, and Polk. In 2019, the mines in Florida accounted for 63% of

domestic annual production capacity. The Mosaic Company operated three mines in the region, one in Hardee County and two in Manatee County. Nutrien Ltd. operated one mine in Hamilton County in northern Florida (table 2). Nutrien operated a phosphoric acid plant in Hamilton County, and Mosaic operated phosphoric acid plants in Hillsborough and Polk Counties.

In January, Mosaic received final permits for its Ona Mine project in Hardee County and began mining in March. To avoid the cost of building a new processing facility, the ore from the western section of the Ona Mine was sent to Mosaic's Four Corners Mine for processing. Ore from the Ona Mine's eastern section was to be processed at the South Pasture Mine, which was closed temporarily in 2018 after the company's Plant City, FL, phosphate plant was closed permanently (Green Markets, 2019c).

In Beaufort County, NC, Nutrien operated a large integrated production facility that included a mine and animal feed, fertilizer, and phosphoric acid plants.

In the Western Phosphate Field of Idaho, Montana, Utah, and Wyoming, five mines were active in 2019—four in Idaho and one in Utah (table 2). Most of the active phosphate mining occurred on Federally owned land in Idaho. The Bureau of Land Management (BLM) administered 86 phosphate leases covering 17,800 hectares (ha) in Idaho (Bureau of Land Management, undated). Itafos, P4 Production, LLC (a subsidiary of Bayer Crop Science US), and J.R. Simplot Co. mined phosphate rock in Caribou County, ID. Simplot also operated the Vernal Mine in Uintah County, UT. In 2019, all companies in Idaho were actively developing new mines to replace existing mines in the next decade.

In August, P4 Production received approval from the BLM for its new Caldwell Canyon Mine in Caribou County, ID. The permit allowed for open pit mining and associated activities on about 630 ha of land with an expected mine life of 42 years. The company planned to haul the ore by truck to an existing rail line going to the company's elemental phosphorus plant in Soda Springs, ID. The new mine was expected to begin operation in about 10 years, after ore at the existing Blackfoot Bridge Mine was exhausted (Green Markets, 2019b).

Simplot continued planning its new Dairy Syncline Mine in Caribou County, ID, which would be located near its existing Smoky Canyon Mine. In 2019, the BLM and the U.S. Forest Service (USFS) issued a final environmental impact statement for the new mine, of which a large portion would be located on Federal land. The USFS also issued a record of decision, which analyzed alternative detailed land use and mine plans. The two agencies expected to finish evaluating the mine plans and issue permits for the mine in 2020 or 2021. Simplot planned to start production at the new mine within the next 10 years, before reserves were exhausted at the Smoky Canyon Mine (Green Markets, 2019e).

## Consumption

Phosphate rock was used primarily for production of wet-process phosphoric acid for fertilizer applications, which accounted for more than 90% of domestic consumption. The remainder was used for animal feed supplements, direct application to soil, elemental phosphorus production, and purified wet-process phosphoric acid (PPA) for nonagricultural applications. Domestic apparent consumption of phosphate rock was 25.5 Mt in 2019 compared with 26.0 Mt in 2018 (table 1).

World consumption of phosphoric acid for all applications increased to 46.4 Mt of  $P_2O_5$  in 2019 from 46.1 Mt in 2018. Worldwide, about 85% of phosphoric acid output was used for fertilizers (Simonova, 2020).

All U.S. phosphate rock mining companies were vertically integrated, having one or more fertilizer plants located near the mine. Mosaic was the leading producer, accounting for about 74% of the North American phosphate fertilizer production and 13% of world output. In 2019, the company operated three wet-process phosphoric acid plants and three fertilizer plants in Florida and one of each in Louisiana. The Uncle Sam, LA, phosphoric acid plant used phosphate rock imported from the Miski Mayo Mine in Peru, of which Mosaic was the majority owner. Mosaic temporarily closed its Louisiana facilities in 2019 from October 1 to December 31 to reduce inventory of phosphate fertilizers (Mosaic Company, The, 2020, p. 1–3).

In June, Mosaic permanently closed its Plant City, FL, phosphoric acid and fertilizer plant, which had been idle since late 2017, to reduce production costs. In September, Anuvia Plant Nutrients entered into an agreement with Mosaic to use the Plant City facility to produce organic crop nutrients. Anuvia planned to start production in 2020. Mosaic obtained an undisclosed financial share of Anuvia's business in the transaction (Green Markets, 2019a).

Nutrien had phosphoric acid and fertilizer production facilities near its mines in Florida and North Carolina. In Idaho, Simplot sent phosphate rock ore from its Smoky Canyon Mine by slurry pipeline to its fertilizer plant in Pocatello, ID. In Utah, Simplot sent ore by slurry pipeline from the Vernal Mine to its phosphate plant in Rock Springs, WY.

Bayer, through its P4 Production subsidiary, operated the only elemental phosphorus plant in the United States in Soda Springs, ID. The company used elemental phosphorus to manufacture phosphorus trichloride, which was used as a chemical intermediary to produce glyphosate-base herbicides. In other countries, elemental phosphorus was used primarily to manufacture high-purity phosphoric acid by burning the phosphorus and condensing in water, producing what is known as thermal acid. Worldwide, a gradual shift to manufacturing PPA instead of thermal acid has taken place because it has lower production costs and none of the hazardous waste disposal issues that are associated with elemental phosphorus. Thermal acid accounted for about 50% of annual world production capacity of high-purity phosphoric acid, primarily in China. The other operating elemental phosphorus facilities were in Kazakhstan and Vietnam.

The United States was considered a mature market for phosphate fertilizers, with average annual consumption of 4.0 Mt of  $P_2O_5$  from 1990 through 2015. Fertilizer consumption

information was collected by the American Association of Plant Food Officials on a crop-year (July 1 to June 30) basis. For crop-year 2015 (July 1, 2014, to June 30, 2015, the most recent crop-year for which data were available), consumption of  $P_2O_5$  in fertilizers was 3.87 Mt compared with 4.26 Mt in crop-year 2014 (Slater and Kirby, 2018, p. 6).

## Transportation

In Florida and North Carolina, crude phosphate rock ore was sent by slurry pipeline from the mines to the processing plants. All beneficiated phosphate rock was used internally to manufacture wet-process phosphoric acid. In central Florida, animal feed products, fertilizers, and phosphoric acid were sent by rail to domestic customers or to the Port of Tampa for export. The Port of Tampa handled the largest quantity of fertilizer materials in the United States.

In northern Florida, Nutrien transported some of its fertilizer products by rail to consumers and some of its material to their port facility at Morehead City, NC, for export. Nutrien transported products from its Aurora, NC, complex by rail to domestic consumers or by barge to the Port of Morehead City for export. Phosphoric acid producers along the Gulf of Mexico received imported phosphate rock by ship and transported their products by barge on the Mississippi River and its tributaries or by rail to domestic consumers.

In Idaho and Utah, phosphate rock was transported to the processing facilities from the mines via rail, slurry pipeline, and truck. Phosphate fertilizers were sent by rail or truck to customers.

## Prices

Price data were collected through the semiannual canvass of producers and reflected the value of phosphate rock sold or used for production of phosphoric acid and elemental phosphorus. The total value of phosphate rock used in the United States decreased slightly from that in 2018, and the average unit value decreased slightly to \$67.93 per metric ton from \$69.23 per metric ton in 2018 (table 1). In 2019, the average unit value of imported phosphate rock increased slightly to \$72.90 per metric ton from \$72.59 per metric ton in 2018. The price was calculated using the U.S. Census Bureau customs value and included cost, insurance, and freight. The import price was within range of average world prices. No standard domestic or world price for phosphate rock exists. Average ranges of world prices were published in various industry trade journals based on a sample of transactions. The bulk free on board price from Morocco, the leading exporter of phosphate rock, was the leading indicator of world prices. In 2019, the price of Moroccan phosphate rock began the year selling in the range of \$78 to \$120 per metric ton and gradually decreased throughout the year to end in the range of \$72 to \$105 per metric ton (CRU International Ltd., 2020).

## Foreign Trade

U.S. producers reported no exports of phosphate rock in 2019 and had not exported phosphate rock since 2003. In 2019, the United States was the leading importer of phosphate rock in the world. In 2019, U.S. imports were 23% less than those

in 2018 at 2.14 Mt, compared with 2.77 Mt in 2018, owing to the closure of Nutrien's Geismar, LA, phosphoric acid plant in December 2018 and the temporary closure of Mosaic's phosphoric acid plant in Uncle Sam, LA, in the second half of 2019. In 2019, 100% of imported phosphate rock was from Peru. All imported phosphate rock was consumed by Mosaic at its phosphoric acid plant in Louisiana. United States import tonnage of DAP and MAP increased by 3% and 7%, respectively; Morocco and Russia were the leading suppliers (table 9).

The United States accounted for about 10% of world exports of phosphate fertilizer products (DAP and MAP), in terms of P<sub>2</sub>O<sub>5</sub> content. China and Morocco were the leading exporters in 2019 (International Fertilizer Association, 2020). Combined exports of DAP and MAP increased by 15% compared with those in 2018. Canada, Brazil, and India were the leading destinations for all types of United States processed phosphate exports combined, in terms of P<sub>2</sub>O<sub>5</sub> content and gross weight (tables 5–7).

## World Review

World production of phosphate rock decreased slightly to 227 Mt from 228 Mt in 2018 (table 10). China (95.0 Mt), Morocco (35.5 Mt), and the United States (23.3 Mt) were the leading producing countries, accounting for 68% of the world total. Phosphate rock production in China was estimated by the International Fertilizer Association (IFA) to be much lower than the official statistics shown in table 10. Production was estimated to be between 80 and 85 Mt, based on reported production of phosphate fertilizers, industrial phosphates, and exports of phosphate rock (Simonova, 2020).

**Brazil.**—Mosaic Fertilizantes P&K S.A., the leading phosphate fertilizer producer in Brazil, was forced to temporarily close three of its five phosphate rock mines in April because of new Government standards for tailings dams at all mines in the country. The company, which had 22 dams at its mine sites, was required to close 4 tailings dams for remediation. One mine reopened in June and the other two reopened in September. Mosaic Fertilizantes's reported production was 2.9 Mt in 2019 compared with 4.0 Mt in 2018 (Mosaic Company, The, 2020, p. 17–19).

## Outlook

According to the IFA, world phosphate rock production is projected to increase to 261 million metric tons per year (Mt/yr) in 2024 from 239 Mt/yr in 2019 (Simonova, 2020). The IFA forecasts used lower estimated production and capacity figures for China instead of the official Chinese data. The global production increase likely will be from a combination of new mines and expansions of existing operations. The bulk of the new production is expected to take place in Africa, with capacity expansion in Morocco accounting for most of the increase. Other mine development and expansion projects that were planned to be completed by 2024 are in progress in Algeria, Brazil, Canada, Egypt, Guinea-Bissau, Senegal, South Africa, Tunisia, Togo, and Uganda (Fertilizer International, 2020a).

The projected increases in annual production capacity for phosphate rock will be commensurate with the associated increase in phosphoric acid and fertilizer production. Phosphate

fertilizers are necessary to grow crops in order to meet the needs of the world's population growth. According to the IFA, world consumption of P<sub>2</sub>O<sub>5</sub> in all uses is projected to increase slightly to 49.1 Mt in 2024 from 46.4 Mt in 2019 (Simonova, 2020).

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TABLE 1  
SALIENT PHOSPHATE ROCK STATISTICS<sup>1</sup>

(Thousand metric tons and thousand dollars unless otherwise specified)

	2015	2016	2017	2018	2019	
United States:						
Mine production (crude ore)	127,000	130,000	123,000	115,000	105,000	
Marketable production:						
Quantity:						
Gross weight	27,400	27,100	27,900	25,800	23,300	
P <sub>2</sub> O <sub>5</sub> content	7,710	7,660	7,700	7,250	6,530	
Value	1,980,000	2,090,000	2,060,000	1,830,000	1,580,000	
Value, average <sup>2</sup>	dollars per metric ton	72.41	76.90	73.67	70.77	67.98
Sold or used by producers:						
Quantity:						
Gross weight	26,200	26,700	26,300	23,300	23,400	
P <sub>2</sub> O <sub>5</sub> content	7,390	7,550	7,370	6,300	6,590	
Value	1,920,000	2,130,000	1,980,000	1,610,000	1,590,000	
Value, average <sup>2</sup>	dollars per metric ton	73.31	80.07	75.09	69.23	67.93
Imports for consumption: <sup>3</sup>						
Quantity, gross weight	1,960	1,590	2,470	2,770	2,140	
Value, cost, insurance, and freight	226,000	159,000	206,000	201,000 <sup>r</sup>	156,000	
Value, average <sup>2</sup>	dollars per metric ton	115.16	100.79	83.45	72.59 <sup>r</sup>	72.90
Consumption, gross weight <sup>4</sup>	28,100	28,200	28,800	26,000	25,500	
Stocks, December 31, producers	6,730	7,450	8,440	10,600	9,830	
World, production, gross weight	261,000	265,000	253,000 <sup>r</sup>	228,000 <sup>r</sup>	227,000 <sup>c</sup>	

<sup>c</sup>Estimated. <sup>r</sup>Revised.

<sup>1</sup>Table includes data available through August 3, 2020. Data are rounded to no more than three significant digits, except average values.

<sup>2</sup>Average value based on the sold or used by producers values.

<sup>3</sup>Source: U.S. Census Bureau.

<sup>4</sup>Defined as sold or used by producers plus imports.



TABLE 2  
ACTIVE PHOSPHATE ROCK MINES IN THE UNITED STATES IN 2019

Owner	Mine	County and State
Itafos	Lanes Creek	Caribou, ID.
Do.	Rasmussen Valley	Do.
Mosaic Company, The	Four Corners	Manatee, FL.
Do.	South Fort Meade	Hardee, FL.
Do.	Wingate	Manatee, FL.
Nutrien Ltd.	Aurora	Beaufort, NC.
Do.	Swift Creek	Hamilton, FL.
P4 Production, LLC (Bayer Crop Science US)	Blackfoot Bridge	Caribou, ID.
Simplot, J.R., Co.	Smoky Canyon	Do.
Do.	Vernal	Uintah, UT.
Do. Ditto.		

TABLE 3  
PRODUCTION OF PHOSPHATE ROCK IN THE UNITED STATES, BY PERIOD<sup>1</sup>

(Thousand metric tons and thousand dollars)

Period	Mine production, crude ore		Marketable production, beneficiated			Ending stocks, rock
	Rock	P <sub>2</sub> O <sub>5</sub> content	Rock	P <sub>2</sub> O <sub>5</sub> content	Value <sup>2</sup>	
2018:						
January–June	60,900	4,810	13,700	3,870	984,000	10,300
July–December	53,800	4,400	12,100	3,380	842,000	10,600
Total	115,000	9,210	25,800	7,250	1,830,000	XX
2019:						
January–June	52,900	4,440	11,300	3,210	775,000	10,600
July–December	51,800	4,440	11,900	3,320	806,000	9,830
Total	105,000	8,880	23,300	6,530	1,580,000	XX

XX Not applicable.

<sup>1</sup>Table includes data available through August 3, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Based on the per ton sold or used values.

TABLE 4  
PHOSPHATE ROCK SOLD OR USED BY PRODUCERS  
IN THE UNITED STATES, BY PERIOD<sup>1</sup>

(Thousand metric tons and thousand dollars)

Period	Rock	P <sub>2</sub> O <sub>5</sub>	Value <sup>2</sup>
		content	
2018:			
January–June	10,900	2,820	747,000
July–December	12,400	3,490	864,000
Total	23,300	6,300	1,610,000
2019:			
January–June	11,500	3,240	787,000
July–December	11,900	3,350	803,000
Total	23,400	6,590	1,590,000

<sup>1</sup>Table includes data available through August 3, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Free on board mine.

TABLE 5  
U.S. EXPORTS OF DIAMMONIUM PHOSPHATE<sup>1,2</sup>

(Thousand metric tons and thousand dollars)

Country or locality	2018		2019	
	Quantity	Value	Quantity	Value
Argentina	13	5,340	99	34,000
Australia	49	18,800	58	20,400
Brazil	202	80,400	91	24,100
Canada	36	14,100	109	49,300
Colombia	98	38,900 <sup>r</sup>	96	32,400
Dominican Republic	23	6,980	32	11,800
Honduras	53	21,700	45	16,700
India	116	43,800	289	95,400
Mexico	180	64,100	241	67,800
Peru	113	45,600	121	41,800
Other	143 <sup>r</sup>	56,200 <sup>r</sup>	55	20,500
Total	1,030	396,000	1,240	414,000

<sup>r</sup>Revised.

<sup>1</sup>Table includes data available through August 3, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Presentation of annual data is based on the top 10 quantities of the leading countries and (or) localities in 2019.

Source: U.S. Census Bureau.

TABLE 6  
U.S. EXPORTS OF MONOAMMONIUM PHOSPHATE<sup>1,2</sup>

(Thousand metric tons and thousand dollars)

Country or locality	2018		2019	
	Quantity	Value	Quantity	Value
Argentina	34	14,000	135	48,700
Australia	224	85,600	183	68,500
Brazil	628	244,000	723	258,000
Canada	1,030	439,000	1,170	523,000
Chile	7	4,070	34	12,700
Colombia	106	38,000	118	47,400
Japan	127	48,600	38	10,500
Mexico	82	32,500	102	40,000
Peru	13	5,320	7	2,270
Uruguay	15	6,120	31	10,100
Other	4	2,260	7	2,930
Total	2,270	920,000	2,550	1,020,000

<sup>1</sup>Table includes data available through August 3, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Presentation of annual data is based on the top 10 quantities of the leading countries and (or) localities in 2019.

Source: U.S. Census Bureau.

TABLE 7  
U.S. EXPORTS OF PHOSPHORIC ACID<sup>1,2</sup>

(Thousand metric tons and thousand dollars)

Country or locality	2018		2019	
	Quantity	Value	Quantity	Value
Brazil	88	37,200	(3)	86
Canada	2	1,620	1	1,320
Colombia	6	4,060	4	2,660
India	363	117,000	267	80,500
Mexico	33	23,300	41	30,800
Other	1 <sup>r</sup>	1,410 <sup>r</sup>	(3)	1,180
Total	494	184,000	313	117,000

<sup>r</sup>Revised.

<sup>1</sup>Table includes data available through August 3, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Excludes superphosphoric acid tonnage.

<sup>3</sup>Less than ½ unit.

Source: U.S. Census Bureau.



TABLE 8  
U.S. EXPORTS OF ELEMENTAL PHOSPHORUS<sup>1</sup>

Country or locality	2018		2019	
	Quantity (metric tons)	Value <sup>2</sup> (thousands)	Quantity (metric tons)	Value <sup>2</sup> (thousands)
Belgium	431	\$1,650	3	\$6
Brazil	7,450	25,800	6,500	24,300
Canada	2,000	6,800	1,420	5,000
Singapore	300	1,040	75	268
Other	1,480 <sup>r</sup>	2,820 <sup>r</sup>	35	83
Total	11,700	38,100	8,030	29,700

<sup>r</sup>Revised.

<sup>1</sup>Table includes data available through August 3, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Free alongside ship values.

Source: U.S. Census Bureau.

TABLE 9  
U.S. IMPORTS FOR CONSUMPTION OF PHOSPHATE ROCK AND PHOSPHATIC MATERIALS<sup>1</sup>

(Thousand metric tons and thousand dollars)

Phosphatic materials	2018		2019		Principal sources in 2019, by quantity
	Quantity	Value <sup>2</sup>	Quantity	Value <sup>2</sup>	
Phosphate rock:					
Unground	2,580	175,000 <sup>r</sup>	2,140	156,000	Peru, 100%.
Ground	187	25,600 <sup>r</sup>	--	--	XX
Total	2,770	201,000 <sup>r</sup>	2,140	156,000	Peru, 100%.
Dicalcium phosphate	35	22,900	9	11,500	China, 73%; Germany, 19%; India, 7%.
Elemental phosphorus	13	39,900	11	33,500	Kazakhstan, 57%; Vietnam, 39%.
Diammonium phosphate	1,120	492,000	1,160	458,000	Morocco, 60%; Russia, 26%; Saudi Arabia, 9%.
Monoammonium phosphate	1,650 <sup>r</sup>	746,000 <sup>r</sup>	1,770	670,000	Morocco, 59%; Russia, 25%; Saudi Arabia, 9%.
Fertilizer containing nitrates and phosphates	4	1,850	2	910	Canada, 66%; Netherlands, 20%; China, 13%.
Phosphoric acid	(3)	38	1	135	Mexico, 96%.

<sup>r</sup>Revised. XX Not applicable. -- Zero.

<sup>1</sup>Table includes data available through August 3, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Declared cost, insurance, and freight values.

<sup>3</sup>Less than ½ unit.

Sources: U.S. Census Bureau.

TABLE 10  
PHOSPHATE ROCK: WORLD PRODUCTION, BY COUNTRY OR LOCALITY<sup>1</sup>

(Thousand metric tons)

Country or locality <sup>2</sup>	2015	2016	2017	2018	2019
<b>Algeria:</b>					
Gross weight	1,289	1,275	1,100 <sup>e</sup>	1,200 <sup>e</sup>	1,300 <sup>e</sup>
P <sub>2</sub> O <sub>5</sub> content <sup>c</sup>	380	375	330	340	390
<b>Australia:</b>					
Gross weight	3,300 <sup>e</sup>	3,000	3,000 <sup>e</sup>	2,800 <sup>e</sup>	2,700 <sup>e</sup>
P <sub>2</sub> O <sub>5</sub> content	860	750	750 <sup>e</sup>	680 <sup>e</sup>	670 <sup>e</sup>
<b>Brazil, concentrate:</b>					
Gross weight	6,100	5,850 <sup>r</sup>	5,200 <sup>e</sup>	5,740	4,700 <sup>e</sup>
P <sub>2</sub> O <sub>5</sub> content	2,100	2,046 <sup>r</sup>	1,560 <sup>e</sup>	2,000 <sup>e</sup>	1,650 <sup>e</sup>
<b>Chile:</b>					
<b>Apatite:</b>					
Gross weight	7	2	--	--	--
P <sub>2</sub> O <sub>5</sub> content	2 <sup>e</sup>	1 <sup>e</sup>	--	--	--
Guano, gross weight	3	5	4	4	3
Phosphorite, gross weight	9	--	--	--	--
<b>China:</b>					
Gross weight	142,000	144,400	123,100	96,310 <sup>r</sup>	95,000 <sup>e</sup>
P <sub>2</sub> O <sub>5</sub> content	42,600 <sup>e</sup>	43,300 <sup>e</sup>	36,900	28,900 <sup>r</sup>	28,500 <sup>e</sup>
<b>Colombia:</b>					
Gross weight	95	66	45	49 <sup>r</sup>	50 <sup>e</sup>
P <sub>2</sub> O <sub>5</sub> content <sup>c</sup>	27	13	14	15	15
<b>Egypt:</b>					
Gross weight	4,100	4,300	4,800	5,000 <sup>e</sup>	5,000 <sup>e</sup>
P <sub>2</sub> O <sub>5</sub> content	1,230	1,290	1,344	1,500 <sup>e</sup>	1,500 <sup>e</sup>
<b>Finland, apatite, concentrates:</b>					
Gross weight	957	940	979	989	995
P <sub>2</sub> O <sub>5</sub> content	380 <sup>r,e</sup>	370 <sup>r,e</sup>	420 <sup>r,e</sup>	410 <sup>r,e</sup>	410
<b>India:</b>					
Gross weight	1,959	825	1,588	1,423 <sup>r</sup>	1,484
P <sub>2</sub> O <sub>5</sub> content	490	210	400 <sup>r</sup>	360 <sup>r</sup>	370
<b>Iran, ore:</b>					
Gross weight	200 <sup>e</sup>	250 <sup>e</sup>	250	250 <sup>e</sup>	250 <sup>e</sup>
P <sub>2</sub> O <sub>5</sub> content	65	78 <sup>e</sup>	78 <sup>e</sup>	78 <sup>e</sup>	78 <sup>e</sup>
<b>Israel, beneficiated:</b>					
Gross weight	3,848	3,946	3,332	3,550	2,807
P <sub>2</sub> O <sub>5</sub> content <sup>e</sup>	1,190	1,220	1,030	1,100	870
<b>Jordan:</b>					
Gross weight	8,336	7,991	8,688	8,022	9,223
P <sub>2</sub> O <sub>5</sub> content	2,668	2,557	2,780	2,567	2,955
<b>Kazakhstan:</b>					
Gross weight	549	781	1,208	1,300 <sup>e</sup>	1,500 <sup>e</sup>
P <sub>2</sub> O <sub>5</sub> content	137	195	302	325 <sup>e</sup>	375 <sup>e</sup>
<b>Malawi:</b>					
Gross weight	12	3	10 <sup>e</sup>	12 <sup>r,e</sup>	12 <sup>e</sup>
P <sub>2</sub> O <sub>5</sub> content <sup>e</sup>	4	1	3	3	3
<b>Mexico:</b>					
Gross weight	1,930	2,909	1,926	742 <sup>r</sup>	558
P <sub>2</sub> O <sub>5</sub> content <sup>e</sup>	540	815	540	210 <sup>r</sup>	160
<b>Morocco:</b>					
Gross weight	26,264	26,900	32,800	34,400 <sup>r</sup>	35,500
P <sub>2</sub> O <sub>5</sub> content	8,404	8,607	10,300 <sup>r</sup>	11,000 <sup>r</sup>	11,400
<b>Nauru:<sup>e</sup></b>					
Gross weight	180 <sup>r</sup>	175 <sup>r</sup>	130 <sup>r</sup>	125 <sup>r</sup>	90
P <sub>2</sub> O <sub>5</sub> content	67	66	49	35 <sup>r</sup>	34

See footnotes at end of table.

TABLE 10—Continued  
 PHOSPHATE ROCK: WORLD PRODUCTION, BY COUNTRY OR LOCALITY<sup>1</sup>

(Thousand metric tons)

Country or locality <sup>2</sup>	2015	2016	2017	2018	2019
<b>Pakistan:<sup>c</sup></b>					
Gross weight	100 <sup>r</sup>	88 <sup>r</sup>	65 <sup>r</sup>	69 <sup>r</sup>	70
P <sub>2</sub> O <sub>5</sub> content	25 <sup>r</sup>	22 <sup>r</sup>	16 <sup>r</sup>	17 <sup>r</sup>	17
<b>Peru:</b>					
Gross weight	3,881	3,853	3,040	4,100 <sup>r</sup>	4,000
P <sub>2</sub> O <sub>5</sub> content	1,180	1,156	922 <sup>e</sup>	1,214 <sup>r</sup>	1,188
<b>Philippines:</b>					
Gross weight	5	8	9 <sup>r</sup>	9 <sup>r,e</sup>	8 <sup>e</sup>
P <sub>2</sub> O <sub>5</sub> content	2	3	3 <sup>e</sup>	3 <sup>e</sup>	3 <sup>e</sup>
<b>Russia:</b>					
Gross weight	11,615	12,300	13,200 <sup>r</sup>	13,600 <sup>r</sup>	13,100
P <sub>2</sub> O <sub>5</sub> content	4,475	5,409 <sup>r</sup>	5,690 <sup>r</sup>	5,777 <sup>r</sup>	5,360 <sup>e</sup>
<b>Saudi Arabia:</b>					
Gross weight	4,100	5,400	5,670	6,090	6,500 <sup>e</sup>
P <sub>2</sub> O <sub>5</sub> content	1,281	1,730	1,800	1,949 <sup>r</sup>	2,100 <sup>e</sup>
<b>Senegal:</b>					
Gross weight	1,062	1,610	1,385	1,649	3,421
P <sub>2</sub> O <sub>5</sub> content <sup>e</sup>	361	547	476	560	1,160
<b>South Africa:</b>					
Gross weight	1,852	1,697	2,079	2,058 <sup>r</sup>	2,100 <sup>e</sup>
P <sub>2</sub> O <sub>5</sub> content	685	636	769	761 <sup>r</sup>	780 <sup>e</sup>
<b>Sri Lanka:</b>					
Gross weight	53	39	42	47 <sup>r</sup>	47
P <sub>2</sub> O <sub>5</sub> content	18	14	15	17	17
<b>Syria:</b>					
Gross weight	538	--	100 <sup>e</sup>	2,000 <sup>r,e</sup>	2,000 <sup>e</sup>
P <sub>2</sub> O <sub>5</sub> content	167 <sup>e</sup>	--	30 <sup>e</sup>	600 <sup>r,e</sup>	600 <sup>e</sup>
<b>Tanzania:</b>					
Gross weight	50 <sup>e</sup>	24	16	-- <sup>r</sup>	--
P <sub>2</sub> O <sub>5</sub> content	14 <sup>e</sup>	7 <sup>e</sup>	5 <sup>e</sup>	-- <sup>r</sup>	-- <sup>e</sup>
<b>Thailand:</b>					
Gross weight	--	--	8	-- <sup>r</sup>	-- <sup>e</sup>
P <sub>2</sub> O <sub>5</sub> content	--	--	2	-- <sup>r</sup>	-- <sup>e</sup>
<b>Togo:</b>					
Gross weight	1,150	850	733	800 <sup>e</sup>	800 <sup>e</sup>
P <sub>2</sub> O <sub>5</sub> content	417	300 <sup>e</sup>	220 <sup>e</sup>	240 <sup>e</sup>	240 <sup>e</sup>
<b>Tunisia:</b>					
Gross weight	3,240	3,664	4,422	3,341	4,108
P <sub>2</sub> O <sub>5</sub> content	972	1,060 <sup>e</sup>	1,282	1,000 <sup>e</sup>	1,200 <sup>e</sup>
<b>Turkey:</b>					
Gross weight	713	773	500 <sup>r,e</sup>	500 <sup>e</sup>	550 <sup>e</sup>
P <sub>2</sub> O <sub>5</sub> content	214	232	150 <sup>r,e</sup>	150 <sup>r,e</sup>	170 <sup>e</sup>
<b>United States:</b>					
Gross weight	27,405	27,119	27,900	25,799	23,265
P <sub>2</sub> O <sub>5</sub> content	7,714	7,660	7,700	7,252	6,529
<b>Uzbekistan:<sup>c</sup></b>					
Gross weight	800	800	900	900	900
P <sub>2</sub> O <sub>5</sub> content	136	136	150	150	150
<b>Venezuela:</b>					
Gross weight	26	25 <sup>e</sup>	20 <sup>e</sup>	20 <sup>e</sup>	15 <sup>e</sup>
P <sub>2</sub> O <sub>5</sub> content <sup>e</sup>	7	7	6	6	5
<b>Vietnam:</b>					
Gross weight	2,923	3,143	4,588 <sup>r</sup>	5,424 <sup>r</sup>	4,652
P <sub>2</sub> O <sub>5</sub> content	880	940	1,400 <sup>r</sup>	1,600 <sup>r</sup>	1,400

See footnotes at end of table.

TABLE 10—Continued  
 PHOSPHATE ROCK: WORLD PRODUCTION, BY COUNTRY OR LOCALITY<sup>1</sup>

(Thousand metric tons)

Country or locality <sup>2</sup>	2015	2016	2017	2018	2019
Zimbabwe: <sup>e</sup>					
Gross weight, concentrate	25	26 <sup>r</sup>	64 <sup>r</sup>	54 <sup>r</sup>	50
P <sub>2</sub> O <sub>5</sub> content	9	10	24 <sup>r</sup>	20 <sup>r</sup>	19
Total:					
Gross weight	261,000	265,000	253,000 <sup>r</sup>	228,000 <sup>r</sup>	227,000 <sup>e</sup>
P <sub>2</sub> O <sub>5</sub> content	79,700 <sup>e</sup>	81,800 <sup>e</sup>	77,500 <sup>r</sup>	70,800 <sup>r</sup>	70,300 <sup>e</sup>

<sup>e</sup>Estimated. <sup>r</sup>Revised. -- Zero.

<sup>1</sup>Table includes data available through August 4, 2020. All data are reported unless otherwise noted. Totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>In addition to the countries and (or) localities listed, Burkina Faso, North Korea, and Uganda may have produced phosphate rock and France and Luxembourg may have produced basic thomas converter slag, but available information was inadequate to make reliable estimates of output.