

PHOSPHATE ROCK

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Phosphorus is an essential element for plant and animal nutrition. Phosphorus is consumed primarily as a principal component of nitrogen-phosphorus-potassium (NPK) fertilizers that are used on food crops throughout the world. Phosphate rock minerals are the only significant global resources of phosphorus.

The United States is the world's leading producer and consumer of phosphate rock and phosphate fertilizers. Domestic production of phosphate rock decreased for the fifth consecutive year owing to the temporary closure of several mines and reduced output rates at others. The closures were necessitated by the large inventories of phosphate rock that have accumulated over the past 2 years of decreasing phosphoric acid production. Mines in Florida and North Carolina accounted for 83% of domestic marketable production, with the remainder produced in Idaho and Utah. More than 90% of the phosphate rock mined was used to produce chemical fertilizers and animal feed supplements; the balance was used to produce elemental phosphorus (P_4) and industrial phosphate compounds. Two companies in Idaho produced P_4 for downstream industrial compounds; however, one of the plants operated at one-third capacity and was closed permanently in December.

Domestic consumption and sales of marketable phosphate rock decreased by 12% from that of 2000. Manufacturers of phosphate fertilizers continued to be affected by weak foreign sales, primarily to China and India, which have been the major destinations for U.S. fertilizer exports for the past decade. In response to market conditions, several phosphoric acid plants were closed temporarily during the year, resulting in a drop in consumption. Phosphate rock imports increased to a record 2.5 million metric tons (Mt), while exports continued to decrease. The U.S. Census Bureau (2002) reported that wet process phosphoric acid (WPPA) production was 10.4 Mt as available phosphorus pentoxide (P_2O_5), compared with 11.4 Mt in 2000. The major fertilizer products produced and traded were diammonium phosphate (DAP), monoammonium phosphate (MAP), triple superphosphate (TSP), and WPPA.

Production

Domestic phosphate rock production data were developed by the U.S. Geological Survey from monthly and semiannual voluntary surveys of the 11 companies that owned phosphate rock mines. Production was reported from 14 mines; two other mines were idle and only reported use and stocks of phosphate rock (table 2).

Marketable phosphate rock production decreased for the fifth consecutive year, falling 17% from that of 2000, to reach its lowest point since 1965 (tables 1, 3). The phosphate industry was affected by a worldwide drop in demand for phosphate

fertilizers, which resulted in temporary closures and reduced production rates at phosphate rock mines and fertilizer plants. Annual phosphate rock production capacity dropped slightly after the closure of two mines during the past 2 years, which are unlikely to reopen in the near future. U.S. mines operated at 73% of rated annual capacity (table 13).

Southern States.—In Florida, phosphate rock was mined and processed by four companies—Cargill Fertilizer, Inc.; CF Industries, Inc.; IMC Phosphates MP Inc.; and PCS Phosphate Co., Inc. Their mines and plants were located in Hamilton, Hardee, Hillsborough, Manatee, and Polk Counties (table 2).

U.S. Agri-Chemicals Corp. and Farmland Hydro, L.P. (a joint venture between Farmland Industries, Inc., and Norsk Hydro ASA) operated WPPA and ammonium phosphate plants at Fort Meade and Green Bay, respectively, using phosphate rock purchased from other companies in Florida.

IMC Phosphates, the largest producer, closed all its mines for the entire months of July and December to reduce stocks of phosphate rock that had accumulated from the temporary closure of the company's two WPPA plants in Louisiana from January to August (IMC Global Inc., 2002, p. 3). IMC Phosphates also has two DAP/MAP granulation facilities in Louisiana. In July, the firm reopened the Uncle Sam WPPA and the Faustina DAP/MAP plants after 8-month closures, although, the Faustina facility only operated at two-thirds annual capacity. The company's other two operations, the Faustina WPPA and Taft DAP/MAP plants, remained idle for the entire year. The Louisiana plants used phosphate rock from the company's mines in Florida.

In January, Farmland-Hydro submitted its application to develop a new phosphate rock mine in Hardee County, FL. The 6,114-hectare property is expected to produce about 2.7 million metric tons per year (Mt/yr) of phosphate rock concentrate for 30 years. The permitting procedure involves Federal, State, regional, and local authorities. As part of the State regulations, Farmland is required to demonstrate how it would create a net environmental benefit in its reclamation plan (Green Markets, 2001c).

A proposal was submitted by Hacklake Resources, Inc., of Indianapolis, IN, to operate a phosphate rock mine in Polk County, FL, on previously mined lands. By using modern technology, the company anticipates recovering a high-grade concentrate for use by the fertilizer industry. Hacklake is in the process of obtaining the necessary permits and developing its mine plans. Production would not begin until late 2002 at the earliest (Green Markets, 2001d).

PCS Phosphates reported a 27% decrease in phosphate rock production owing to mining in an area of lower grade ore in North Carolina and reduced mining levels attributed to decreased demand resulting from the closure of its DAP and

associated facilities in Florida (Potash Corporation of Saskatchewan Inc., 2002b, p. 6). Overall, the company reported a 23% drop in phosphoric acid production from that of 2000 and a 50% reduction in annual DAP production capacity (Potash Corporation of Saskatchewan Inc., 2002a, p. 16). The firm increased its output of purified phosphoric acid (PPA) for industrial and food products by purchasing the remaining 50% of its joint-venture facility at Aurora. The former partner in the joint venture, Albright and Wilson, Inc., was acquired by Rhodia, Inc., in 2000, and subsequently, Rhodia was required to divest its share of the joint venture as part of the merger agreement with Albright and Wilson (Potash Corporation of Saskatchewan Inc., 2001).

The Nichols Mine, which is owned by Agrifos LLC, has been closed since August of 2000. The Wingate Creek Mine has been closed since December 1999, and its owner Nu-Gulf Industries Inc. (a subsidiary of now-bankrupt Mulberry Corp.) no longer controls the mine. A Federal bankruptcy judge is scheduled to make the property available for auction in 2002 (Green Markets, 2002).

Agrifos LLC filed for chapter 11 bankruptcy protection on May 8. The company cited low phosphate prices, the cost of closing its Nichols Mine in 2000, the unwillingness of existing lenders to support additional borrowing, and inability to refinance or restructure debts as the reasons for filing (Green Markets, 2001a). The bankruptcy filing did not affect the operation of its Pasadena, TX, processed phosphates plant.

Three other concentrated phosphate plants were located along the Gulf of Mexico in addition to those owned by IMC. Agrifos Fertilizer, LLC, Pasadena, TX; PCS Nitrogen, Inc., Geismar, LA; and Mississippi Phosphates Corp., Pascagoula, MS, all produced WPPA and ammonium phosphate fertilizers using phosphate rock imported from Morocco.

Western States.—In Idaho, four companies conducted open pit mining in Caribou County (table 2). Astaris LLC (a joint venture between FMC Corp. and Solutia, Inc.) operated the Dry Valley Mine on Federal and private leases to provide feedstock for both its Pocatello P_4 plant and PPA facility in Soda Springs, which is operated in a joint-venture agreement with Agrium, Inc. Monsanto Co. operated the Enoch Valley Mine, which supplied its P_4 plant in Soda Springs. Agrium produced phosphate rock from the Rasmussen Ridge Mine to feed its Conda WPPA plant. J.R. Simplot Co. operated the Smoky Canyon Mine, which supplied its WPPA plant in Pocatello via a 138-kilometer (km) slurry pipeline.

Astaris opened a new 80,000-metric-ton-per-year (t/yr) PPA production facility in May. The plant is located in Soda Springs and will be operated in a joint-venture agreement with Agrium (Astaris LLC, 2001b). With the opening of the PPA facility, Astaris closed its Pocatello plant permanently in December as part of the company's shift in raw material supply from P_4 to lower cost PPA. In addition, Astaris signed a long-term contract to purchase PPA from PCS Phosphates to supplement its own production. Astaris will purchase P_4 from Monsanto for applications that require P_4 as a feed material (Astaris LLC, 2001a). After the closure of the Pocatello plant, its ownership reverted to FMC, which will be responsible for decommissioning the facility and performing environmental remediation that was previously mandated by the U.S. Environmental Protection Agency (FMC Corp., 2001).

In Utah, SF Phosphates Ltd., Co. (joint venture between Simplot and Farmland Industries, Inc.), operated a major mining and phosphate rock beneficiation facility near Vernal. The beneficiated phosphate rock was transported by a 155-km slurry pipeline to the company's phosphate fertilizer production plant at Rock Springs, WY.

Consumption

Phosphate rock sold or used decreased by 12% from 2000, and fell to its lowest point since 1965 (table 4). Apparent consumption also was down by 12%, to its lowest level since 1986 (table 1). The significant drop was caused by a 9% reduction in phosphoric acid production and a decrease in P_4 production (U.S. Census Bureau, 2002). U.S. manufacturers were affected by reduced world and domestic demand for phosphate fertilizers. Domestically, phosphate fertilizer consumption was down by 2% for the crop year ending June 30 compared with the same period in 2000 (Terry and Kirby, 2002, p. 6). The decrease was caused by the fourth consecutive year of overall lower planted acreage, primarily corn, and poor spring weather in parts of the Corn Belt and the northern plains, which caused some fertilizer applications to be missed entirely (Pertz, 2001).

U.S. companies in the Florida-North Carolina region rely heavily on export sales for the bulk of their fertilizer business. During the past 2 years, world production has increased, and world consumption has decreased, especially in China, the primary destination for domestic fertilizers. Chinese purchases of U.S. DAP were down by 29% from 2000, owing to Government quotas on phosphate imports and drought conditions. Sales, however, jumped dramatically in December, likely in anticipation of China's acceptance into the World Trade Organization. DAP sales to India increased by 43% from 2000, but Indian Government subsidies and local production limited the need for imports (Prud'homme, 2001).

Phosphate rock use in the Western United States fell slightly owing to a significant drop in P_4 production from Astaris, which operated only one of the four furnaces at its facility in Pocatello owing to the increased cost of electricity (Green Markets, 2001b). In addition, Agrium operated its Conda facility at a reduced rate during the first half of the year after failure of a digester unit in late 2000 (Agrium Inc., 2001, p. 32). Approximately 58% of P_4 was consumed to manufacture thermal phosphoric acid, which is used in detergents, food additives, water- and metal-treatment chemicals, soft drinks, and as a raw material to make calcium, potassium, and sodium phosphates. The other 42% was used directly to manufacture phosphorus trichloride, pentasulfide, and other compounds, that are used in herbicides, insecticides, flame-retardants, lubrication greases, and plasticizers (Mansville Chemical Products Corp., 2001). Production of thermal phosphoric acid (P_2O_5 content) was 140,000 metric tons (t) in 2001 compared with 256,000 t in 2000 (U.S. Census Bureau, 2002), owing to reductions at the Astaris facility. Exports of P_4 increased to 6,300 t from 3,440 t in 2000 (table 11).

Stocks

U.S. stocks of phosphate rock ended the year 8% lower than in 2000 (table 3). By region, inventories of phosphate rock fell

by 19% in Florida and North Carolina, owing to the 2 month closure of all mines by IMC Phosphates and reduced output by other companies. Stocks increased by 40% in Idaho and Utah, primarily owing to reduced production of P₄ and repairs to the Agrium facility.

Transportation

In Florida, beneficiated phosphate rock was moved by rail and truck to phosphoric acid plants within the State. Phosphate rock, phosphoric acid, fertilizers, and animal feed supplements were sent by rail or truck to the port of Tampa and then were shipped for domestic or export use. Phosphate fertilizers produced by companies along the Gulf of Mexico were transported primarily by barge on the Mississippi River and its tributaries or by rail for domestic consumption. Exported products were shipped directly from major ports along the Gulf of Mexico. PCS Phosphates operates a port facility at Morehead City, NC, for exporting phosphate fertilizers from its facilities in North Carolina and Florida. In the West, phosphate ore was sent from the mine via truck, rail, and slurry pipeline.

Prices

The average price per metric ton for domestic phosphate rock increased by 10% in 2001 (table 5).

Foreign Trade

Imports of phosphate rock increased to an estimated 2.5 Mt owing to Agrifos using imported rock at its Pasadena, TX, facility after the closure of the company's mine in August 2000. Reported imports from the U.S. Census Bureau were 856,000 t because many of the data were suppressed (table 12). More than 99% of the imported phosphate rock was from Morocco and primarily used by three companies.

Domestic phosphate rock exports decreased by 63% to 111,000 t; however, U.S. Census Bureau data does not separate exports of previously imported phosphate rock from mined material (table 6). Exports of domestically mined phosphate rock were estimated to be less than 10,000 t in 2001 and will likely be near zero in 2002.

Total exports of phosphate fertilizers, in terms of P₂O₅ content, were down by 4% from 2000. Exports of DAP and WPPA fell by 11% and 39%, respectively. However, this was offset by increases in MAP and TSP exports, which rose by 12% and 25%, respectively. DAP is the major phosphate product exported, by tonnage, with more than 53% sold to China and India combined, compared with 61% in 2000 and 70% in 1999 (tables 7-11). This reflected decreasing demand, high stocks, and drought conditions in China, and government subsidy programs and construction of new facilities in India.

World Review

World production decreased to 126 Mt in 2001 from 132 Mt in 2000, primarily owing to the drop in U.S. output. The United States, Morocco, China, and Russia were the largest producers, in order of output, accounting for 68% of total production (table 14). Significant increases in production were reported in

Australia and Canada, where new mines reached full operating capacity (Prud'homme, 2001).

World consumption of P₂O₅ contained in fertilizers fell by 3% owing to lower usage in South Asia, China, the European Union, and North America. High fertilizer prices, poor weather conditions, and less planted acreage were common to the areas that reported lower usage (Prud'homme, 2001).

Australia.—WMC Fertilizers Pty. Ltd. doubled its production of phosphate rock from 2000 to nearly 1.9 Mt, as it achieved full production capacity at its DAP facility in Queensland in December after 2 years of operation. The plant was closed in July and August for inspection and to correct design problems (WMC Ltd., 2002, p. 25).

Canada.—Agrium corrected problems with its mill at the Kapuskasing, Ontario, mine and reached full production capacity late in the year. Production doubled from 2000 to an estimated 800,000 t (Agrium Inc., 2002, p. 31).

MCK Mining Corp. of Toronto completed a second drilling program at the Martison deposit near Hearst, Ontario, which is 110 km north of Kapuskasing. The company explored another area of the deposit that was originally evaluated by drilling two holes in 1981. The new program involved drilling 11 holes no closer than 200 meters (m) apart, totaling 1,250 m. The results were favorable for further exploration, with 10 of the holes intersecting the phosphate deposit with an average grade of 22% P₂O₅ (MCK Mining Corp., 2001).

China.—In May, Spur Ventures, Inc., of Vancouver, British Columbia, Canada, received approval from China's National Environmental Protection Bureau for the Yichang Phosphate project in Hubei Province. The environmental study was conducted jointly by the Hubei Environmental Research Institute and four engineering companies. The data for the study were obtained from the feasibility study that was completed in 2000, from current and historic environmental and ecological data obtained from a 12-month site monitoring, and from Chinese Government data banks. The study concluded that the potential gas emissions, fluid discharges, and solid disposals from the proposed facilities all satisfy the standards set by Chinese environmental regulations (Green Markets, 2001e).

Spur signed a letter of intent with 12 local fertilizer marketing and distribution companies in China to distribute and market 1 Mt of DAP and NPK fertilizers from Spur's proposed Yichang operation. Spur plans to produce 480,000 t/yr of DAP and 529,000 t/yr NPK fertilizer at Yichang (Green Markets, 2001f).

China became a member of the World Trade Organization (WTO) on December 11. As part of its accession agreement, China instituted a fixed 4% tariff on import quotas for fertilizers. The tariff rate quota (TRQ) for DAP would begin at 5.4 Mt in 2002 and increase by 5% per year to 7.98 Mt in 2010. In addition, the agreement gradually increases the quantity of material that may be imported by private companies from 10% in 2002 to 49% in 2010. State-owned trading enterprises would maintain the right to the majority of all trades through 2010 (Fertilizer Week, 2001).

Outlook

The short-term outlook for the domestic phosphate rock industry is favorable compared with the past several years.

Phosphate rock production and consumption should increase slightly from 2001 because domestic and world demand for phosphate fertilizers is projected to increase in 2002. Exports of phosphate fertilizers continue to be the determining factor for improvement of the domestic industry. After 3 years of declines, exports of DAP are expected to begin to rebound owing to China's accession into the WTO. The TRQ allows up to 5.4 Mt to be imported, although the actual amount indicated by various analysts will likely be around 4 Mt, about the same as in 2000. U.S. companies will remain the world's major supplier but face more competition in areas of increasing demand, such as Asia and Latin America. Exports to India, the other significant destination for U.S. DAP, are not likely to return to the level reached in 1999 owing to Government subsidy programs that favor indigenous production and the construction and expansion of local fertilizer plants. U.S. companies are likely to continue to pursue markets in Latin America to compensate for lower exports to other regions.

Domestically, P₂O₅ consumption is projected to return to nearly 4 Mt, after decreasing for 3 consecutive years. Specifically, planted acreage, primarily corn, is expected to grow, and fertilizer applications should increase owing to more favorable spring weather, after 2 years of below normal fertilization. While it is unlikely that any closed phosphate rock mines will reopen, U.S. WPPA and DAP capacity utilization should return to more than 80% because production had increased in the fourth quarter of 2001 and the first quarter of 2002. Mine production is planned to increase next year in North Carolina when PCS begins operating in a section of its mine that has a higher P₂O₅ content. Output from Florida, however, may only increase slightly as stocks of phosphate rock remain high. Western production should remain about the same in 2002.

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TABLE 1
SALIENT PHOSPHATE ROCK STATISTICS 1/

(Thousand metric tons and thousand dollars unless otherwise specified)

	1997	1998	1999	2000	2001
United States:					
Mine production (crude ore)	166,000	170,000	161,000	163,000	130,000
Marketable production:					
Quantity	45,900	44,200	40,600	38,600	31,900
P ₂ O ₅ content	13,300	12,900	11,800	11,200	9,230
Value	\$1,080,000	\$1,130,000	\$1,240,000	\$932,000	\$856,000
Average 2/ dollars per metric ton	\$24.40	\$25.46	\$30.56	\$24.14	\$26.82
Sold or used by producers: 3/					
Quantity	42,100	43,700	41,600	37,400	32,800
P ₂ O ₅ content	12,200	12,700	12,100	10,900	9,500
Value 4/	\$1,030,000	\$1,130,000	\$1,310,000	\$909,000	\$879,000
Average dollars per metric ton	\$24.50	\$25.87	\$31.49	\$24.29	\$26.81
Exports:					
Quantity	335	378	272	299	111
Value	\$11,700	\$16,100	\$11,400	\$12,100	\$4,280
Average dollars per metric ton	\$34.80	\$42.70	\$41.96	\$40.38	\$38.58
Imports for consumption e/ 5/					
Quantity	1,830	1,760	2,170	1,930	2,500
Value, cost, insurance, freight e/	\$91,800	\$92,700	\$123,000	\$99,800	\$123,000
Average dollars per metric ton	\$50.19	\$52.66	\$56.54	\$51.75	\$49.30
Consumption e/ 6/					
Consumption e/ 6/	43,600	45,000	43,500	39,000	35,200
Stocks, December 31, producers	7,910	7,920	6,920	8,170	7,510
World, production, gross weight	143,000	144,000	135,000 r/	132,000 r/	126,000 e/

e/ Estimated. r/ Revised.

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

2/ Average value based on the sold or used values.

3/ Includes domestic sales and exports.

4/ Total value of all domestic and export sales.

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

6/ Expressed as sold or used plus imports minus exports.

TABLE 2
ACTIVE PHOSPHATE ROCK MINES IN THE UNITED STATES IN 2001

Owner	Mine	County and State
Agrium Inc.	Rasmussen Ridge	Caribou, ID.
Astaris LLC	Dry Valley	Do.
Cargill Fertilizer, Inc.	Hookers Prairie	Polk, FL.
Do.	South Fort Meade	Do.
CF Industries, Inc.	South Pasture	Hardee, FL.
IMC Phosphates MP Inc.	Four Corners	Hillsborough/Manatee, FL.
Do.	Fort Green	Polk, FL.
Do.	Hopewell	Hillsborough, FL.
Do.	Kingsford	Polk/Hillsborough, FL.
Monsanto Co.	Enoch Valley	Caribou, ID.
PCS Phosphate Co., Inc.	Swift Creek	Hamilton, FL.
Do.	Aurora	Beaufort, NC.
SF Phosphates, Ltd. Co.	Little Brush Creek	Uintah, UT.
J.R. Simplot Co.	Smoky Canyon	Caribou, ID.

TABLE 3
PRODUCTION OF PHOSPHATE ROCK IN THE UNITED STATES, BY REGION 1/

(Thousand metric tons and thousand dollars)

Period/region	Mine production (crude ore)		Marketable production			Ending stocks, rock
	Rock	P ₂ O ₅ content	Rock	P ₂ O ₅ content	Value 2/	
2000:						
Florida and North Carolina	155,000	14,200	33,300	9,730	804,000	6,620
Idaho and Utah	7,550	1,670	5,300	1,510	128,000	1,550
Total	163,000	15,900	38,600	11,200	932,000	8,170
2001:						
January-June:						
Florida and North Carolina	70,400	6,620	15,500	4,500	416,000	8,520
Idaho and Utah	4,290	977	3,320	915	84,300	2,280
Total	74,700	7,600	18,800	5,410	500,000	10,800
July-December:						
Florida and North Carolina	52,300	7,180	11,100	3,260	314,000	5,330
Idaho and Utah	2,600	579	2,030	556	42,100	2,170
Total	54,900	7,760	13,200	3,820	356,000	7,510
Grand total	130,000	15,400	31,900	9,230	856,000	XX

XX Not applicable.

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

2/ Average value based on the sold or used values.

TABLE 4
PHOSPHATE ROCK SOLD OR USED BY PRODUCERS IN
THE UNITED STATES, BY GRADE AND REGION 1/

(Thousand metric tons and thousand dollars)

Period and grade (percentage of BPL content 2/)	Rock	P ₂ O ₅ content	Value 3/
2000:			
Florida and North Carolina	31,900	9,340	774,000
Idaho and Utah	5,470	1,520	134,000
Total	37,400	10,900	909,000
2001:			
January-June:			
60 to less than 66	11,300	3,330	308,000
Other 4/	5,040	1,380	120,000
Total	16,400	4,710	428,000
July-December:			
60 to less than 66	13,600	3,980	370,000
Other 4/	2,850	812	80,900
Total	16,400	4,790	451,000
Grand total	32,800	9,500	879,000
Florida and North Carolina	28,100	8,200	772,000
Idaho and Utah	4,730	1,300	107,000

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

2/ 1.0% BPL (bone phosphate of lime or tricalcium phosphate)= 0.458% P₂O₅.

3/ Free on board mine.

4/ Includes less than 60% and greater than 66% BPL content.

TABLE 5
VALUE OF U.S. PHOSPHATE ROCK, BY GRADE

(Dollars per metric ton, free on board mine)

Grade (percentage of BPL content 1/)	2000			2001		
	Domestic	Export	Average	Domestic	Export	Average
70 to less than 72	W	W	W	W	W	W
66 to less than 70	30.06	W	30.06	27.88	W	27.88
60 to less than 66	24.27	W	24.36	26.61	W	26.61
Weighted average 2/	24.20	40.38	24.29	26.81	38.58	26.81

W Withheld to avoid disclosing company proprietary data.

1/ 1.0% BPL (bone phosphate of lime or tricalcium phosphate)=0.458% P₂O₅.

2/ Includes less than 60% and greater than 72%, in addition to the grades listed.

TABLE 6
U.S. EXPORTS OF GROUND AND
UNGROUND PHOSPHATE ROCK

(Thousand metric tons)

Country	2000	2001
Canada	33	38
Netherlands	181	5
Other	85	68
Total	299	111

Source: U.S. Census Bureau.

TABLE 7
U.S. EXPORTS OF SUPERPHOSPHATES
(CONCENTRATED)

(Thousand metric tons)

Country	2000	2001
Australia	110	161
Bangladesh	18	140
Brazil	162	242
Chile	67	26
Japan	51	37
Other	137 r/	72
Total	545	678

r/ Revised.

Source: U.S. Census Bureau.

TABLE 8
U.S. EXPORTS OF DIAMMONIUM PHOSPHATE 1/

(Thousand metric tons)

Country	2000	2001
Argentina	223	250
Australia	413	313
Brazil	120	42
Canada	109	109
China	4,060	2,860
Colombia	97	103
Ecuador	42	78
India	345	492
Japan	356	337
Kenya	98	124
Mexico	295	276
Pakistan	295	371
Peru	--	109
Thailand	204	214
Other	577	730
Total	7,240	6,410

-- Zero.

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

Source: U.S. Census Bureau.

TABLE 9
U.S. EXPORTS OF MONOAMMONIUM
PHOSPHATE 1/

(Thousand metric tons)

Country	2000	2001
Argentina	--	167
Australia	491	532
Brazil	283	741
Canada	861	652
Colombia	108	117
Japan	127	127
Mexico	52	81
Other	374 r/	165
Total	2,300	2,580

r/ Revised. -- Zero.

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

Source: U.S. Census Bureau.

TABLE 10
U.S. EXPORTS OF PHOSPHORIC ACID 1/

(Thousand metric tons)

Country	2000	2001
Australia	65	79
Canada	29	36
India	149	40
Other	135	73
Total	378	228

1/ Excludes superphosphoric acid tonnage.

Source: U.S. Census Bureau.

TABLE 11
U.S. EXPORTS OF ELEMENTAL PHOSPHORUS 1/

Country	2000		2001	
	Quantity (metric tons)	Value 2/ (thousands)	Quantity (metric tons)	Value 2/ (thousands)
Brazil	5	\$14	2,170	\$7,430
Canada	693	1,400	964	2,170
Japan	1,210	2,670	192	556
Mexico	1,260	2,610	2,560	5,260
Netherlands	17	27	115	257
Other	262	504	293	604
Total	3,440	7,220	6,300	16,300

1/ 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 12
U.S. IMPORTS FOR CONSUMPTION OF PHOSPHATE ROCK AND PHOSPHATIC MATERIALS

(Thousand metric tons and thousand dollars)

Phosphatic materials	2000		2001	
	Quantity	Value 2/	Quantity	Value 2/
Natural calcium phosphates, unground 3/	186	5,750	265	9,700
Natural calcium phosphates, ground 3/	479	28,600	591	32,500
Total calcium phosphates 4/	1,930	99,800	2,500	123,000
Dicalcium phosphate	8	9,300	6	6,490
Elemental phosphorus	3	5,570	22	36,000
Normal superphosphate	(5/)	9	(5/)	81
Triple superphosphate	3	430	35	4,900
Diammonium phosphate	123	21,900	133	22,300
Fertilizer containing nitrates and phosphates	79	7,220	1	506
Phosphoric acid	(5/)	70	1	227

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

2/ Declared cost, insurance, freight values.

3/ Some phosphate rock tonnages and values were suppressed by the U.S. Census Bureau.

4/ Includes an estimate for data suppressed by U.S. Census Bureau.

5/ Less than 1/2 unit.

Source: U.S. Census Bureau.

TABLE 13
PHOSPHATE ROCK ANNUAL WORLD
PRODUCTION CAPACITY, DECEMBER 31, 2001 1/

(Thousand metric tons)

Region/country	Capacity
United States	44,000
Africa	53,100
Asia	33,600
Europe and Russia	13,800
Middle East	14,600
Latin America and Canada	8,530
Oceania	3,400
Total	170,000

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

Sources: International Fertilizer Industry Association and U.S. Geological Survey.

TABLE 14
WORLD PRODUCTION OF PHOSPHATE ROCK, BASIC SLAG, AND GUANO, BY COUNTRY 1/ 2/

(Thousand metric tons)

Commodity and country	Gross weight					P ₂ O ₅ content				
	1997	1998	1999	2000	2001 e/	1997	1998	1999	2000	2001 e/
Phosphate rock:										
Albania e/	1	1	1	1	1	(3/)	(3/)	(3/)	(3/)	(3/)
Algeria	1,063	1,155 r/	1,096	877 r/	875	330 e/	358 e/	340 e/	265 e/	268
Australia e/	1	1	1 r/	975 r/ 4/	1,893 4/	(3/)	(3/)	(3/)	225 r/	438
Brazil, concentrate	4,276 r/	4,421	4,344 r/	4,725 r/	4,700	1,510 r/	1,561 r/	1,543 r/	1,687 r/	1,700
Canada e/	--	--	--	300	800	--	--	--	125	300
Chile	13	15	12 r/	12 r/	13	3	4	3 r/	3 r/	3
China e/	24,500	25,000	20,000	19,400	21,000	7,530	7,500	6,000	5,820	6,300
Christmas Island e/	600	600	600	575	500	198	198	198	190	165
Colombia	45	44 r/	43 r/	43 r/	42	9	8 r/	8 r/	8 r/	8
Egypt 5/	1,067	1,076	1,018	1,020 e/	1,020	310	311	298	300 e/	300
Finland	690	716	724 r/	750 r/ e/	750	254	260	268 e/	277 r/ e/	277
India	1,043	1,730	1,262 r/	1,136 r/	1,200	282	467	380 r/	336 r/	355
Indonesia	1	1	1	1 e/	1	(3/)	(3/)	(3/)	(3/)	(3/)
Iraq e/ 5/	1,000	1,000	1,000	1,000	1,000	300	300	300	300	300
Israel	4,047	4,067	4,128	4,110	3,511 4/	1,260	1,288	1,310	1,305 r/	1,115 4/
Jordan	5,896	5,925	6,014	5,526 r/	5,843 4/	1,946	1,955	1,924 r/	1,824 r/	1,928 4/
Kazakhstan e/	1,000	100	68 r/ 4/	33 r/ 4/	30	290	29	20 r/	10 r/	9
Korea, North e/	520	450	350	350	350	164	142	105	105	105
Mexico	714	756	951	1,052	787 4/	214	227	285	316	225
Morocco 6/	23,084	23,587	22,163 r/	21,459 r/	21,766 4/	7,848	7,850	7,500	7,200 e/	7,200
Nauru	491	487	600	500 e/	266 4/	187	185	230 e/	190 r/ e/	100
Pakistan e/	11 4/	11	12	11	11	2	2	2	2	2
Peru	168 r/ e/	131 r/ e/	25 r/ e/	16 r/ e/	17	52 r/	47 r/	9 r/	6 r/	6
Philippines e/	30	8 4/	181 r/ 4/	434 r/ 4/	450	10	3 r/	60 r/	143 r/	148
Russia e/	9,800	10,100	11,400	11,100	10,500	3,750 r/	4,660 r/	5,270 r/	5,900 r/	5,580
Senegal e/	1,565 r/ 4/	1,480 4/	2,000 r/	2,000 r/	1,700	575	540	660 r/	660 r/	560
South Africa	2,732	2,739	2,957	2,796 r/	2,550	1,066	1,068	1,153	1,090 r/	965
Sri Lanka	30	38	32	36 r/	36	10	13	11	12 r/ e/	12
Syria	2,392	2,496	2,084	2,166	2,043 4/	730	765	635 e/	646 r/ e/	613
Tanzania	3	2	-- r/	-- r/	--	1	1	-- r/	-- r/	--
Thailand	4	3	4	3	4	1	1	1	1 e/	1
Togo	2,631	2,253 r/	1,600 r/	1,400 r/	1,060	950 r/	810 r/	600 r/	500 e/	380
Tunisia, washed	6,941	7,901	8,006	8,339	8,000	2,140	2,370	2,400 e/	2,500 e/	2,400
United States	45,900	44,200	40,600	38,600	31,900 4/	13,300	12,900	11,800	11,200	9,230 4/
Uzbekistan e/	--	100	150	300	300	--	17	25	50	50
Venezuela	291	322	366	389 r/	420	79	87	99	105 r/	114
Vietnam	581 r/	599 r/	681 r/	707 r/	750	174 r/	180 r/	204 r/	212 r/	225
Zimbabwe, concentrate e/	94	91	126 r/	110 r/	100	30	29	40 r/	35 r/	32
Total	143,000	144,000	135,000 r/	132,000 r/	126,000	45,500 r/	46,100 r/	43,600 r/	43,500 r/	41,400
Basic (Thomas converter) slag: e/										
Argentina	(3/)	(3/)	(3/)	(3/)	(3/)	(3/)	(3/)	(3/)	(3/)	(3/)
Egypt	8	8	7 r/	8	8	2	2	2	2	2
France	44	45	50	50	50	8	8	8	8	8
Germany	125	125	150	150	150	19	19	19	18	18
Luxembourg	500	500	475	475	475	75	75	75	75	75
Total	677	678	682 r/	683	683	104	104	104	103	103
Guano, Philippines e/	5	5	5	-- 4/	--	2	2	2	-- 4/	--

e/ Estimated. r/ Revised. -- Zero.

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

2/ Table includes data available through May 8, 2002. Data for major phosphate rock-producing countries derived in part from the International Fertilizer Industry Association; other figures are from official country sources where available.

3/ Less than 1/2 unit.

4/ Reported figure.

5/ Beneficiated.

6/ Includes production from Western Sahara.