



# 2018 Minerals Yearbook

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## PHOSPHATE ROCK [ADVANCE RELEASE]

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# PHOSPHATE ROCK

By Stephen M. Jasinski

Domestic survey data and tables were prepared by Joseph J. Kohler, statistical assistant.

In 2018, domestic production of marketable phosphate rock was 25.8 million metric tons (Mt), which was 8% less than that in 2017. Reported domestic sales and use of phosphate rock decreased by 12% to 23.3 Mt compared with 26.3 Mt in 2017, and U.S. consumption of phosphate rock was 10% lower at 26.0 Mt compared with 28.8 Mt in 2017. Producer stocks of phosphate rock increased to 10.6 Mt, which was 25% more than that at yearend 2017 (table 1). World phosphate rock production was estimated to be 249 Mt, a slight decrease from that of 2017 (table 10).

Phosphorus is an essential element for plant and animal nutrition and is consumed primarily as a principal component of nitrogen-phosphorus-potassium (N-P-K) fertilizers. Phosphate rock minerals are the only significant global resources of phosphorus. In this report (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 2018, domestic production of phosphoric acid for agricultural use decreased by 10% to 6.56 Mt of  $P_2O_5$  from 7.25 Mt in 2017. Combined production of diammonium phosphate (DAP) and monoammonium phosphate (MAP), the major fertilizer products manufactured from phosphoric acid, was 2.25 Mt of  $P_2O_5$ , which was 23% lower than that in 2017, owing to the closure of The Mosaic Company's Plant City, FL, facility (Fertilizer Institute, The, 2019).

## Production

The U.S. Geological Survey obtained domestic phosphate rock production data from monthly and semiannual voluntary canvasses of all five companies that mined phosphate rock. All companies responded to the canvasses, representing 100% of production data. In 2018, phosphate rock was produced at five mines in Florida, five in Idaho, and one each in North Carolina and Utah (table 2).

The U.S. phosphate rock industry is concentrated in central Florida in the counties of Hardee, Hillsborough, and Manatee. In 2018, the mines in Florida accounted for 63% of domestic annual production capacity. Mosaic operated four mines in the region. Nutrien Ltd. operated one mine in Hamilton County in northern Florida (table 2).

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, six mines were active in 2018—five in Idaho and one in Utah (table 2). Most of the active mining takes place on Federally owned land in Idaho. The Bureau of Land Management (BLM) administers 86 phosphate leases covering 17,800 hectares

in Idaho (U.S. Department of the Interior, Bureau of Land Management, undated). Phosphate rock was mined in Caribou County, ID, by Itafos; P4 Production, LLC (a subsidiary of Bayer AG); and J.R. Simplot Co. Simplot also operated the Vernal Mine in Uintah County, UT. In 2018, all companies in Idaho were actively developing new mines to replace existing mines in the next decade (Green Markets, 2018b).

In January 2018, Agrium, Inc. and PotashCorp of Saskatchewan Inc. completed their merger to form the new company Nutrien, after receiving approval from the U.S. Federal Trade Commission (Green Markets, 2018k). As a condition of the merger, Agrium sold its active phosphate mines and phosphate plant in Idaho to Itafos. As part of the agreement, Itafos would sell the MAP back to Nutrien (Green Markets, 2018f). Itafos planned to develop the Paris Hills Mine project in southeastern Idaho to replace its currently operating Lanes Creek and Rasmussen Valley Mines, which were projected to be depleted in 2024 (Green Markets, 2018g). Itafos also indicated it was interested in obtaining permits from the BLM to develop the Husky–Dry Ridge phosphate mine project that was started by Agrium prior to its merger with PotashCorp. Itafos obtained the property in its acquisition of the Agrium phosphate assets in Idaho and had the leases reassigned in 2018 (Green Markets, 2018h).

Bayer AG completed its acquisition of Monsanto Co. in June and assumed ownership of all Monsanto phosphate rock properties and an elemental phosphorus plant in Idaho (Green Markets, 2018a).

In 2018, the BLM released a draft environmental impact statement (EIS) for a new mine that was proposed by P4 Production to replace the existing Blackfoot Bridge Mine near Soda Springs, ID. Mining would begin at the proposed Caldwell Canyon Mine around 2030, when the Blackfoot Bridge Mine was expected to be depleted (Green Markets, 2018c).

In November, the BLM and the U.S. Forest Service (USFS) jointly released a draft EIS for Simplot's proposed Dairy Syncline Mine that would be located near Simplot's existing Smoky Canyon Mine in Caribou County, ID. The new mine would have an estimated 30 years of phosphate rock ore at current production rate of the Smoky Canyon Mine. The new mine would begin operation when the existing mine was exhausted. In October, the BLM and USFS released a draft EIS for permits for an expansion to the Smoky Canyon Mine, which would keep the mine in operation for about 10 years until the Dairy Syncline Mine commences production (Green Markets, 2018d).

## Consumption

Phosphate rock was used primarily for production of wet-process phosphoric acid for fertilizer applications, which accounted for more than 95% of domestic consumption. The remainder was used for animal feed supplements, direct application to soil, and elemental phosphorus production.

Domestic apparent consumption of phosphate rock was 26.0 Mt in 2018 compared with 28.8 Mt in 2017 (table 1).

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 with about 73% of North American phosphoric fertilizer production and 14% of world output. In 2018, the company operated three wet-process phosphoric acid plants and three fertilizer plants in Florida and one of each in Louisiana. Mosaic indefinitely closed its Plant City, FL, phosphoric acid and fertilizer plant in December 2017 to reduce production costs. 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 Company, The, 2019, p. 1–3).

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 plant in Rock Springs, WY.

Nutrien manufactured wet-process phosphoric acid in Geismar, LA, using imported phosphate rock from Morocco. Nutrien sold some merchant-grade acid (MGA) and purified phosphoric wet-process acid (PPA) to Innophos Holdings, Inc., which had a nearby facility, for the production of PPA for use in technical- and food-grade applications (Innophos Holdings, Inc., 2019, p. 6). Nutrien closed the phosphate plant in Geismar at the end of December and planned to increase production at its facilities in Aurora, NC, and White Springs, FL, to compensate for the closure (Green Markets, 2018j). Innophos entered into a new supply agreement with Nutrien in July 2018 in which it would purchase MGA and PPA from Nutrien's Aurora, NC, plant (Green Markets, 2018e).

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 (O'Connell, 2018). In other countries, elemental phosphorus was used chiefly 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 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, however, still accounted for about 50% of annual world production capacity of high-purity phosphoric acid, primarily in China. The only other operating elemental phosphorus facilities in the world were in China, Kazakhstan, and Vietnam.

The United States was considered a mature market for phosphate fertilizers, with average annual consumption of about 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 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; the beneficiated phosphate rock was sent by conveyers to acid plants. 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 handles the largest volume of fertilizer materials in the United States.

In northern Florida, Nutrien transported its fertilizer products by rail to consumers; some materials, however, were sent by rail to their port facility at Morehead City, NC, for export. Nutrien transported products from its Aurora, NC, complex to the Port of Morehead City by barge for export or delivery by rail to domestic consumers. 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 used for production of phosphoric acid and elemental phosphorus. The total value of phosphate rock used in the United States decreased by 18% from that of 2017 and the average unit value decreased by 8% to \$69.23 per metric ton from \$75.09 per metric ton in 2017 (table 1). 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 2018, the price of Moroccan phosphate rock began the year in the range of \$70 to \$90 per metric ton and gradually increased throughout the year to end in the range of \$78 to \$115 per metric ton (CRU International Ltd., 2019). In 2018, the average unit value of imported phosphate rock decreased by 13% to \$72.39 per metric ton from \$83.45 per metric ton in 2017. The price was calculated using the U.S. Census Bureau customs value and included cost, insurance, and freight (table 1). The import price was within range of average world prices.

## Foreign Trade

U.S. producers reported no exports of phosphate rock in 2018 and have not exported phosphate rock since 2002. The United States was the leading importer of phosphate rock in the world. In 2018, U.S. imports were 12% greater than those in 2017, at 2.77 Mt, compared with 2.47 Mt in 2017. In 2018, 98% of imported phosphate rock was from Peru, and 2% was from Morocco. All imported phosphate rock was consumed by Mosaic and Nutrien at their phosphoric acid plants in Louisiana. U.S. import tonnage of DAP and MAP increased by 40% and

59%, respectively. Imports of DAP were higher than exports in 2018 for the first time in history, with Morocco and Russia becoming the leading suppliers (tables 5–7, 9).

The United States accounted for 9% of world exports of phosphate fertilizer products (DAP, MAP, and Triple Super Phosphate), in terms of P<sub>2</sub>O<sub>5</sub> content. China (32%) and Morocco (22%) were the leading exporters in 2018 (International Fertilizer Association, 2019). Canada and Brazil were the leading destinations for all types of U.S. 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 249 Mt from 251 Mt in 2017. China (120 Mt), Morocco (34.8 Mt), and the United States (25.8 Mt) were the leading producing countries, accounting for 72% of the world total (table 10). Phosphate rock production in China has been reported by several sources to be much lower than the official statistics used in table 10. Production has been estimated to be between 80 and 85 Mt, based on reported production of phosphate fertilizers, industrial phosphates, and exports of phosphate rock (Simonova, 2019).

**Brazil.**—Mosaic completed its acquisition of Vale Fertilizantes S.A. on January 8, 2018 (Green Markets, 2018i). Included in the purchase were five phosphate rock mines in Brazil, with a total annual production capacity of 5 Mt, and the Vale stake in the Miski Mayo Mine joint-venture phosphate rock mine in Peru, which gave Mosaic 75% ownership of the mine. Mitsui & Co. Ltd. owned the other 25% of the joint venture. The purchase also included two phosphoric acid plants and four processed fertilizer plants, the only potash mine in Brazil, and the Kronau, Saskatchewan, Canada, potash project (Mosaic Company, The, 2019, p. 17).

**Saudi Arabia.**—Ma'aden Phosphate Co. (MPC) began commercial production of DAP at the Wa'ad Al Shammal phosphate project, which included the Umm Wu'al phosphate mine on the Al Khabra deposit. The facility had been running on a trial basis since mid-2017 as it ramped up to full capacity. The project was a joint venture among MPC (60%), Mosaic (25%), and Saudi Arabian Basic Industries Corp. (15%). The project included the phosphate rock mine and beneficiation plant and production facilities for phosphoric acid, ammonium phosphates, animal feed, purified phosphoric acid, sodium tripolyphosphate, and sulfuric acid. The phosphate products would be sent by rail to Ras Al Khair to be processed into fertilizers. Existing fertilizer plants would be expanded at Ras Al Khair as part of this project. Production capacities were rated at 5.3 million metric tons per year (Mt/yr) of phosphate concentrate, 1.5 Mt/yr of phosphoric acid, and 3.5 Mt/yr of phosphate fertilizers. MPC announced it planned to expand Wa'ad Al Shammal to double the current capacities. The new phase of the project was planned to begin operations in 2024 (Fertilizer International, 2019).

**Syria.**—Production of phosphate rock continued in 2018, under the control of Russia's JSC Stroytransgaz, which was given a 50-year contract by the Government of Syria to operate the mine. The phosphate mine in the Homs region had been closed since 2016, when an insurgent militant group took

control of the region. The Government of Syria regained control of the area in late 2017, allowing for mining to resume. No reports of production tonnage were available as of mid-2019 (Syrian Observer, The, 2018).

## Outlook

According to the International Fertilizer Association (IFA), world phosphate rock production is projected to increase to 255 Mt/yr in 2023 from 235 Mt/yr in 2018 (Simonova, 2019). The IFA forecasts used lower estimated production and capacity figures for China rather than official data. The increase likely will be from a combination of new mines and expansions of existing operations. The bulk of the new production was expected from capacity expansion in Morocco. Several smaller mine development and expansion projects that were planned to be completed by 2023 were in progress in Algeria, Brazil, Canada, Egypt, Guinea-Bissau, Senegal, South Africa, and Uganda (Fertilizer International, 2019).

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 50.3 Mt in 2023 from 46.8 Mt in 2018 (Simonova, 2019).

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

(Thousand metric tons and thousand dollars unless otherwise specified)

	2014	2015	2016	2017	2018	
<b>United States:</b>						
Mine production (crude ore)	112,000	127,000	130,000	123,000	115,000	
Marketable production:						
Quantity:						
Gross weight	25,300	27,400	27,100	27,900	25,800	
P <sub>2</sub> O <sub>5</sub> content	7,110	7,710	7,660	7,700	7,250	
Value	1,990,000	1,980,000	2,090,000	2,060,000	1,830,000	
Value, average <sup>2</sup>	dollars per metric ton	78.59	72.41	76.90	73.67	70.77
Sold or used by producers:						
Quantity:						
Gross weight	26,700	26,200	26,700	26,300	23,300	
P <sub>2</sub> O <sub>5</sub> content	7,540	7,390	7,550	7,370	6,300	
Value	2,150,000	1,920,000	2,130,000	1,980,000	1,610,000	
Value, average <sup>2</sup>	dollars per metric ton	80.31	73.31	80.07	75.09	69.23
Imports for consumption: <sup>3</sup>						
Quantity, gross weight	2,380	1,960	1,590	2,470 <sup>r</sup>	2,770	
Value, cost, insurance, and freight	238,000	226,000	159,000	206,000 <sup>r</sup>	200,000	
Value, average <sup>2</sup>	dollars per metric ton	99.75 <sup>r</sup>	115.16 <sup>r</sup>	100.79 <sup>r</sup>	83.45 <sup>r</sup>	72.39
Consumption, gross weight <sup>4</sup>	29,100	28,100 <sup>r</sup>	28,200	28,800 <sup>r</sup>	26,000	
Stocks, December 31, producers <sup>r</sup>	5,880	6,730	7,450	8,440	10,600	
World, production, gross weight	235,000 <sup>r</sup>	261,000	265,000 <sup>r</sup>	251,000 <sup>r</sup>	249,000	

<sup>r</sup>Revised.

<sup>1</sup>Table includes data available through April 16, 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 dollars per metric ton by producer values.

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

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

TABLE 2  
ACTIVE PHOSPHATE ROCK MINES IN THE UNITED STATES IN 2018

Owner	Mine	County and State
Itafos	Lanes Creek	Caribou, ID.
Do.	Rasmussen Valley	Do.
Mosaic Company, The	Four Corners	Hillsborough/Manatee, FL.
Do.	South Fort Meade	Hardee, FL.
Do.	South Pasture <sup>1</sup>	Do.
Do.	Wingate	Manatee, FL.
Nutrien Ltd.	Aurora	Beaufort, NC.
Do.	Swift Creek	Hamilton, FL.
P4 Production, LLC (Bayer AG)	Blackfoot Bridge	Caribou, ID.
Do.	Enoch Valley	Do.
Simplot, J.R., Co.	Smoky Canyon	Do.
Do.	Vernal	Uintah, UT.

Do. Ditto.

<sup>1</sup>Temporarily closed in August 2018.

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>	
2017:						
January–June	59,400	4,240	13,900	3,860	971,000	7,450
July–December	63,300	4,480	14,000	3,840	1,080,000	8,440
Total	123,000	8,720	27,900	7,700	2,060,000	XX
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

XX Not applicable.

<sup>1</sup>Table includes data available through April 16, 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> content	Value <sup>2</sup>
2017:			
January–June	11,900	3,350	842,000
July–December	14,400	4,020	1,130,000
Total	26,300	7,370	1,980,000
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

<sup>1</sup>Table includes data available through April 16, 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	2017		2018	
	Quantity	Value	Quantity	Value
Australia	17	6,270	49	18,800
Brazil	213	67,700	202	80,400
Canada	92	33,800	36	14,100
Colombia	105	36,200	98	39,900
Honduras	50	17,400	53	21,700
India	506	168,000	116	43,800
Japan	99 <sup>r</sup>	31,700 <sup>r</sup>	100	38,800
Mexico	224	72,500	180	64,100
Peru	125	41,000	113	45,600
Other	178 <sup>r</sup>	61,000 <sup>r</sup>	79	28,600
Total	1,610 <sup>r</sup>	536,000 <sup>r</sup>	1,030	396,000

<sup>r</sup>Revised.

<sup>1</sup>Table includes data available through April 16, 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 2018.

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	2017		2018	
	Quantity	Value	Quantity	Value
Argentina	44	\$14,800	34	14,000
Australia	298	97,100	224	85,600
Brazil	690	221,000	628	244,000
Canada	863	341,000	1,030	439,000
Chile	17	7,400	7	4,070
Colombia	108	38,700	106	38,000
Japan	45 <sup>r</sup>	14,600 <sup>r</sup>	127	48,600
Mexico	82	29,500	82	32,500
Peru	13	4,960	13	5,320
Uruguay	(3)	202	15	6,120
Other	69 <sup>r</sup>	25,300 <sup>r</sup>	4	2,260
Total	2,230 <sup>r</sup>	795,000 <sup>r</sup>	2,270	920,000

<sup>r</sup>Revised.

<sup>1</sup>Table includes data available through April 16, 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 2018.

<sup>3</sup>Less than ½ unit.

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	2017		2018	
	Quantity	Value	Quantity	Value
Brazil	88	34,200	88	37,200
India	319	77,300	363	117,000
Mexico	60	41,300	33	23,300
Other	16	9,000	10	7,090
Total	483	162,000	494	184,000

<sup>1</sup>Table includes data available through April 16, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

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

Source: U.S. Census Bureau.

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

Country or locality	2017		2018	
	Quantity (metric tons)	Value <sup>2</sup> (thousands)	Quantity (metric tons)	Value <sup>2</sup> (thousands)
Belgium	1,020	\$3,960	431	\$1,650
Brazil	11,800	41,500	7,450	25,800
Canada	1,870	5,750	2,000	6,800
Netherlands	1,530	3,060	1,420	2,690
Other	16	38	358	1,170
Total	16,300	54,300	11,700	38,100

<sup>1</sup>Table includes data available through April 16, 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	2017		2018		Principal sources, by quantity, 2018
	Quantity	Value <sup>2</sup>	Quantity	Value <sup>2</sup>	
Phosphate rock:					
Unground	2,160 <sup>†</sup>	161,000	2,580	176,000	Peru, 98%; Morocco, 2%.
Ground	308 <sup>†</sup>	45,800 <sup>†</sup>	187	24,600	Morocco, 100%.
Total	2,470 <sup>†</sup>	206,000 <sup>†</sup>	2,770	200,000	Peru, 91%; Morocco, 9%.
Dicalcium phosphate	20	18,800	35	22,900	China, 82%; Morocco, 11%; Germany, 5%.
Elemental phosphorus	8	26,400	13	39,900	Kazakhstan, 57%; Vietnam, 40%.
Triple superphosphate	--	--	--	--	--
Diammonium phosphate	805	286,000	1,120	492,000	Morocco, 59%; Russia, 25%; Saudi Arabia, 4%.
Monoammonium phosphate	1,040	406,000	1,640	741,000	Morocco, 48%; Russia, 39%; Australia, 4%.
Fertilizer containing nitrates and phosphates	9	3,140	4	1,850	China, 73%; Canada, 24%; Spain, 3%.
Phosphoric acid	(3)	66	(3)	38	Mexico, 82%; Morocco, 17%.

<sup>†</sup>Revised. -- Zero.

<sup>1</sup>Table includes data available through April 16, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Declared cost, insurance, 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>	Gross weight					P <sub>2</sub> O <sub>5</sub> content				
	2014	2015	2016	2017	2018	2014	2015	2016	2017	2018
Algeria	1,418	1,289	1,275	1,100 <sup>r,e</sup>	1,200 <sup>e</sup>	415 <sup>e</sup>	380 <sup>e</sup>	375 <sup>e</sup>	330 <sup>r,e</sup>	340 <sup>e</sup>
Australia	2,900 <sup>e</sup>	3,300 <sup>e</sup>	3,000	3,000 <sup>e</sup>	2,800 <sup>e</sup>	750	860	750	750 <sup>e</sup>	680 <sup>e</sup>
Brazil, concentrate	6,513	6,100	5,600 <sup>r,e</sup>	5,200 <sup>e</sup>	5,740	2,521	2,100	1,800	1,560 <sup>e</sup>	2,000 <sup>e</sup>
Chile:										
Apatite	9	7	2	--	-- <sup>e</sup>	3	2 <sup>e</sup>	1 <sup>e</sup>	--	-- <sup>e</sup>
Guano	3 <sup>r</sup>	3 <sup>r</sup>	5	4	4 <sup>e</sup>	NA	NA	NA	NA	NA
Phosphorite	11	9	--	--	-- <sup>e</sup>	NA	NA	--	--	--
China	120,000	142,000	144,400	123,100 <sup>r</sup>	120,000 <sup>e</sup>	36,000 <sup>e</sup>	42,600 <sup>e</sup>	43,300 <sup>e</sup>	36,900 <sup>r</sup>	36,000 <sup>e</sup>
Colombia	42 <sup>r</sup>	95 <sup>r</sup>	66 <sup>r</sup>	45	50 <sup>e</sup>	9 <sup>e</sup>	27 <sup>e</sup>	13 <sup>e</sup>	14 <sup>e</sup>	15 <sup>e</sup>
Egypt	5,378	4,100	4,300	4,800 <sup>r</sup>	5,000 <sup>e</sup>	1,620	1,230	1,290	1,344 <sup>r</sup>	1,500 <sup>e</sup>
Finland, apatite, concentrates	946	957	940	979	989	350 <sup>r,e</sup>	350 <sup>e</sup>	340 <sup>r,e</sup>	360 <sup>r,e</sup>	360 <sup>e</sup>
India	1,296	1,959	825	1,588	1,600 <sup>e</sup>	370	490	210	490 <sup>e</sup>	500 <sup>e</sup>
Iran, ore	120 <sup>r,e</sup>	200 <sup>r,e</sup>	250 <sup>r,e</sup>	250 <sup>r</sup>	250 <sup>e</sup>	37 <sup>r</sup>	65 <sup>r</sup>	78 <sup>r,e</sup>	78 <sup>r,e</sup>	78 <sup>e</sup>
Iraq	34 <sup>e</sup>	-- <sup>e</sup>	--	-- <sup>e</sup>	--	7 <sup>e</sup>	-- <sup>e</sup>	--	-- <sup>e</sup>	--
Israel, beneficiated	3,357	3,848 <sup>r</sup>	3,946	3,332 <sup>r</sup>	3,550	1,040 <sup>e</sup>	1,190 <sup>e</sup>	1,220 <sup>r,e</sup>	1,030 <sup>r,e</sup>	1,100 <sup>e</sup>
Jordan	7,144	8,336	7,991	8,688	8,022	2,286	2,668	2,557 <sup>e</sup>	2,780	2,567
Kazakhstan	485 <sup>r</sup>	549 <sup>r</sup>	781 <sup>r</sup>	1,208 <sup>r</sup>	1,300 <sup>e</sup>	121 <sup>r</sup>	137 <sup>r</sup>	195 <sup>r</sup>	302 <sup>r</sup>	325 <sup>e</sup>
Malawi	11	12	3	10 <sup>e</sup>	10 <sup>e</sup>	NA	NA	NA	NA	NA
Mexico	1,663	1,930	2,909	1,926	1,539	466	540 <sup>e</sup>	815 <sup>e</sup>	540 <sup>e</sup>	460 <sup>e</sup>
Morocco <sup>3</sup>	27,390	26,264	26,900 <sup>r</sup>	32,800 <sup>r</sup>	34,800 <sup>e</sup>	8,460 <sup>r</sup>	8,404 <sup>r</sup>	8,607 <sup>r</sup>	9,400 <sup>e</sup>	10,500 <sup>e</sup>
Nauru	--	--	--	--	--	87 <sup>e</sup>	67 <sup>e</sup>	66 <sup>e</sup>	49 <sup>e</sup>	47
Pakistan	89	110 <sup>r</sup>	77 <sup>r</sup>	34 <sup>r</sup>	35 <sup>e</sup>	22 <sup>e</sup>	27 <sup>r,e</sup>	19 <sup>r,e</sup>	9 <sup>r,e</sup>	9 <sup>e</sup>
Peru	3,801	3,881	3,853	3,040	3,900	1,155	1,180	1,156	922 <sup>e</sup>	1,200 <sup>e</sup>
Philippines	4	5	8	8 <sup>e</sup>	8 <sup>e</sup>	1	2	3	3 <sup>e</sup>	3 <sup>e</sup>
Russia	10,777 <sup>r</sup>	11,615 <sup>r</sup>	12,300 <sup>r</sup>	12,500 <sup>r</sup>	14,000 <sup>e</sup>	4,150 <sup>e</sup>	4,475 <sup>e</sup>	4,800 <sup>r,e</sup>	4,900 <sup>r,e</sup>	5,500 <sup>e</sup>
Saudi Arabia	3,425	4,100	5,400 <sup>r</sup>	5,670 <sup>r</sup>	6,090	1,096	1,281	1,730 <sup>r</sup>	1,800 <sup>r</sup>	1,950
Senegal	806	1,062	1,610	1,385	1,649	274 <sup>e</sup>	361 <sup>e</sup>	547 <sup>e</sup>	476 <sup>e</sup>	560 <sup>e</sup>
South Africa	2,011	1,852	1,697	2,079	2,100 <sup>e</sup>	743	685	636	769 <sup>r</sup>	800 <sup>e</sup>
Sri Lanka	63	53	39	42	48	22 <sup>r</sup>	18 <sup>r</sup>	14 <sup>r</sup>	15 <sup>r</sup>	17
Syria	1,234	538	--	100 <sup>e</sup>	100 <sup>e</sup>	370	167 <sup>e</sup>	--	30 <sup>e</sup>	30 <sup>e</sup>
Tanzania	50 <sup>e</sup>	50 <sup>r,e</sup>	24	16	15 <sup>e</sup>	15	14 <sup>r</sup>	7	5	5
Thailand	1	--	--	8	8 <sup>e</sup>	(4)	--	--	2 <sup>e</sup>	2 <sup>e</sup>
Togo	1,098	1,150	850	733 <sup>r</sup>	800 <sup>e</sup>	395 <sup>e</sup>	417	300 <sup>e</sup>	220 <sup>r,e</sup>	240 <sup>e</sup>
Tunisia	3,784	3,240	3,664	4,422	3,341	1,135	972	1,060 <sup>e</sup>	1,282	1,000 <sup>e</sup>
Turkey	604	713	773	550 <sup>r</sup>	500 <sup>e</sup>	181	214	232	240 <sup>e</sup>	240 <sup>e</sup>
United States	25,300	27,400	27,100	27,900	25,800	7,110	7,710	7,660	7,700	7,250
Uzbekistan <sup>e</sup>	800	800	800	900	900	136	136	136	150	150
Venezuela	36	26	25 <sup>e</sup>	20 <sup>e</sup>	20 <sup>e</sup>	10 <sup>e</sup>	7 <sup>e</sup>	7 <sup>e</sup>	6 <sup>e</sup>	6 <sup>e</sup>
Vietnam	2,471	2,923 <sup>r</sup>	3,143 <sup>r</sup>	3,239 <sup>r</sup>	3,300 <sup>e</sup>	700	880 <sup>r</sup>	940 <sup>r</sup>	970 <sup>r</sup>	970 <sup>e</sup>
Zimbabwe, concentrate <sup>e</sup>	11	25	27	25	25	4	9	10	9	9
<b>Total</b>	<b>235,000<sup>r</sup></b>	<b>261,000</b>	<b>265,000<sup>r</sup></b>	<b>251,000<sup>r</sup></b>	<b>249,000</b>	<b>72,100<sup>r</sup></b>	<b>79,700<sup>r</sup></b>	<b>80,900<sup>r</sup></b>	<b>75,400<sup>r</sup></b>	<b>76,400</b>

<sup>e</sup>Estimated. <sup>r</sup>Revised. NA Not available. -- Zero.

<sup>1</sup>Table includes data available through July 18, 2019. 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 and Nauru 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.

<sup>3</sup>Includes production from Western Sahara.

<sup>4</sup>Less than ½ unit.