Phosphate Rock

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Phosphorus is an essential element for plant and animal nutrition and it 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. Throughout this report (unless noted otherwise), mine production is reported in terms of marketable production, which refers to beneficiated phosphate rock, with a phosphorus pentoxide (P_2O_5) content of greater than 27.5% for phosphoric acid or 20% for elemental phosphorus production.

The world phosphate market began to recover in 2002, following more than 2 years of weak market conditions that were caused by a combination of lower fertilizer demand, excess capacity, and changes in global supply patterns. The adverse economic conditions significantly affected producers in the Southeastern United States, which rely heavily upon export sales. Since late 1999, three phosphate producers have filed for bankruptcy, two phosphate plants in Florida have closed permanently, and several other plants and mines were temporarily closed or reduced their output. Domestic production rates for phosphate rock and phosphoric acid and fertilizer export tonnage increased in 2002. Although the United States has remained the largest global supplier of phosphate fertilizers, primarily diammonium phosphate (DAP), its share of the world DAP export market has fallen from nearly 65% in 1998 to below 50% in 2002 (Prud'homme, 2002).

Mines in the Florida and North Carolina region accounted for 86% of domestic production of phosphate rock. The remainder was produced in Idaho and Utah. More than 90% of the phosphate rock consumed in the United States was used to manufacture wet process phosphoric acid for fertilizer, animal feed, and chemical uses. One company in Idaho produced elemental phosphorus from its own ore.

According to the U.S. Census Bureau, production of wet process phosphoric acid increased by about 3% compared with that of 2001 to 10.6 million metric tons (Mt) of P_2O_5 content. Production of DAP, monoammonium phosphate (MAP), and superphosphate, the most widely used phosphate fertilizer products, each grew by 6% in 2002 (U.S. Census Bureau, 2003).

Production

Domestic phosphate rock production data were developed by the U.S. Geological Survey (USGS) from monthly and semiannual voluntary surveys of the 11 companies that owned phosphate rock mines during 2002. Production was reported from 14 mines, and two mines were inactive and only reported stocks and sales or use data.

After reaching a 35-year low in 2001, domestic production of marketable phosphate rock grew by 13% in 2002, owing to an increase in production of phosphoric acid and phosphate fertilizers (table 3). Mine capacity utilization was at 83% in 2002 compared with 74% in 2001, when several mines were temporarily closed for short periods throughout the year. Output from mines in Idaho and Utah was slightly lower in 2002 because of the closure of the Astaris LLC elemental phosphorus plant in December 2001 and the company's associated transition to manufacturing purified phosphoric acid.

In 2002, Florida accounted for more than 75% of domestic production and about 20% of world production, which was greater than Morocco, the world's second largest producer (Florida Phosphate Council, 2003). The largest economic phosphate deposits and production facilities in the United States are located in the Bone Valley formation in the central part of the State, in the counties of Hardee, Hillsborough, Manatee, and Polk. Three companies, Cargill Fertilizer, Inc., CF Industries, Inc., and IMC Phosphates MP Inc., operated seven mines in the central region of Florida. One mine operated by PCS Phosphate Co., Inc. is located in Hamilton County in the northeastern part of the State (table 2).

In October, IMC Phosphates purchased the Nichols Mine and the associated 6.6 Mt of phosphate rock reserves in Polk County, FL, from Agrifos Fertilizer LLC for $15.95 million (Green Markets, 2002a). Agrifos, which closed the mine in August 2000, because of poor economic conditions and excess water in the mine, filed for Chapter 11 bankruptcy protection in 2001. The company has continued to operate its phosphate plant in Pasadena, TX, using phosphate rock imported from Morocco. The Nichols Mine had production capacity of about 1 million metric tons per year (Mt/yr) and was the smallest active mine in Florida.

IMC Phosphates received approval from Manatee County, FL, for an 850-hectare (ha) extension to the Four Corners Mine in December (Green Markets, 2003c). This was after the Manatee County Board of Commissioners placed 5,300 ha of land that drains into the Peace River off limits to new phosphate mining. The county may grant an exception in the future if the mining project does not have a degradation of water quality (Green Markets, 2002e). The Florida Department of Environmental Protection issued an approval notice for the company's proposed Ona Mine in Hardee County, FL, in January 2003 (Green Markets, 2003b). Approval for the Ona Mine has been appealed by local environmental groups over concerns about disruption of water supplies and excess sediment from the mine flowing into the Peace River, which flows into Charlotte Harbor (Green Markets, 2003d). IMC Phosphates was expected to begin permitting procedures in 2003 for the proposed Pine Level Mine, which is under development in DeSoto and Manatee Counties, FL.

IMC Phosphates, the largest domestic phosphate rock producer, used about 70% of its phosphate rock production internally to produce phosphoric acid at three facilities—New Wales and South Pierce in Florida and Uncle Sam in Louisiana. New Wales and South Pierce also manufacture phosphate fertilizer products. The IMC Phosphates phosphoric acid plant in Faustina, LA, and its DAP and MAP plant in Taft, LA, were closed in 2002 because of economic conditions. IMC sold the other 30% of its phosphate rock output to phosphoric acid manufactures in Florida without captive rock sources (IMC Global Inc., 2003).

In November, Cargill Fertilizer purchased the Florida assets of Farmland Hydro, Limited Partnership (FHLP), which filed for bankruptcy on May 31 (Farmland Industries Inc., 2002). The properties included 64 Mt of phosphate reserves in Hardee County, where FHLP had begun permitting procedures for a 6,100-ha phosphate rock mine, a phosphate plant in Green Bay, FL, and an ammonia terminal in Tampa, FL. The Green Bay facility has an existing phosphate rock supply contract with IMC Phosphates that expires in 2005. Cargill will expand its production capacity at the South Ft. Meade Mine by 2 Mt/yr by 2005 and increase output from the Hookers Prairie Mine to supply the Green Bay plant after the IMC contract expires (Cargill Crop Nutrition, 2003). As a condition of the sale, Farmland agreed not to compete against Cargill in the phosphate business for 3 years, exclusive of its joint venture with J.R. Simplot Co. in Idaho and Wyoming. In addition to the former FHLP Green Bay facility, Cargill has existing phosphoric acid and fertilizer plants in Tampa and Bartow, FL (Green Markets, 2002c).

Cargill also purchased the former Mulberry Phosphates, Inc. phosphoric acid and fertilizer plant in Mulberry, which has been closed since late 1999. As part of the purchase agreement, Cargill cannot manufacture products that generate phosphogypsum, and the existing Mulberry phosphogypsum stack will remain the property of the State. Cargill will remove the estimated 7,600 megaliters of acidic process water from the stack and permanently close the stack. The State will pay for closing costs, and Cargill will provide the labor and expertise. Cargill is the only operating phosphate company that has successfully closed a phosphogypsum stack. Cargill was expected to use the Mulberry, FL, facility to produce sulfuric acid for use in its other phosphate facilities in Florida (Green Markets, 2002b).

Manatee County, FL, placed an 18-month moratorium on new mining projects in November. This would not affect projects that are currently in the permitting process or expansion of existing mines (Green Markets, 2002d). The only mine located entirely within the county, the Nu-Gulf Industries Inc. Wingate Creek Mine, has been closed since 1999, shortly before Mulberry Corp. (the parent company of Nu-Gulf) filed for bankruptcy. The mine and its reserves were scheduled to have been auctioned in 2002, but the sale was postponed indefinitely in April (Green Markets, 2002f).

In the fourth quarter, PCS reopened its White Springs, FL, DAP facility, which had been closed since January 2001 because of weak economic conditions. It was expected to operate at near the full capacity of 645,000 metric tons per year (t/yr) in 2003. In North Carolina, PCS operated the Aurora integrated phosphate complex in Beaufort County. The site contains a phosphate rock mine, phosphoric acid, fertilizer, and purified phosphoric acid plants. An 83,000-metric ton (t) expansion of the purified acid plant was completed early in 2003 that increased capacity to 251,000 t/yr (Potash Corporation of Saskatchewan Inc., 2003).

In addition to the Agrifos plant in Pasadena, TX, two other companies—Mississippi Phosphates, Corporation, Pascagoula, MS, and PCS Nitrogen Fertilizer, LP, Geismar, LA—operated phosphoric acid plants that used phosphate rock imported from Morocco. Mississippi Phosphates produced DAP and MAP at its facility, whereas PCS Nitrogen sold most of its phosphoric acid to Rhodia Phosphorus and Performance Derivatives, which has a purified phosphoric acid plant in Geismar (Potash Corporation of Saskatchewan Inc., 2003).

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 to provide feedstock for a purified phosphoric acid facility in Conda, ID, which was operated in a joint-venture agreement with Agrium US, Inc. Monsanto Co. operated the Enoch Valley Mine, which supplied its elemental phosphorus plant in Soda Springs. Agrium produced phosphate rock from the Rasmussen Ridge Mine to feed its Conda phosphoric acid plant. J.R. Simplot Co. operated the Smoky Canyon Mine, which supplied its phosphoric acid plant in Pocatello via a 138-kilometer (km) slurry pipeline.

In December, Astaris announced that it would close its Dry Valley Mine in January 2003 for at least 1 year to reduce stocks of phosphate rock that have accumulated during the transition from producing elemental phosphorus to purified acid. Although the new facility opened in May 2001, 6 months before the closure of its Pocatello elemental phosphorus plant, it did not operate near full capacity until 2002 (Green Markets, 2003a).

Simplot received approval from the U.S. Bureau of Land Management to expand its Smoky Canyon Mine. The permitting procedure was delayed for several months while an agreement was reached between a local environmental group and the company concerning the scope of the mining project was pursued (Green Markets, 2002g).

In Utah, SF Phosphates Ltd., Co. (a 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

Higher domestic consumption of phosphate fertilizer and stronger export sales of DAP led to an increase in phosphoric acid production, which resulted in phosphate rock shipments and apparent consumption both increasing by 6% over that of 2001 (table 1). More than 50% of the phosphate rock consumed in the United States in 2002, was contained in exported phosphate fertilizers and industrial phosphates (U.S. Census Bureau, 2003).

The U.S. market for phosphate fertilizer is quite mature and since 1991 has averaged 4 Mt/yr. For the crop year ending June 30, 2002, U.S. consumption of P_2O_5 contained in fertilizers increased from a 10-year low of 3.85 Mt in 2001 to a 17-year high of 4.2 Mt (Terry and Kirby, 2003). The 9% growth was attributed to rebound from below normal use in 2001 and higher fertilizer application rates for the major crops, primarily corn (Baumes, 2002).

Production of thermal phosphoric acid, the main use for elemental phosphorus, fell 15% to 123,000 t, which reflected the closure of one elemental phosphorus plant in December 2001 (U.S. Census Bureau, 2003). Thermal phosphoric acid was used directly in detergents, food additives, water- and metal-treatment chemicals, and soft drinks, and as a raw material to produce calcium, potassium, and sodium phosphates. Elemental phosphorus also was used to manufacture phosphorus trichloride, pentasulfide, and other compounds, which were used in herbicides, insecticides, flame-retardants, lubrication greases, and plasticizers. The two largest end use categories for industrial phosphates in the United States are detergents and cleaners and food and beverage additives, accounting for 29% and 28% of consumption, respectively. In comparison, worldwide, 60% of industrial phosphates are used in detergents and cleaners, reflecting the domestic restrictions on phosphates in laundry detergents (Pickett, 2002).

Stocks

Stocks of phosphate rock on December 31 were 8.86 Mt, an 18% increase from the end of 2001 (table 3). In Florida and North Carolina, stocks were up 23% owing to below average phosphoric acid production and significant remaining stocks from 2001. In Idaho and Utah, ending stocks were up 6%, primarily from the effects of closing the Astaris elemental phosphorus facility at the end of 2001 and the company's shift to manufacturing high-purity phosphoric acid.

Transportation

In Florida and North Carolina, crude phosphate rock ore was sent by slurry pipeline from the mines to the processing plants. Most beneficiated phosphate rock was used internally to manufacture phosphoric acid and sent by conveyers to the acid plant. The small amount of beneficiated rock that was sold was sent by rail. IMC Phosphates sends some phosphate rock by rail to the port of Tampa and then by barge to its facilities in Louisiana. In Central Florida, phosphoric acid, fertilizers, and animal feed supplements were transported by rail from the production facilities to domestic consumers or to the port of Tampa for export. In 2002, 17.8 Mt of phosphate fertilizer products was shipped from the port of Tampa (Florida Phosphate Council, 2003). In northern Florida, PCS Phosphates ships its products primarily by rail to domestic consumers, however, some products are exported from the company's Morehead City, NC, terminal. PCS used barges and tugboats to move products from its Aurora, NC, facility to the Morehead City port for export and served its domes`tic consumers by rail. Phosphate companies located along the Gulf of Mexico received phosphate rock by ship from Morocco and transported their products 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. In the West, phosphate ore was sent from the mines to the processing plants via truck, rail, and slurry pipeline.

Prices

The average domestic producer price increased to $27.69 per metric ton compared with $26.81 per ton in 2001 (table 5). Price data were collected on the semiannual canvass of producers and reflected the value of phosphate rock sold or used for phosphoric acid and elemental phosphorus manufacturing. This is not an actual market price because nearly all phosphate rock produced in the United States is used internally. The small amount that is sold (less than 3% of shipments) is done so on long-term contracts. Unlike many other mineral commodities, there is no standard domestic or world price for phosphate rock. Average ranges of prices are published in various industry trade journals based on a sample of transactions. The import price per metric ton is based on U.S. Census Bureau customs value and includes cost, insurance, and freight.

Foreign Trade

Phosphate rock imports were estimated to have increased to 2.7 Mt in 2002 from 2.5 Mt in 2001 (table 12). Phosphate rock import data were derived from official U.S. Census Bureau reports and export data provided by the Moroccan phosphate rock producer. This was necessary because a significant amount of phosphate rock import tonnage and value from Morocco, which accounted for 99% of all phosphate rock imports, were suppressed by the U.S. Census Bureau. The three phosphoric acid producers located along the Gulf of Mexico—Agrifos, Mississippi Phosphates, and PCS Nitrogen—were the primary importers.

Phosphate rock export tonnage reported by producers on the USGS canvass for 2002 was well below the reported U.S. Census Bureau figure of 39,000 t; however, the U.S. Census Bureau data were used to avoid disclosing company proprietary information (table 6). The discrepancy may be attributed to reexports of previously imported phosphate rock or misclassification of items. The U.S. Census Bureaurevised phosphate rock export statistics down for 2001 from 111,000 t to 9,000 t based on a review of the data (Fertilizer Institute, 2002). Phosphate rock exports are likely to be near zero in the future because it is more profitable to ship fertilizer products rather than rock and declining reserves in Florida limit the amount of excess rock.

The United States is the largest exporter of phosphate fertilizers, accounting for about 54% of world DAP exports and 37% of total world P_2O_5 exports, according to preliminary 2002 trade reports (Prud'homme, 2002). Exports of DAP increased by 6% from those of 2001 owing to a 47% increase in exports to China, the leading market for U.S. phosphate fertilizers. DAP exports to India, the second largest export market were down 60% compared with 2001 (tables 7-10). Exports of elemental phosphorus increased to 10,600 t from 6,300 t in 2001 (table 11).

World Review

World production of phosphate rock increased to 135 Mt from 126 Mt in 2001, with the United States, China, Jordan, and Morocco having the greatest increases, in order of tonnage (table 14). The United States remained the top producer, accounting for 27% of world production, followed by China and Morocco, each at 17% of the total. World production capacity decreased by 1% owing to slight drops in Africa, Oceania, and the United States (table 13). However, capacity utilization was 80%, up from 74% in 2001.

Two significant mine expansion projects were completed in 2002; a 450,000-t expansion of the Coprebras Ouvidor Mine in Brazil and a 200,000-t expansion of the El Nasr Sebaya Mine in Egypt. Several other projects at existing mines in Africa are anticipated to increase world phosphate rock production capacity by 4.84 Mt/yr by the end of 2004. The largest regional increase, 2.8 Mt, is planned in the Northwest African countries of Algeria, Morocco, and Tunisia. In Togo, the new owners of the Hahotoe and Kpogame Mines are implementing a significant investment program that will double current annual capacity of 1.2 Mt in 2003 (Prud'homme, 2002).

World production of phosphoric acid increased by approximately 10% over that of 2001, with the United States, India, Morocco, Russia, and Senegal reporting significant growth (Heffer, 2003). World demand for phosphate fertilizers grew in 2002, after several years of high stocks, poor weather conditions, reduced world demand, and the opening of new fertilizer plants that reduced world trade in DAP. China was the leading importer of DAP, with nearly double the tonnage of 2001, owing to growing demand and China's admittance into the World Trade Organization (WTO). U.S. producers have replaced some of the lost market share in processed phosphates trade to India and Australia with sales to Latin America, but a return to export levels seen in the 1990s is unlikely. Many of the new phosphate plants that have opened or are scheduled to open in the next 5 years in Asia will depend upon imports of either phosphate rock or phosphoric acid, of which the United States is an insignificant supplier on the world market.

Australia.—WMC Resources Ltd. reported production of 2.05 Mt of marketable phosphate rock ore with an average grade of 23.82% P_2O_5 (WMC Resources Ltd., 2003). WMC is expected to complete a 0.2-Mt/yr capacity expansion of the Duchess Mine in 2003, which will bring the capacity to 2.2 Mt/yr (Prud'homme, 2002).

China.—Phosphate rock production increased by 2 Mt and exports decreased to 3.5 Mt in 2002 from 4.9 Mt in 2001, as the Government restricted imports to insure supplied for local phosphate fertilizer plants and related expansion projects. Phosphate rock exports however, will remain significant because fertilizer demand will continue to grow faster than new production capacity can be added. It has been estimated that more than 30% of China's P_2O_5 requirements was met by imports (Fan and Xie, 2002).

Under the terms of its admittance to the WTO, China was required to established a tariff rate quota (TRQ), which allocates the amount of DAP and other products permitted for import at a reduced tariff. The DAP TRQ was 5.4 Mt in 2002 and is planned to increase by 5% per year to 7.98 Mt in 2010 (Fertilizer Week, 2001).

Mexico.—The Grupo Fertinal, SA de CV phosphate rock mine and fertilizer complex in Baja California Sur has been closed since a hurricane damaged the loading dock and other facilities in September 2002. The company was in negotiations with its insurance provider to obtain the necessary funds to rebuild the facilities (Fertilizer Week, 2002).

Outlook

The outlook for the domestic phosphate rock industry during the next several years is for increased sales and higher profits because export sales, domestic consumption, and prices began to rebound in 2002. According to projections by the International Fertilizer Industry Association, world fertilizer consumption was expected to grow at a rate of 2.1% per year between 2003 and 2008, with phosphate consumption growing by 2.7% per year. The highest growth in phosphate consumption is expected in Asia, Oceania, and South America, all significant destinations for U.S. fertilizer exports. U.S. DAP exports to India may increase depending on the status of the Oswal plant, which was operating below 50% capacity because of environmental and management problems. The level of exports however, will remain limited because of Indian Government subsidy programs that favor local production.

Domestic P_2O_5 consumption is forecasted to decrease slightly in 2003, and then increase by less than 1% per year through 2005 based on average weather conditions and acres planted for major crops.

Domestic phosphate rock production likely will not increase as rapidly as phosphoric acid production because of high stocks of phosphate rock and declining reserves in Florida. Capacity is expected to remain steady for at least the next 5 years, with new mines and expansion projects slated to only replace existing mines. The permitting procedures for new mines however, have encountered greater than expected public opposition, which may affect future expansion and lead to increasing imports from Morocco.

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TABLE 1
SALIENT PHOSPHATE ROCK STATISTICS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

		1998	1999	2000	2001	2002
United States:						
Mine production, crude ore		170,000	161,000	163,000	130,000	154,000
Marketable production:						
Gross weight		44,200	40,600	38,600	31,900	36,100
P_2O_5 content		12,900	11,800	11,200	9,230	10,700
Value		1,130,000	1,240,000	932,000	856,000	993,000
Average[2]	dollars per metric ton	25.46	30.56	24.14	26.82	27.47
Sold or used by producers:[3]						
Gross weight		43,700	41,600	37,400	32,800	34,700
P_2O_5 content		12,700	12,100	10,900	9,500	10,300
Value[4]		1,130,000	1,310,000	909,000	879,000	962,000
Average	dollars per metric ton	25.87	31.49	24.29	26.81	27.69
Exports:						
Gross weight		378	272	299	9 r	39
Value		16,100	11,400	12,100	W	W
Average	dollars per metric ton	42.70	41.96	40.38	W	W
Imports for consumption[e, 5]						
Quantity		1,760	2,170	1,930	2,500	2,700
Cost, insurance, and freight value[e]		92,700	123,000	99,800	123,000	112,000
Average	dollars per metric ton	52.66	56.54	51.75	49.30	41.45
Consumption[e, 6]		45,000	43,500	39,000	35,300 r	37,400
Stocks, December 31, producers		7,920	6,920	8,170	7,510	8,860
World, production, gross weight		144,000	134,000 r	132,000	126,000	135,000 e

[e]Estimated. [r]Revised. W Withheld to avoid disclosing company proprietary data.
[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 2002

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			
			Beneficiated			Ending stocks, rock
	Rock	P_2O_5 content	Rock	P_2O_5 content	Value[2]	
2001:						
Florida and North Carolina	123,000	13,900	26,600	7,760	730,000	5,330
Idaho and Utah	6,890	1,560	5,350	1,470	126,000	2,170
Total	130,000	15,400	31,900	9,230	856,000	7,510
2002:						
January-June:						
Florida and North Carolina	72,800	4,200	15,700	4,620	452,000	6,080
Idaho and Utah	2,930	703	2,200	635	52,400	2,030
Total	75,700	4,900	17,900	5,260	504,000	8,110
July-December:						
Florida and North Carolina	74,400	6,790	15,400	4,700	426,000	6,560
Idaho and Utah	3,570	800	2,830	742	62,800	2,300
Total	78,000	7,590	18,200	5,440	489,000	8,860
Grand total	154,000	12,500	36,100	10,700	993,000	XX

XX Not applicable.
[1]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 GRADE AND REGION[1]

(Thousand metric tons and thousand dollars)

Period and grade (percentage of BPL content[2])	Rock	P_2O_5 content	Value[3]
2001:			
Florida and North Carolina	28,100	8,200	772,000
Idaho and Utah	4,730	1,300	107,000
Total	32,800	9,500	879,000
2002:			
January-June:			
60 to less than 66	11,800	3,500	321,000
Other[4]	5,550	1,600	169,000
Total	17,400	5,100	490,000
July-December:			
60 to less than 66	13,900	4,250	370,000
Other[4]	3,500	912	102,000
Total	17,400	5,160	472,000
Grand total	34,700	10,300	962,000
Florida and North Carolina	29,800	8,910	840,000
Idaho and Utah	4,920	1,350	122,000
Total	34,700	10,300	962,000

[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% P_2O_5.
[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	2001			2002		
(percentage of BPL content[1])	Domestic	Export	Average	Domestic	Export	Average
70 to less than 72	W	W	W	W	W	W
66 to less than 70	27.88	W	27.88	25.90	--	25.90
60 to less than 66	26.61	W	26.61	27.35	--	27.35
Weighted average[2]	26.81	W	26.81	27.69	W	27.69

W Withheld to avoid disclosing company proprietary data. -- Zero.

[1]1.0% BPL (bone phosphate of lime or tricalcium phosphate)=0.458% P_2O_5.

[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	2001[r]	2002
Canada	3	24
Colombia	4	--
Other	2	15
Total	9	39

[r]Revised. -- Zero.

Source: U.S. Census Bureau.

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

(Thousand metric tons)

Country	2001	2002
Australia	161	110
Bangladesh	140	63
Brazil	242	198
Chile	26	48
Japan	37	42
Other	72	85
Total	678	546

Source: U.S. Census Bureau.

TABLE 8
U.S. EXPORTS OF DIAMMONIUM PHOSPHATE[1]

(Thousand metric tons)

Country	2001	2002
Argentina	250	105
Australia	313	214
Brazil	42	43
Canada	109	239
China	2,860	4,210
Colombia	103	131
Ecuador	78	49
India	492	201
Japan	337	309
Kenya	124	77
Mexico	276	430
Pakistan	371	149
Peru	109	66
Thailand	214	98
Other	730	494
Total	6,410	6,820

[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	2001	2002
Argentina	167	98
Australia	532	550
Brazil	741	537
Canada	652	435
Colombia	117	108
Japan	127	128
Mexico	81	110
Other	165	240
Total	2,580	2,210

[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	2001	2002
Australia	79	17
Canada	36	46
India	40	--
Other	73	124
Total	228	187

-- Zero.

[1]Excludes superphosphoric acid tonnage.

Source: U.S. Census Bureau.

TABLE 11
U.S. EXPORTS OF ELEMENTAL PHOSPHORUS[1]

Country	2001 Quantity (metric tons)	2001 Value[2] (thousands)	2002 Quantity (metric tons)	2002 Value[2] (thousands)
Brazil	2,170	$7,430	7,150	$21,100
Canada	964	2,170	698	1,580
Japan	192	556	38	81
Mexico	2,560	5,260	2,500	5,030
Netherlands	115	257	2	3
Other	293	604	208	418
Total	6,300	16,300	10,600	28,200

[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[1]

(Thousand metric tons and thousand dollars)

Phosphatic materials	2001 Quantity	2001 Value[2]	2002 Quantity	2002 Value[2]
Natural calcium phosphates, unground[3]	265	9,700	730	22,300
Natural calcium phosphates, ground[3]	591	32,500	595	32,700
Total calcium phosphates[4]	2,500	123,000	2,700	112,000
Dicalcium phosphate	6	6,490	6	6,400
Elemental phosphorus	22	36,000	34	50,900
Normal superphosphate	(5)	81	8	1,220
Triple superphosphate	35	4,900	29	3,500
Diammonium phosphate	133	22,300	156	32,800
Fertilizer containing nitrates and phosphates	1	506	3	835
Phosphoric acid	1	227	18	10,200

[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, 2002[1]

(Thousand metric tons)

Region/country	Capacity
United States	43,400
Africa	51,600
Asia	33,600
Europe and Russia	13,800
Middle East	14,600
Latin America and Canada	8,530
Oceania	2,850
Total	168,000

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

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

TABLE 14
PHOSPHATE ROCK, BASIC SLAG, AND GUANO: WORLD PRODUCTION, BY COUNTRY[1, 2]

(Thousand metric tons)

Commodity and country	Gross weight					P_2O_5 content				
	1998	1999	2000	2001	2002[e]	1998	1999	2000	2001	2002[e]
Phosphate rock:										
Albania[e]	1	1	1	1	1	(3)	(3)	(3)	(3)	(3)
Algeria	1,155	1,096	877	896 [r]	741 [4]	358	340	265	280 [r]	200
Australia	1	2 [r]	977 [r]	1,893	2,025 [4]	(3)	(3)	225	438	482 [4]
Brazil, concentrate	4,421	4,344	4,725	4,805 [r]	4,850	1,561	1,543	1,687	1,708 [r]	1,700
Canada[e]	--	--	300	800	1,000	--	--	125	300	380
Chile	15	12	12	12 [r]	12	4	3	3	3	3
China[e]	25,000	20,000	19,400	21,000	23,000	7,500	6,000	5,820	6,300	6,900
Christmas Island	600	650 [r]	590 [r]	568 [r]	500	198	220 [r]	197 [r]	190 [r]	167
Colombia	44	43	43	42	42	8	8	8	8	8
Egypt, beneficiated	1,076	1,018	1,096 [r]	972 [r]	1,500	311	298	317 [r]	293 [r]	434
Finland[e]	716 [4]	724 [4]	750	750	760	260 [4]	268	277	277	280
India	1,730	1,262	1,136	1,200 [e]	1,250	467	380	336	355 [e]	370
Indonesia[e]	1 [4]	1 [4]	1	1	1	(3) [4]	(3) [4]	(3)	(3)	(3)
Iraq, beneficiated[e]	1,000	1,000	650 [r]	300 [r]	300	300	300	200 [r]	100 [r]	100
Israel	4,067	4,128	4,110	3,511	3,500	1,288	1,310	1,305	1,115	1,110
Jordan	5,925	6,014	5,526	5,843	7,179 [4]	1,955	1,924	1,824	1,928	2,350
Kazakhstan[e]	100	68 [4]	33 [4]	30	60	29	20	10	9	17
Korea, North[e]	450	350	350	350	350	142	105	105	105	105
Mexico	756	951	1,052	787 [r]	--	227	285	316	236 [r]	--
Morocco[5]	23,587	22,163	21,463 [r]	21,983 [r]	23,000	7,850	7,500	7,200	7,400 [r]	7,400
Nauru	487	604 [r]	504 [r]	266	150	185	234 [r]	194 [r]	100	55
Pakistan[e]	11	12	11	11	11	2	2	2	2	2
Peru	131 [e]	25 [e]	17 [r, e]	16 [e]	16	47	9	6	5 [r]	5
Philippines	8	181	434	450 [e]	400	3 [e]	60 [e]	143 [e]	148 [e]	135
Russia[e]	10,100	11,400	11,100	10,500	10,700	4,660	5,270	5,900	5,580	5,700
Senegal	1,478 [r]	1,814 [r]	1,739 [r]	1,708 [r]	1,500	540	660	462 [r]	582 [r]	490
South Africa	2,739	2,957	2,796	2,420 [r]	2,913 [4]	1,068	1,153	1,090	943 [r]	1,100
Sri Lanka	38	32	34 [r]	36	36	13	11	12	12 [e]	13
Syria	2,496	2,084	2,166	2,043	2,400	765	635 [e]	646 [e]	613 [e]	720
Tanzania	5 [r]	24 [r]	17 [r]	13 [r]	13	1 [r]	7 [r]	5 [r]	4 [r]	4
Thailand	3	4	3	4 [e]	4	1	1	1 [e]	1 [e]	1
Togo	2,250 [r]	1,600	1,400	1,060	1,281 [4]	810	600 [e]	500 [e]	380 [e]	460
Tunisia, washed	7,901	8,006	8,339	8,144 [r]	7,750	2,370	2,400 [e]	2,500 [e]	2,400 [e]	2,300
United States	44,200	40,600	38,600	31,900	36,100 [4]	12,900	11,800	11,200	9,230	10,700 [4]
Uzbekistan[e]	100	150	150 [r]	200 [r]	200	17	25	25 [r]	33 [r]	33
Venezuela	322	366	389	399 [r]	400	87	99	105	114 [e]	114
Vietnam	599	681	707	750 [e]	750	180	204	212	225 [e]	225
Zimbabwe, concentrate[e]	91	126	78 [r]	87 [r]	80	29	40	25 [r]	28 [r]	26
Total	144,000	134,000 [r]	132,000	126,000	135,000	46,100	43,700 [r]	43,200 [r]	41,400	44,100
Basic (Thomas converter) slag:[e]										
Argentina	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Egypt	8	7	7 [r]	7 [r]	7	2	2	2	2	2
France	45	50	50	50	50	8	8	8	8	8
Germany	125	150	150	150	150	19	19	18	18	18
Luxembourg	500	475	475	475	475	75	75	75	75	75
Total	678	682	682 [r]	682 [r]	682	104	104	103	103	103
Guano, Philippines[e]	5	5	-- [4]	--	--	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, 2003. 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]Includes production from Western Sahara.