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2017 Minerals Yearbook

PHOSPHATE ROCK [ADVANCE RELEASE]

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U.S. Geological Survey

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Phosphate Rock

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In 2017, domestic production of marketable phosphate rock was 27.9 million metric tons (Mt), which was 3% more than that in 2016. Reported domestic use of phosphate rock decreased slightly to 26.3 Mt compared with 26.7 Mt in 2016, and U.S. consumption of phosphate rock was slightly higher at 28.8 Mt compared with 28.2 Mt in 2016. Producer stocks of phosphate rock increased to 8.4 Mt, which was 13% more than at yearend 2016 (table 1). World phosphate rock production was estimated to be 270 Mt, a slight increase over that of 2016 (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 otherwise noted), 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 2017, domestic production of phosphoric acid for agricultural use increased slightly to 7.25 Mt of P_2O_5 from 7.19 Mt in 2016. Combined production of diammonium phosphate (DAP) and monoammonium phosphate (MAP), the major fertilizer products manufactured from phosphoric acid, was 4.21 Mt of P_2O_5, which was slightly lower than that in 2016 (Fertilizer Institute, The, 2018b).

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 2017, phosphate rock was produced at five mines in Florida, four 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, Manatee, and Polk. In 2017, the mines in Florida accounted for 63% of domestic annual production capacity. The Mosaic Company operated four mines in the region. PCS Phosphate Co., Inc. (a subsidiary of PotashCorp of Saskatchewan Inc.) operated one mine in Hamilton County in northern Florida (table 2).

In Beaufort County, NC, PCS Phosphate 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 2017—four in Idaho and one in Utah (table 2). Most of the mining took 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 Nu-West Industries, Inc. (a subsidiary of Agrium, Inc.); P4 Production, LLC (a subsidiary of Monsanto Co.); and J.R. Simplot Co. Simplot also operated the Vernal Mine in Uintah County, UT.

All three companies in Idaho were in the process of developing new mines to replace existing mines when they are exhausted. Agrium continued planning the Rasmussen Valley Mine, adjacent to its existing Rasmussen Ridge Mine. The company received approval from the BLM and the U.S. Department of Agriculture, Forest Service in early January 2017 to begin operations at the new mine. Production was expected to shift to the new mine in 2018 (Green Markets, 2017b). Monsanto submitted plans to the BLM for its Caldwell Canyon Mine in 2017. The BLM expected to complete the final environmental impact statement (EIS) for the new mine by the end of 2018. After the EIS is approved, Monsanto can then begin development of the mine; however, the company did not expect to exhaust its current Blackfoot Bridge Mine for at least 12 years. The BLM also was in the process of completing the EIS for the new Simplot Dairy Syncline Mine, which would be near its currently operating Smoky Canyon Mine. The BLM approved an expansion to Smoky Canyon in 2016 that would allow Simplot to continue mining in that location until 2024 (Green Markets, 2017h).

In December 2016, Agrium and PotashCorp announced a merger agreement to create a new company, Nutrien, Ltd. In 2017, the merger was approved by Government agencies in Brazil, Canada, India, and Russia (Green Markets, 2017g). As a condition of merger approval from the U.S. Federal Trade Commission (FTC), Agrium sold its Rasmussen Ridge phosphate rock mine, other phosphate rock properties under development, and the Conda phosphoric acid and fertilizer plant to Itafos in late 2017. As part of the agreement, Nutrien would supply Itafos with 100% of the ammonia required at the Conda plant and purchase 100% of the MAP produced (Green Markets, 2017a). The merger was approved by the FTC in January 2018 (Green Markets, 2018b).

Itafos also purchased the assets of Stonegate Agricom Ltd. (Toronto, Ontario, Canada), which had been developing the proposed Paris Hills phosphate project in Bear Lake County in southeastern Idaho and the Mantaro phosphate project in Peru (Green Markets, 2017d). Itafos planned to use the Paris Hills Mine to supply the Conda phosphate plant when mining was exhausted at its other properties in Caribou County, ID (Green Markets, 2017c).

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 28.8 Mt in 2017 compared with 28.2 Mt in 2016 (table 1).

All U.S. phosphate rock mining companies were vertically integrated, having one or more fertilizer plants located near the mines. No sales of domestically mined phosphate rock were reported by producers. Mosaic was the leading producer with about 74% of North American phosphoric fertilizer production and 14% of world output. In 2017, the company operated four wet-process phosphoric acid plants and four fertilizer plants in Florida and one of each in Louisiana (Mosaic Company, The, 2018, p. 1). Mosaic indefinitely closed its Plant City, FL, phosphoric acid and fertilizer plant in December to reduce production costs. The company was planning to use output from its joint venture in Saudi Arabia and increased production at its other United States plants to replace the output from Plant City (Mosaic Company, The, 2018, p. 3). The Louisiana phosphoric acid plant used phosphate rock imported from Peru; however, flooding at the mine in Peru forced Mosaic to import phosphate rock from Morocco in March (Green Markets, 2017e).

PCS Phosphate 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 phosphate rock ore by slurry pipeline from the Vernal Mine to its plant in Rock Springs, WY.

PCS Nitrogen, Inc. manufactured wet-process phosphoric acid in Geismar, LA, using imported phosphate rock from Morocco. PCS Nitrogen sold some merchant-grade and purified phosphoric wet-process acid (PPA) to Innophos Holdings, Inc., which had a nearby facility, for producing PPA for use in technical- and food-grade applications (Innophos Holdings, Inc., 2018, p. 6).

Monsanto 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 (Monsanto Co., 2017, p. 7). In other countries, elemental phosphorus was used chiefly to manufacture high-purity phosphoric acid by burning the phosphorus and dissolving the resulting phosphorus pentoxide 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 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 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; 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 handled the largest volume of fertilizer materials in the United States.

In northern Florida, PCS Phosphate transported its fertilizer products by rail to consumers; however, some fertilizer materials were sent by rail to the PCS Phosphate port facility at Morehead City, NC, for export. PCS Phosphate transported phosphoric acid and fertilizer 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 by 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. Because phosphate rock produced in the United States is all used internally, this was not a good indicator of actual world price trends. The total value of phosphate rock used in the United States decreased by 7% from that of 2016, and the average unit value decreased by 6% to $75.09 per metric ton from $80.07 per metric ton in 2016 (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 2017, the price of Moroccan phosphate rock began the year in the range of $80 to $100 per metric ton and gradually decreased, ending the year in the range of $70 to $80 per metric ton (CRU International Ltd., 2018). In 2017, the average unit value of imported phosphate rock decreased by 16% to $83.75 per metric ton from $99.96 per metric ton in 2016. 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 the range of average world prices.

Foreign Trade

U.S. producers reported no exports of phosphate rock in 2017 (table 1) and have not exported phosphate rock since 2002. The United States was the leading importer of phosphate rock in the world. In 2017, U.S. imports were 58% higher than those in 2016, at 2.52 Mt compared with 1.59 Mt in 2016. In 2017, 66% of imported phosphate rock was from Peru and 34% from

Morocco. All imported phosphate rock was consumed by Mosaic and PCS Nitrogen at their phosphoric acid plants in Louisiana. U.S. import tonnage of other phosphate fertilizers was small compared with exports of the same materials (tables 5–7, 9).

The United States accounted for 12% of world exports of phosphate fertilizer products (DAP, MAP, and triple superphosphate), in terms of P_2O_5 content. China (30%) and Morocco (21%) were the leading exporters in 2017 (International Fertilizer Association, 2018, p. 7–11). Combined domestic exports of phosphoric acid and phosphate fertilizers, in terms of P_2O_5 content, decreased slightly from those of 2016 (Fertilizer Institute, The, 2018a). India was the leading destination for all types of United States phosphate exports combined, in terms of P_2O_5 content (tables 5–7).

World Review

World production of phosphate rock increased slightly in 2017 to 270 Mt compared with 263 Mt in 2016. China (144 Mt), Morocco (30.0 Mt), and the United States (27.9 Mt) were the leading producing countries, accounting for 75% 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 (Prud'homme, 2018, p. 39).

Brazil.—Mosaic agreed to purchase Vale Fertilizantes S.A., the phosphate rock and potash business of Vale S.A., in 2016. In August 2017, the two companies received antitrust approval from the Government of Brazil. The acquisition of nearly 6 million metric tons per year (Mt/yr) of phosphate rock production capacity included five phosphate rock mines in Brazil and the Vale stake in the Miski Mayo Mine joint venture in Peru, which would increase Mosaic's interest in the Miski Mayo Mine to 75%. The purchase included four phosphoric acid and fertilizer plants and a potash mine in Brazil. Mosaic also would acquire the Kronau, Saskatchewan, Canada, potash project and an option to buy the Rio Colorado potash project in Argentina (Green Markets, 2017f). The merger was approved on January 8, 2018 (Green Markets, 2018a).

Morocco.—OCP Group continued with an expansion program to increase its mine capacity from 39.0 Mt/yr to 52.1 Mt/yr during the next decade. A 12-Mt/yr expansion at Gantour was ongoing in 2017 and was planned to be completed by 2023. OCP planned to open new mines at the Meskala deposit in the Essaouira Region after 2023 (Prud'homme, 2018, p. 40).

Saudi Arabia.—Ma'aden Phosphate Co. (MPC) began production in mid-2017 at the Wa'ad Al Shammal phosphate project, which included the Umm Wu'al phosphate mine on the Al Khabra deposit. 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, beneficiation plant, and production facilities for phosphoric acid, 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 the project. Production capacities were rated at 5.3 Mt/yr of phosphate concentrate, 3.5 Mt/yr of phosphate fertilizers, and 1.5 Mt/yr of phosphoric acid. MPC announced that it planned to expand the Wa'ad Al Shammal project to double the current capacities. The new phase of the project was planned to be operational by 2024 (Fertilizer International, 2018).

Outlook

According to the International Fertilizer Association (IFA), world phosphate rock production is projected to increase to 250 Mt in 2022 from 230 Mt in 2017. Global production capacity is projected to increase to 275 Mt/yr in 2021 from 250 Mt/yr in 2017 (Prud'homme, 2018, p. 39). The increase likely will be from a combination of new mines and expansions of existing operations. The IFA forecasts used the lower estimated production and capacity figures for China rather than official data. The bulk of the new capacity is expected to be in Jordan, Morocco, and Saudi Arabia (Prud'homme, 2018, p. 44). U.S. production capacity likely will remain stable through 2018. Four new mines are planned in Idaho, but all would be replacements for existing mines and will not significantly change domestic production capacity. Two mines are under development in Florida, but neither has been permitted.

In terms of regional mine development, Africa and the Middle East are projected to account for about 75% of new production capacity planned to be completed by 2022. In addition to Jordan, Morocco, and Saudi Arabia, smaller mine-development and expansion projects were in progress in Algeria, Brazil, Canada, Egypt, Senegal, Togo, Tunisia, and Turkey (Prud'homme, 2018, p. 40).

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 to meet the needs of world population growth. According to the IFA, world consumption of P_2O_5 in all uses is projected to increase slightly to 50.5 Mt in 2022 from 46.4 Mt in 2017 (Prud'homme, 2018, p. 44).

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TABLE 1
SALIENT PHOSPHATE ROCK STATISTICS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

		2013	2014	2015	2016	2017
United States:						
Mine production (crude ore)		139,000	112,000	127,000	130,000	123,000
Marketable production:						
Quantity:						
Gross weight		31,200	25,300	27,400	27,100	27,900
P_2O_5 content		8,930	7,110	7,710	7,660	7,700
Value		2,850,000	1,990,000	1,980,000	2,090,000	2,060,000
Value, average[2]	dollars per metric ton	91.11	78.59	72.41	76.90	73.67
Used by producers:						
Quantity:						
Gross weight		28,800	26,700	26,200	26,700	26,300
P_2O_5 content		8,200	7,540	7,390	7,550	7,370
Value		2,610,000	2,150,000	1,920,000	2,130,000	1,980,000
Value, average[2]	dollars per metric ton	90.72	80.31	73.31	80.07	75.09
Imports for consumption:[3]						
Quantity, gross weight		3,170	2,380	1,960	1,590	2,520
Value, cost, insurance, and freight		375,000	238,000	226,000	159,000 r	211,000
Value, average[2]	dollars per metric ton	118.36	100.08 r	115.20 r	99.96 r	83.75
Consumption, gross weight[4]		31,900	29,100	28,200 r	28,200	28,800
Stocks, December 31, producers		9,000	5,880	6,730	7,450	8,440
World, production, gross weight		232,000	236,000 r	261,000 r	263,000 r	270,000

rRevised.
[1]Table includes data available through May 24, 2019. Data are rounded to no more than three significant digits, except average values.
[2]Average value based on the used by producer values.
[3]Source: U.S. Census Bureau.
[4]Defined as used by producers plus imports.

TABLE 2
ACTIVE PHOSPHATE ROCK MINES IN THE UNITED STATES IN 2017

Owner	Mine	County and State
Mosaic Company, The	Four Corners	Hillsborough and Manatee, FL.
Do.	South Fort Meade	Hardee, FL.
Do.	South Pasture	Do.
Do.	Wingate	Manatee, FL.
Nu-West Industries, Inc. (Agrium Inc.)	Rasmussen Ridge	Caribou, ID.
P4 Production, LLC (Monsanto Co.)	Blackfoot Bridge	Do.
Do.	Enoch Valley	Do.
PCS Phosphate Co., Inc.	Aurora	Beaufort, NC.
Do.	Swift Creek	Hamilton, FL.
Simplot, J.R., Co.	Smoky Canyon	Caribou, ID.
Do.	Vernal	Uintah, UT.

Do. Ditto.

TABLE 3
PRODUCTION OF PHOSPHATE ROCK IN THE UNITED STATES, BY PERIOD[1]

(Thousand metric tons and thousand dollars)

	Mine production, crude ore		Marketable production, beneficiated			
Period	Rock	P_2O_5 content	Rock	P_2O_5 content	Value[2]	Ending stocks, rock
2016:						
January–June	64,300	5,100	12,600	3,580	1,010,000	7,110
July–December	65,300	5,010	14,500	4,080	1,070,000	7,450
Total	130,000	10,100	27,100	7,660	2,090,000	XX
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

XX Not applicable.
[1]Table includes data available through May 24, 2019. Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Based on the per ton sold or used values.

TABLE 4
PHOSPHATE ROCK SOLD OR USED BY PRODUCERS
IN THE UNITED STATES, BY PERIOD[1]

(Thousand metric tons and thousand dollars)

Period	Rock	P_2O_5 content	Value[2]
2016:			
January–June	12,600	3,580	1,050,000
July–December	14,000	3,980	1,080,000
Total	26,700	7,550	2,130,000
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

[1]Table includes data available through May 24, 2019. Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Free on board mine.

TABLE 5
U.S. EXPORTS OF DIAMMONIUM PHOSPHATE, BY COUNTRY OR LOCALITY[1]

(Thousand metric tons and thousand dollars)

	2016		2017	
Country or locality	Quantity	Value	Quantity	Value
Argentina	34 r	11,400 r	28	9,900
Brazil	257 r	83,200 r	213	67,700
Canada	87	36,800	92	33,800
Colombia	130	46,000 r	105	36,200
Honduras	65	22,800	50	17,400
India	552	182,000	506	168,000
Japan	116 r	41,500 r	106	34,200
Mexico	205	72,200	224	72,500
Peru	156 r	52,700	125	41,000
Other	108 r	37,600 r	166	57,300
Total	1,710	586,000 r	1,620	538,000

rRevised.
[1]Table includes data available through May 24, 2019. Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.

TABLE 6
U.S. EXPORTS OF MONOAMMONIUM PHOSPHATE, BY COUNTRY OR LOCALITY[1, 2]

(Thousand metric tons and thousand dollars)

	2016		2017	
Country or locality	Quantity	Value	Quantity	Value
Argentina	91	30,100	44	14,800
Australia	262	93,400 r	298	97,100
Brazil	913	301,000	690	221,000
Canada	896 r	380,000 r	863	341,000
Chile	1	710	17	7,400
Columbia	123	41,900	108	38,700
Japan	90 r	32,200 r	58	17,800
Mexico	76	28,900 r	82	29,500
Paraguay	--	--	29	9,970
Venezuela	24	7,830	31	10,600
Other	44 r	15,500 r	22	9,830
Total	2,520 r	931,000 r	2,240	798,000

rRevised. -- Zero.
[1]Table includes data available through May 24, 2019. Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Presentation of annual data is based on the top 10 quantities (gross weight) of the leading countries in 2017.

Source: U.S. Census Bureau.

TABLE 7
U.S. EXPORTS OF PHOSPHORIC ACID, BY COUNTRY OR LOCALITY[1, 2]

(Thousand metric tons and thousand dollars)

	2016		2017	
Country or locality	Quantity	Value	Quantity	Value
Brazil	88	32,000	88	34,200
India	416	124,000	319	77,300
Mexico	74 r	41,500 r	60	41,300
Other	20 r	6,610 r	16	9,000
Total	598 r	204,000 r	483	162,000

rRevised.
[1]Table includes data available through May 24, 2019. Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Excludes superphosphoric acid tonnage.

Source: U.S. Census Bureau.

TABLE 8
U.S. EXPORTS OF ELEMENTAL PHOSPHORUS, BY COUNTRY OR LOCALITY[1]

(Metric tons and thousand dollars)

	2016		2017	
Country or locality	Quantity	Value[2]	Quantity	Value[2]
Belgium	157	$595	1,020	$3,960
Brazil	13,400 r	51,300 r	11,800	41,500
Canada	1,110	3,690	1,870	5,750
Netherlands	1,690	3,220	1,530	3,060
Vietnam	336	1,290	--	--
Other	126 r	267 r	16	38
Total	16,800 r	60,400 r	16,300	54,300

rRevised. -- Zero.
[1]Table includes data available through May 24, 2019. Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Free alongside ship values.

Source: U.S. Census Bureau.

TABLE 9
U.S. IMPORTS FOR CONSUMPTION OF PHOSPHATE ROCK AND PHOSPHATIC MATERIALS[1]

(Thousand metric tons and thousand dollars)

Phosphatic materials	2016		2017	
	Quantity	Value[2]	Quantity	Value[2]
Phosphate rock:				
Unground	1,320	118,000	2,190	161,000
Ground	267	41,000 r	328	49,300
Total	1,590	159,000 r	2,520	211,000
Dicalcium phosphate	28	21,200	20	18,800
Elemental phosphorus	5	18,000	8	26,400
Triple superphosphate	295	89,400	--	--
Diammonium phosphate	586	213,000	805	286,000
Monoammonium phosphate	853	334,000	1,040	406,000
Fertilizer containing nitrates and phosphates	32	12,700 r	9	3,140
Phosphoric acid	2	401	(3)	66

rRevised. -- Zero.
[1]Table includes data available through May 24, 2019. Data are rounded to no more than three significant digits.
[2]Declared cost, insurance, and freight values.
[3]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 10
PHOSPHATE ROCK: WORLD PRODUCTION, BY COUNTRY OR LOCALITY[1]

(Thousand metric tons)

Country or locality[2]	2013	2014	2015	2016	2017
Algeria:					
Gross weight	1,151	1,418	1,289	1,275 r	1,300 e
P_2O_5 content[e]	345	415	380	375	390
Australia:[e]					
Gross weight	2,500	2,900	3,300	3,000	3,000
P_2O_5 content	580	750	860	750	750
Brazil, concentrate:					
Gross weight	6,715	6,513	6,100 r	5,300 r	5,200 e
P_2O_5 content	2,504	2,521	2,100 r	1,800 r	1,560 e
Canada:					
Gross weight	300	--	--	(3) r, e	(3) e
P_2O_5 content	111 e	--	--	(3) r	(3)
Chile:					
Apatite:					
Gross weight	37 r	9	7	2 r	--
P_2O_5 content	12 r	3	2 e	1 r, e	--
Guano, gross weight	NA	NA	NA	5 r	4
Phosphorite, gross weight	--	11 r	9 r	-- r	--
China:					
Gross weight	111,700	120,000	142,000	144,400 r	144,000 e
P_2O_5 content[e]	33,500	36,000	42,600	43,300 r	43,200
Colombia:					
Gross weight	41	30	90	43	45 e
P_2O_5 content[e]	12	9	27	13	14
Egypt:					
Gross weight	5,922	5,378	4,100 r	4,300 r	4,400 e
P_2O_5 content	1,777	1,620	1,230 r	1,290 r	1,300 e
Finland, apatite, concentrates:					
Gross weight	877	946	957	940	979
P_2O_5 content[e]	320	345	350	343	357
India:					
Gross weight	1,536 e	1,296	1,959	825 r	1,588
P_2O_5 content	380 r	370 r	490	210 r	490 e
Iran, ore:					
Gross weight	109	75	85	100	100 e
P_2O_5 content	33	23	26	30	30 e
Iraq:					
Gross weight	350	34 e	-- e	--	-- e
P_2O_5 content	64	7 e	-- e	--	-- e
Israel, beneficiated:					
Gross weight	3,578	3,357	3,849	3,946 r	3,848
P_2O_5 content	1,100 e	1,040 e	1,190 e	1,223 r	1,193
Jordan:					
Gross weight	5,399	7,144	8,336	7,991	8,688
P_2O_5 content	1,728	2,286	2,668	2,560 e	2,780
Kazakhstan:[e]					
Gross weight	1,870	1,500 r	1,800 r	1,500	1,500
P_2O_5 content	411	350	387	330	330
Malawi:					
Gross weight	12	11	12	3	10 e
P_2O_5 content	4	3	4	1	3
Mexico:					
Gross weight	2,217	1,663	1,930 r	2,909 r	1,926
P_2O_5 content	620	466	540 r, e	815 r, e	540 e

See footnotes at end of table.

TABLE 10—Continued
PHOSPHATE ROCK: WORLD PRODUCTION, BY COUNTRY OR LOCALITY[1]

(Thousand metric tons)

Country or locality[2]	2013	2014	2015	2016	2017
Morocco:[4]					
Gross weight	26,400	27,390	26,264	26,929	30,000 e
P_2O_5 content	8,448	8,580	8,040	8,470	9,400 e
Pakistan:					
Gross weight	105	89	93 r	55 r	60
P_2O_5 content[e]	26 r	22 r	23 r	14 r	17
Peru:[5]					
Gross weight	3,546	3,801	3,881	3,853 r	3,040
P_2O_5 content	1,075	1,155	1,180	1,156 r	922 e
Philippines:					
Gross weight	3	4	5	8 r	8 e
P_2O_5 content	1	1	2	3 r	3 e
Russia:					
Gross weight	10,700 e	10,800 e	11,600 e	12,400	13,292
P_2O_5 content[e]	4,130	4,150	4,480	4,780	5,160
Saudi Arabia:					
Gross weight	3,262	3,425	4,100	4,200	5,000
P_2O_5 content	1,044	1,096	1,281	1,281 r	1,300 e
Senegal:					
Gross weight	882 r	806 r	1,062 r	1,610 r	1,385
P_2O_5 content[e]	300 r	274 r	361 r	547 r	476
South Africa:					
Gross weight	2,132	2,011	1,852	1,697 r	2,079
P_2O_5 content	788	743	685	636	772
Sri Lanka:					
Gross weight	49	63 r	53 r	39 r	42
P_2O_5 content[e]	13	17 r	14 r	10	11
Syria:					
Gross weight	900 r	1,234	538	--	100 e
P_2O_5 content[e]	300	370	167	--	30
Tanzania:					
Gross weight	97 r	50 r, e	--	24 r	16
P_2O_5 content	28 r, e	15 r, e	--	7 r, e	5 e
Thailand:					
Gross weight	(3) r	1	--	--	8
P_2O_5 content	(3) r	(3) r	--	--	2 e
Togo:					
Gross weight	1,214	1,098	1,150	850	825 e
P_2O_5 content	440 e	395 e	417	300 e	297 e
Tunisia:					
Gross weight	3,283	3,784	3,240	3,664 r	4,422
P_2O_5 content	985	1,135	972	1,060 e	1,282
Turkey:					
Gross weight	510	604	713	773 r	800 e
P_2O_5 content	153	181	214	232 r	240 e
United States:					
Gross weight	31,200	25,300	27,400	27,100	27,900
P_2O_5 content	8,930	7,110	7,710	7,660	7,700
Uzbekistan:					
Gross weight[e]	850	800	800	800 r	900
P_2O_5 content	145 e	136 e	136 e	136 r, e	150
Venezuela:					
Gross weight	106	36	26	25 e	20 e
P_2O_5 content	29	10 e	7 e	7 r, e	6 e

See footnotes at end of table.

TABLE 10—Continued

PHOSPHATE ROCK: WORLD PRODUCTION, BY COUNTRY OR LOCALITY[1]

(Thousand metric tons)

Country or locality[2]	2013	2014	2015	2016	2017
Vietnam:					
Gross weight	2,656	2,471	2,758	2,849 r	3,000 e
P_2O_5 content	745	700	800	850 r, e	900 e
Zimbabwe, concentrate:[e]					
Gross weight	6	11 r	25 r	27 r	25
P_2O_5 content	2	4 r	9 r	10 r	9
Grand total:					
Gross weight	232,000	236,000 r	261,000 r	263,000 r	270,000
P_2O_5 content	71,100 r	72,300 r	79,300 r	80,200 r	81,600

[e]Estimated. [r]Revised. NA Not available. -- Zero.

[1]Table includes data available through September 20, 2018. All data are reported unless otherwise noted. Totals, U.S. data, and estimated data are rounded to three significant digits; may not add to totals shown.

[2]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.

[3]Less than ½ unit.

[4]Includes production from Western Sahara.

[5]Source: Vale S.A.