



2011 Minerals Yearbook

PHOSPHATE

PHOSPHATE ROCK

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World phosphate rock production, consumption, and trade all increased in 2011 from those of 2010. Domestic marketable phosphate rock production in 2011 was 28.1 million metric tons (Mt) a 9% increase from that of 2010. Reported domestic use of phosphate rock was 28.6 Mt, compared with 28.1 Mt in 2010 (tables 1 and 4) and apparent consumption increased by 5% from 30.5 Mt in 2010 to 32.0 Mt in 2011, owing to an increase in production of phosphoric acid. World production of phosphate rock reached a record high of 198 Mt, which was 9% higher than that in 2010 (table 10) owing to market rebound from the global economic downturn and increasing demand for fertilizer in China, India, and South America.

Phosphorus is an essential element for plant and animal nutrition and is consumed primarily as a principal component of nitrogen-phosphorus-potassium (NPK) 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 suitable phosphorus pentoxide (P_2O_5) content for wet-process phosphoric acid or elemental phosphorus manufacturing. Quantities are reported in metric units and percentages have been calculated using unrounded data.

Domestic production of phosphoric acid for agricultural use in 2011 increased to 8.42 Mt P_2O_5 from 8.14 Mt in 2010. Combined production of diammonium phosphate (DAP) and monoammonium phosphate (MAP), the major fertilizer products manufactured from phosphoric acid, was 11.5 Mt, which was slightly lower than that in 2010 (The Fertilizer Institute, 2012). Production data for all types of phosphoric acid and fertilizer products are no longer available from the U.S. Census Bureau (U.S. Census Bureau, 2011).

Production

U.S. Geological Survey domestic phosphate rock production data were obtained from monthly and semiannual voluntary canvasses of all companies that owned phosphate rock mines. All companies responded to the canvass. In 2011, phosphate rock was produced at seven mines in Florida, four in Idaho, and one each in North Carolina and Utah (table 2).

The U.S. phosphate industry is concentrated in Florida in the counties of Hamilton, Hardee, Hillsborough, Manatee, and Polk. In 2011, seven mines, representing 65% of domestic annual production capacity, were active in Florida. The Mosaic Company operated five mines, and CF Industries, Inc. and PCS Phosphate Co., Inc. each operated one mine (table 2).

In July 2011, Mosaic was forced to close its South Fort Meade Mine after an injunction was issued by the U.S. District Court for the Middle District of Florida to cease all mining in the Hardee County extension of the mine. The ruling was the

result of an ongoing lawsuit filed by the Sierra Club in 2010 to block the extension of the South Fort Meade Mine. The mine was closed for the remainder of 2011 (Green Markets, 2011b). Mosaic permanently closed its Hopewell Mine in January 2011, when the reserves were depleted. This reduced U.S. annual production capacity by 500,000 metric tons (Mosaic Co., The, 2012, p. 6).

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

In the Western Phosphate Field in Idaho, Montana, Utah, and Wyoming, five mines were active in 2011—four in Idaho and one in Utah (table 2). In Idaho, phosphate rock was mined in Caribou County by Nu-West Industries, Inc. (a subsidiary of Agrium Inc., Calgary, Alberta, Canada), P4 Production, L.L.C. (a subsidiary of Monsanto Co.), and J.R. Simplot Co. Simplot also operated the Vernal Mine in Uintah County, UT. Nu-West reported production from two mines in 2011. The company reopened its Rasmussen Ridge Mine in February and operated it in conjunction with the Dry Valley Mine until August when all production was shifted to the Rasmussen Ridge Mine.

Monsanto received approval from the U.S. Bureau of Land Management to begin construction of a new 595-hectare (ha) phosphate rock mine to replace its existing South Rasmussen Mine, which was expected to be depleted in late 2012. The new Blackfoot Bridge Mine will be near the company's existing mine in Caribou County, ID, and was expected to be in operation for at least 17 years (Green Markets, 2011c).

Stonegate Agricom Ltd. (Toronto, Ontario, Canada) was in the early stages of development of the Paris Hills phosphate project in Bear Lake County in southeastern Idaho. The company planned to open an underground phosphate rock mine in a 1,008-ha area where three mines operated intermittently in the 20th century. The Bloomington Canyon Mine operated from 1942–43 and 1973–75, the Consolidated Mine, operated from 1930–32, and the Paris Canyon Mine, operated from 1917–26 (Jasinski and others, 2004). The company estimated a total measured and indicated mineral resource of 19 Mt with an average grade of 30.6% P_2O_5 and an inferred resource of 12 Mt with an average grade of 30.1% P_2O_5 (Stonegate Agricom, Ltd., 2011).

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 in the manufacturing of animal feed supplements, for direct application to soil, and for elemental phosphorus production. Domestic apparent consumption of phosphate rock was 32.0 Mt compared with 30.5 Mt in 2010

(table 1). There were no sales of domestically mined phosphate rock reported by producers.

All phosphate rock mining companies are vertically integrated, having one or more fertilizer plants, usually located near the mine. Mosaic was the leading company with about 56% of domestic phosphoric acid production capacity and 13% of world capacity. In 2010, the company operated four wet process phosphoric acid plants and four fertilizer plants in Florida and one of each in Louisiana (Mosaic Company, The, 2012, p. 1).

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

Three companies—Agrifos Fertilizer Inc., Pasadena, TX; Mississippi Phosphates Corp., Pascagoula, MS; and PCS Nitrogen, Inc., Geismar, LA—manufactured wet-process phosphoric acid using imported phosphate rock from Morocco. Agrifos and Mississippi Phosphates produced phosphate fertilizer products for domestic and export markets. PCS sold some merchant-grade phosphoric acid to Innophos Holdings, Inc., which had a nearby facility, for upgrading into high-purity acid for technical- and food-grade applications (Innophos Holdings, Inc., 2012, p. 8).

Agrifos ceased production of phosphoric acid and phosphate products in April 2011 per a 2008 agreement with the U.S. Environmental Protection Agency that required the closure of the phosphogypsum stack because of violations to the Resource Conservation and Recovery Act by the plant's previous owner, Exxon Mobil Corp. The closure, cleanup, and monitoring of the phosphoric acid facility are the responsibility of ExxonMobil until 2060 (Green Markets 2010).

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 for the production of glyphosate-base herbicides (Monsanto Company, 2011, p. 9). In other countries, elemental phosphorus was used chiefly to manufacture high-purity phosphoric acid by burning the phosphorus in water, which is known as thermal acid. Worldwide, there has been a gradual shift to manufacturing high-purity phosphoric acid from wet-process acid, which has lower operating costs and none of the hazardous waste disposal issues that are associated with elemental phosphorus. Thermal acid, however, still accounts for more than 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 located in China, Kazakhstan, and the Netherlands.

The United States is considered a mature market for phosphate fertilizers, with average annual consumption of slightly more than 4.0 Mt since 1993. Fertilizer consumption information is collected by the Association American of Plant Food Control Officials on a crop year (July 1 to June 30) basis. During the most recent year for which data were available, crop year 2010 (July 1, 2009, to June 30, 2010), consumption of P_2O_5 consumed in fertilizers was 3.72 Mt compared with 2.85 Mt in 2009, owing to the recovery from the economic downturn

causing fertilizer use and sales to return to near average levels of the past decade (Slater and Kirby, 2011, p. 6).

Stocks

Producers' stocks of phosphate rock on December 31, 2011, were 18% lower than at yearend 2010 (table 3).

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, PCS transported its fertilizer products by rail to consumers; some materials, however, were sent by rail to the PCS port facility at Morehead City, NC, for export. PCS used barges and tugboats to move products from its Aurora, NC, complex to the Port of Morehead City for export or delivery by rail to domestic consumers. Phosphoric acid producers along the Gulf of Mexico received 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 sent from the mine to the processing facility via truck, rail, and slurry pipelines.

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 increased by 29% from that of 2010 (table 1). Unlike many other mineral commodities, 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 import price of \$116.88 per metric ton was determined based on the U.S. Census Bureau customs value and included cost, insurance, and freight (table 1).

Foreign Trade

U.S. producers reported no exports of phosphate rock in 2011 (table 1). The United States is the leading importer of phosphate rock in the world. In 2011, nearly 70% of imported phosphate rock was from Morocco with the rest from Peru. All imported phosphate rock was consumed by phosphoric acid producers located along the Gulf of Mexico—Agrifos (Texas), Mississippi Phosphates (Mississippi), Mosaic (Louisiana), and PCS Nitrogen (Louisiana). In 2011, U.S. imports were estimated to be 3.35 Mt, based on data from the U.S. Census Bureau and PIERs, a commercial database reporting on waterborne trade activity. Tonnage and value information for some phosphate rock imports into Louisiana were underreported by the U.S. Census Bureau, which necessitated the use of other

sources. U.S. import tonnage of other phosphate fertilizers was insignificant compared with exports of the same materials (tables 5–7, 9).

The United States is the leading exporter of phosphate fertilizers in the world, accounting for about 25% of world P_2O_5 contained in processed phosphate exports in 2011. In total, exports of phosphoric acid and phosphate fertilizers increased by 8%, in terms of P_2O_5 content (The Fertilizer Institute, 2012). India was the leading destination for U.S. phosphate exports (tables 5–7).

World Review

World production of phosphate rock increased by 9% in 2011 compared with that of 2010. China (81.0 Mt), the United States (28.1 Mt), and Morocco (28.0 Mt) were the leading producing countries, accounting for 69% of the world total (table 10). Much of the activity in phosphate rock exploration and expansion took place in Africa and Australia in 2011. There were major projects in Africa (Morocco and Namibia); smaller mines were under various stages of development in Angola, Congo (Brazzaville), Guinea-Bissau, Ethiopia, Mali, Mauritania, Mozambique, Uganda, and Zambia. Expansion of production capacity was planned in Egypt, Senegal, South Africa, Tunisia, and Togo. Other new mines and expansion of new facilities outside of Africa were ongoing in Brazil, China, and Kazakhstan.

Australia.—Minemakers Ltd. continued development of the Wonarah Rock Phosphate Project in the Northern Territory. The company changed the business plan of the project from producing phosphate rock for export to upgrading the rock into phosphoric acid or fertilizer for export. In November 2011, a study commissioned by Minemakers was completed. The study proposed to either produce wet process phosphoric acid and DAP/MAP or to produce superphosphoric acid via the improved hard process (IHP), a thermal processing technology developed by JDCPhosphate Inc. (JDC). Minemakers was waiting for JDC to complete a demonstration plant before it committed to using the IHP. Minemakers planned to start mining in 2014 with an initial capacity of 1.5 million metric tons per year (Mt/yr) and gradually increase to 3.0 Mt/yr (Minemakers Limited, 2011, p. 9).

Canada.—Agrium signed a long-term contract with OCP Group of Morocco to supply phosphate rock to its Alberta phosphate facility beginning in late 2013 when the company's Kapuskasing, Ontario, mine was projected to be depleted (Agrium Inc., 2012, p. 3).

Arianne Resources Inc. began development of the Lac-a-Paul Project in northern Quebec. A prefeasibility study was completed in November 2011 that demonstrated measured and indicated resources of 348 Mt of apatite with an average grade of 6.5% P_2O_5 that could be upgraded to a 39% P_2O_5 concentrate. The company planned to commence mining in 2014 (Fertilizer International, 2012b).

Iraq.—A recent evaluation of the seven major phosphate deposits in Iraq was conducted by the Iraq Geological Survey. Of the seven, only the Akashat deposit has been mined. It has been in operation since 1983 and has reserves of 430 Mt, with an average grade of 21.5% P_2O_5 . Total phosphate rock resources

in Iraq are 9.5 billion metric tons, which is 3% of estimated world resources (Al-Bassam and others, 2012, p. 18).

Namibia.—Namibia Marine Phosphate (pty) Ltd., (NMP) [a joint venture between Minemakers, UCL Resources Ltd. (Australia), and Tungeni Investments cc (Namibia)], continued development of its Sandpiper project 60 kilometers (km) off the coast of Namibia. NMP plans to dredge marine sediments containing 18% to 20% P_2O_5 at a depth of 225 meters. A feasibility study completed in early 2012 demonstrated the viability of a 3 Mt/yr production facility producing a concentrate of 28% P_2O_5 for export beginning in 2013 and expanding by up to 3 Mt/yr by 2016, depending on market conditions (Minemakers Ltd., 2011).

Morocco.—OPC Group began work on expanding its mines and production facilities. As announced in 2010, OCP planned to increase phosphate rock production capacity from 30 Mt/yr to 50 Mt/yr by 2018. Phosphate rock beneficiation capacity would increase from 9 Mt/yr to 38 Mt/yr and DAP/MAP capacity would increase from 3 Mt/yr to 9 Mt/yr. The processing expansion would be accomplished through the construction of four new plants at the Jorf Lasfar complex, which would be served by a 44-Mt/yr slurry pipeline from the mines (Fertilizer International, 2012c).

New Zealand.—Chatham Rock Phosphate Ltd. proceeded with development of a shallow undersea mining operation 450 km off the east coast of New Zealand. The company has an offshore mining permit for 4,276 square kilometers with an estimated resource of 100 Mt of phosphate rock. The company signed an agreement with a dredging company in 2011 and planned to begin comprehensive ore sampling and assessment (Green Markets, 2011a).

Peru.—Output from the Vale SA Miski Mayo Mine near Bayovar increased production to 2.5 Mt in 2011. Vale planned to increase production capacity from 3.9 Mt/yr to 5.8 Mt/yr by 2016 and develop a second deposit at Bayovar, which would add an additional 1.9 Mt/yr to production capacity by 2017. Mosaic has rights for up to 35% of the output from the mine (Fertilizer International, 2011).

Stonegate Agricom continued with exploration of the Mantaro Phosphate Property located near Huancayo. Measured and indicated resources were 39.5 Mt with an average grade 10.0% P_2O_5 . More drilling and testing were planned in 2012 (Stonegate Agricom Ltd., 2012).

Russia.—JSC Acron, through its North-Western Phosphorus Co. subsidiary, planned to commence mining in 2012 at the Oleniy Ruchey deposit in the Murmansk region. The mine was expected to have a production capacity of 1 Mt/yr and increase to 2 Mt/yr in 2017 (Industrial Minerals, 2011).

Saudi Arabia.—Ma'aden Phosphate Co. began mining and processing phosphate rock at its Al-Jalamid complex in 2011. The phosphate concentrate was used to produce DAP at Ras Al Khair. Ma'aden planned to build a new phosphate complex at Umm Wu'al to mine the Al-Khabra deposit. The new mine would have a production capacity of 5 Mt/yr, the same as Al-Jalamid (Fertilizer International, 2012a).

Outlook

World phosphate rock annual production capacity was projected to increase 20% from 2011 to 2016, increasing from 213 Mt to 256 Mt, with more than 50% of the increase from Africa. The increase will be from a combination of new mines and expansion of existing operations (Heffer and Prud'homme, 2012). U.S. production capacity will likely remain the same or decrease slightly through 2015, depending on whether three new mines under development in Florida receive permits to operate. Three new mines are planned in Idaho, but two would be as replacements for existing mines and not significantly change domestic production capacity.

The projected increases in annual production capacity for phosphate rock will supply the associated increase in phosphoric acid and fertilizer production. World population growth ensures the need for phosphate fertilizer to grow crops for food and biofuels. World consumption of P_2O_5 in fertilizer was projected to increase from 40.9 Mt in 2011, to 41.9 Mt in 2012, and to 45.3 Mt in 2016, according to the International Fertilizer Industry Association (Heffer and Prud'homme, 2012). Phosphoric acid production capacity was expected to increase gradually from 42.5 Mt P_2O_5 in 2012 to 46.2 Mt P_2O_5 in 2016, with one-third of the new output from operations in China. Global production of phosphate fertilizer was expected to increase from 39.9 Mt/yr P_2O_5 to 47.6 Mt/yr P_2O_5 between 2011 and 2016 (Heffer and Prud'homme, 2012).

Domestic production and consumption of phosphate rock in 2012 were expected to be slightly lower than in 2011, owing to the temporary closure of some fertilizer plants planned for the first quarter of 2012 because of weak seasonal demand.

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TABLE 1
SALIENT PHOSPHATE ROCK STATISTICS¹

(Thousand metric tons and thousand dollars unless otherwise specified)

	2007	2008	2009	2010	2011
United States:					
Mine production (crude ore)	126,000	124,000	107,000	106,000	129,000
Marketable production:					
Quantity:					
Gross weight	29,700	30,200	26,400	25,800	28,100
P ₂ O ₅ content	8,480	8,590	7,640	7,400	8,160
Value	1,520,000	2,320,000	3,360,000	1,980,000	2,720,000
Value, average ² dollars per metric ton	51.10	76.76	127.19	76.69	96.64
Sold or used by producers:					
Quantity:					
Gross weight	31,100	28,900	25,500	28,100	28,600
P ₂ O ₅ content	8,890	8,200	7,380	8,000	8,320
Value	1,600,000	2,210,000	3,250,000	2,210,000	2,850,000
Value, average dollars per metric ton	51.36	76.64	127.22	78.50	99.61
Imports for consumption: ^{3, 3, 4}					
Quantity, gross weight	2,670	2,750	2,000	2,400	3,350
Value, cost, insurance, and freight ^c	154,000	266,000	161,000	211,000	392,000
Value, average dollars per metric ton	57.54	96.95	80.61	87.79	116.88
Consumption, gross weight ^{e, 5}	33,800 ^r	31,600	27,500	30,500	32,000
Stocks, December 31, producers	4,970	6,340	8,120	5,620	4,580
World, production, gross weight	160,000	166,000 ^r	162,000 ^r	181,000	198,000 ^e

^cEstimated. ^rRevised.

¹Data are rounded to no more than three significant digits, except average values per metric ton.

²Average value based on the sold or used values.

³Sources: U.S. Census Bureau and the PIERS.

⁴Includes some estimated phosphate rock tonnage imported from Morocco but not reported by the U.S. Census Bureau.

⁵Expressed as sold or used plus imports.

TABLE 2
ACTIVE PHOSPHATE ROCK MINES IN THE UNITED STATES IN 2011

Owner	Mine	County and State
CF Industries Holdings, Inc.	South Pasture	Hardee, FL.
Mosaic Company, The	Four Corners	Hillsborough/Manatee/Polk, FL.
Do.	Hookers Prairie	Polk, FL.
Do.	Hopewell ¹	Hillsborough, FL.
Do.	South Fort Meade	Polk, FL.
Do.	Wingate	Manatee, FL.
Nu-West Industries, Inc. (Agrium Inc.)	Dry Valley ²	Caribou, ID.
Do.	Rasmussen	Do.
P4 Production, LLC. (Monsanto Co.)	South Rasmussen	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.		

¹Closed January 2011.

²Closed August 2011.

TABLE 3
PRODUCTION OF PHOSPHATE ROCK IN THE UNITED STATES, BY PERIOD¹

(Thousand metric tons and thousand dollars)

Period	Mine production, crude ore		Marketable production, beneficiated			Ending stocks, rock
	Rock	P ₂ O ₅ content	Rock	P ₂ O ₅ content	Value ²	
2010:						
January–June	55,300	5,870	13,200	3,720	896,000	7,570
July–December	50,600	6,030	12,700	3,680	1,080,000	5,620
Total	106,000	11,900	25,800	7,400	1,980,000	XX
2011:						
January–June	60,900	6,400	13,800	4,010	1,390,000	4,860
July–December	68,400	6,950	14,300	4,160	1,330,000	4,580
Total	129,000	13,300	28,100	8,160	2,720,000	XX

XX Not applicable.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Based on the per ton sold or used values.

TABLE 4
PHOSPHATE ROCK SOLD OR USED BY PRODUCERS IN THE UNITED STATES, BY
PERIOD¹

(Thousand metric tons and thousand dollars)

Period	Rock	P ₂ O ₅ content	Value ²
2010:			
January–June	13,700	3,850	912,000
July–December	14,400	4,160	1,290,000
Total	28,100	8,000	2,210,000
2011:			
January–June	13,600	3,910	1,300,000
July–December	15,000	4,410	1,550,000
Total	28,600	8,320	2,850,000

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Free on board mine.

TABLE 5
U.S. EXPORTS OF DIAMMONIUM PHOSPHATE^{1,2}

(Thousand metric tons and thousand dollars)

Country	2010		2011	
	Quantity	Value	Quantity	Value
Argentina	-- [†]	-- [†]	128	62,800
Australia	147	69,200	102	61,100
Brazil	151	59,800	303	181,000
Canada	31	4,600	213	41,000
Colombia	127	57,200	96	58,800
Guatemala	24	10,000	65	33,800
India	2,550	1,080,000	2,100	1,240,000
Japan	166	64,100	169	102,000
Mexico	216	88,400	189	99,100
Peru	59	23,700	71	37,600
Other	619 [†]	256,000 [†]	495	272,000
Total	4,090	1,710,000	3,940	2,190,000

[†]Revised. -- Zero.

¹Presentation of annual data is based on the top 10 quantities (gross weight) of the leading countries in 2011.

²Data 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^{1,2}

(Thousand metric tons and thousand dollars)

Country	2010		2011	
	Quantity	Value	Quantity	Value
Argentina	258	112,000	267	161,000
Australia	330	153,000	252	153,000
Brazil	588	255,000	841	491,000
Canada	647	263,000	906	585,000
Chile	76	28,700	37	18,400
China	26	8,020	31	12,700
Colombia	133	66,900	156	95,700
Japan	71	26,300	99	60,400
Mexico	96	43,900	69	36,100
Thailand	7	3,800	15	9,330
Other	98 [†]	40,100 [†]	38	22,200
Total	2,330	1,000,000	2,710	1,650,000

[†]Revised.

¹Presentation of annual data is based on the top 10 quantities (gross weight) of the leading countries in 2011.

²Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.

TABLE 7
U.S. EXPORTS OF PHOSPHORIC ACID^{1,2}

(Thousand metric tons and thousand dollars)

Country	2010		2011	
	Quantity	Value	Quantity	Value
Argentina	6	4,320	32	17,300
Brazil	96	42,600	92	47,000
Canada	17	4,860	17	5,030
India	456	153,000	588	272,000
Mexico	60	17,500	220	65,200
Other	39 ^r	13,000 ^r	5	1,430
Total	674	235,000	954	408,000

^rRevised.

¹Excludes superphosphoric acid tonnage.

²Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.

TABLE 8
U.S. EXPORTS OF ELEMENTAL PHOSPHORUS¹

Country	2010		2011	
	Quantity (metric tons)	Value ² (thousands)	Quantity (metric tons)	Value ² (thousands)
Brazil	14,100	\$46,200	11,600	\$41,200
Canada	950	3,180	1,120	3,800
Mexico	2,830	5,420	1	14
Other	389	1,820	346	687
Total	18,300	56,600	13,100	45,700

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Free alongside ship values.

Source: U.S. Census Bureau.

TABLE 9
U.S. IMPORTS FOR CONSUMPTION OF PHOSPHATE ROCK AND PHOSPHATIC MATERIALS¹

(Thousand metric tons and thousand dollars)

Phosphatic materials	2010		2011	
	Quantity	Value ²	Quantity	Value ²
Phosphate rock:				
Unground ³	1,280	117,000	2,450	345,000
Ground ³	605	48,900	402	62,900
Total ⁴	2,400	211,000	3,350	392,000
Dicalcium phosphate	7	9,990	7	10,800
Elemental phosphorus	7	23,500	5	18,700
Normal superphosphate	4	1,400	4	1,580
Triple superphosphate	189	66,900	207	113,000
Diammonium phosphate	190	101,000	260	155,000
Monoammonium phosphate	269	142,000 ^r	602	361,000
Fertilizer containing nitrates and phosphates	(5)	182	2	895
Phosphoric acid	31	20,600	1	185

^rRevised.

¹Data are rounded to no more than three significant digits.

²Declared cost, insurance, freight values.

³Some phosphate rock tonnages and values were not reported by the U.S. Census Bureau.

⁴Includes an estimate for tonnage data not reported by U.S. Census Bureau.

⁵Less than ½ unit.

Sources: U.S. Census Bureau and the PIERS.

TABLE 10
PHOSPHATE ROCK, BASIC SLAG, AND GUANO: WORLD PRODUCTION, BY COUNTRY^{1,2}

(Thousand metric tons)

Commodity and country ³	Gross weight					P ₂ O ₅ content				
	2007	2008	2009	2010	2011 ^c	2007	2008	2009	2010	2011 ^c
Phosphate rock:										
Algeria ^c	1,800 ⁴	1,805 ⁴	1,070	1,525 ^{r,4}	1,500	536	542	305	458 ^r	450
Australia ^c	2,850 ⁴	2,950	2,500	2,600	2,650	655	678	575	600	610
Brazil, concentrate	6,185	6,727 ^r	6,084 ^r	6,192 ^r	6,200 ^p	2,185	2,472 ^r	2,163 ^r	2,179 ^r	2,200 ^p
Burkina Faso ^c	2	2	2	2	2	1	1	1	1	1
Canada ^c	700	900 ^r	900 ^r	900 ^r	900	210	300 ^r	300 ^r	300 ^r	300
Chile:										
Apatite	13	21	11	9 ^r	10	4 ^e	7 ^e	3 ^e	3 ^{r,e}	3
Guano	--	3	2	1 ^r	1	-- ^r	NA	NA	NA	NA
Phosphorite	12	17	1	41 ^r	40	NA	NA	NA	NA	NA
China	45,400	50,700	60,200	68,000	81,000 ⁴	15,100	15,200	18,000	20,400	24,000 ⁴
Colombia ^c	43	27	27	30	--	8	8	8	8	--
Egypt, beneficiated	3,890	5,523	6,627	3,435 ^r	3,500	1,167	1,657	2,000	1,031 ^r	1,050
Finland ^c	825	825	650	825	825	300	300	225	300	300
India ^c	1,210	1,220	1,230	1,240	1,250	629 ^r	631	640	645	650
Indonesia ^c	1	1	1	1	1	(5)	(5)	(5)	(5)	(5)
Iran ^c	330	325	330	330	330	41	36	40	40	40
Iraq, beneficiated ^c	1	10	30	10	30	(5)	3	10	3	10
Israel	3,069	3,088	2,697	3,135	3,105 ⁴	840 ^e	850 ^e	740 ^e	860 ^e	850
Jordan	5,552	6,265	5,281	6,529 ^r	6,500	1,780	2,005	1,620	2,000 ^e	2,000
Kazakhstan ^c	720 ⁴	1,226 ⁴	1,225 ⁴	1,600	1,600	165	280	280	350	350
Korea, North ^c	300	300	300	300	300	95	95	95	95	95
Mexico	42	968	1,443	1,507	1,510	14	291	433	452	455
Morocco ⁶	27,800	24,500	18,400	26,600 ^r	28,000	8,900	7,850	6,000	8,800 ^r	9,200
Nauru ^c	45	45	45	45	45	17	17	17	17	17
Pakistan	4	4	4	4 ^e	4	1	1	1	1 ^e	1
Peru ^c	57	38	38	791 ⁴	2,544 ⁴	17	11	11	237 ⁴	760 ⁴
Philippines	2	2	2	2 ^r	2	1	1	1	1 ^e	1
Russia ^c	11,400	10,400	9,500	11,000	11,200	4,200	3,800	3,500	4,000	4,070
Saudi Arabia ^c	--	--	--	100	1,000	--	--	--	30	300
Senegal	691	645	948 ^r	976 ^r	980	234	180	320 ^e	330 ^{r,e}	330
South Africa	2,556	2,287	2,237	2,494	2,500	959 ^r	858 ^r	839 ^r	935	940
Sri Lanka	40	42	36 ^r	48 ^r	48	15 ^e	15 ^e	14 ^{r,e}	18 ^{r,e}	18
Syria	3,678	3,221	2,466	3,765 ^r	3,100	1,140 ^e	993	1,030 ^e	1,160 ^{r,e}	930
Tanzania	8	29	1	1 ^e	1	3	9	(5)	(5) ^e	(5)
Thailand ^c	4 ⁴	4 ⁴	3 ⁴	3	3	1	1	1	1	1
Togo ^c	750 ⁴	842 ⁴	726 ⁴	720 ^r	730	270	303	260	260 ^r	260
Tunisia, washed	8,005	7,623	7,398	7,281 ^r	5,000	2,320 ^{r,e}	2,210 ^{r,e}	2,140 ^{r,e}	2,110 ^{r,e}	1,500
United States	29,700	30,200	26,400	25,800	28,100 ⁴	8,480	8,590	7,640	7,400	8,160 ⁴
Uzbekistan ^c	600	600	600	800	850	140	140	140	200	213
Venezuela ^c	400	400	400	400	400	115	115	115	115	115
Vietnam	1,523	2,101	2,047 ^r	2,268 ^r	2,300	460	630	614 ^r	680 ^r	700
Zimbabwe, concentrate ^c	30	30	30	30	30	10	10	10	10	10
Total	160,000	166,000 ^r	162,000 ^r	181,000	198,000	51,000 ^r	51,100 ^r	50,100 ^r	56,000 ^r	60,900

See footnotes at end of table.

TABLE 10—Continued
 PHOSPHATE ROCK, BASIC SLAG, AND GUANO: WORLD PRODUCTION, BY COUNTRY^{1,2}

(Thousand metric tons)

Commodity and country ³	Gross weight					P ₂ O ₅ content				
	2007	2008	2009	2010	2011 ^e	2007	2008	2009	2010	2011 ^e
Basic (Thomas converter) slag: ^e										
France	50	50	50	50	50	8	8	8	8	8
Luxembourg	475	475	475	475	475	70	70	70	70	70
Total	525	525	525	525	525	78	78	78	78	78

^eEstimated. ^pPreliminary. ^rRevised. NA Not available. -- Zero.

¹World totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

²Table includes data available through May 13, 2012. Figures are from official country sources where available.

³In addition to the commodities listed, phosphate rock may be produced in Nigeria, but information is inadequate to estimate output.

⁴Reported figure.

⁵Less than ½ unit.

⁶Includes production from Western Sahara.