POTASH

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Potash is used primarily as an agricultural fertilizer (plant nutrient) because it is a source of soluble potassium, one of the three primary plant nutrients required for plant growth and maturation (the others are fixed nitrogen and soluble phosphorus). Potash and phosphorus are mined products, and fixed nitrogen is produced from the atmosphere by using industrial processes. Modern agricultural practice uses large amounts of these primary nutrients plus additional nutrients, such as boron, calcium, chlorine, copper, iron, magnesium, manganese, molybdenum, sulfur, and zinc, to ensure plant health and proper maturation. The three major plant nutrients have no cost-effective substitutes. Low-nutrient-content alternative sources, such as animal manure and guano, bone meal, compost, glauconite, and "tankage" from slaughterhouses, are available, but the cost of transportation per metric ton of nutrient can reduce their desirability beyond relatively short distances. In addition to its use as a fertilizer, potassium chloride is important in industrialized economies where it is used in aluminum recycling, by the chloralkali industry to produce potassium hydroxide, in metal electroplating, oil-well drilling mud, snow and ice melting, steel heat-treating, and water softening.

Potassium hydroxide is used for industrial water treatment and is the precursor of potassium carbonate, several forms of potassium phosphate, many other potassic chemicals, and in soap manufacture. Potassium carbonate is used in the glass industry for television and computer monitor production. It is used to produce alkaline batteries, animal feed supplements, some types of fire extinguishers, food products, pharmaceutical preparations, photographic chemicals, and as a catalyst for synthetic rubber manufacture. Generally, these nonfertilizer uses have accounted for 10% to 15% of annual potash consumption in the United States.

Potash denotes a variety of mined and manufactured salts, all of which contain the element potassium in water-soluble form. At the end of the 19th century, potash was still made from hardwood trees and was a mixture of potassium carbonate and potassium hydroxide, both of which are caustic. Lye denoted sodium hydroxide, and potash lye was potassium hydroxide, a higher grade product that made a better (softer, facial) grade of soap than lye soap for laundry. The 1942 Webster's dictionary defined potash as potassium carbonate.

Since approximately 1950, when potash fertilizer and industrial sales exceeded 1.28 million metric tons (Mt) K_2O equivalent[1] and potassium carbonate consumption remained less than 100,000 metric tons (t) K_2O, the term potash was used to indicate potassic fertilizers, which were potassium chloride (KCl or sylvite), potassium sulfate [K_2SO_4 or sulfate of potash (SOP), usually a manufactured product], and potassium-magnesium sulfate [$K_2SO_4 \cdot 2MgSO_4$ or langbeinite or double sulfate of potash magnesia (SOPM or K-Mag)]. Muriate of potash (MOP) is an agriculturally acceptable mix of KCl (95% pure or greater) and sodium chloride (halite) for fertilizer use that includes minor amounts of other nontoxic minerals from the mined ore and is neither the crude ore sylvinite nor pure sylvite.

This publication has historically included potassium nitrate [KNO_3 or saltpeter or nitrate of potash (NOP), a mostly manufactured product] and mixed sodium-potassium nitrate ($NaNO_3 + KNO_3$ or Chilean saltpeter, a natural product) because it functions as a potassic plus nitrogenous fertilizer. Saltpeter and Chilean saltpeter are still noted in the import tables (tables 8, 9). Alunite, feldspar, and muscovite are potassium-bearing minerals that are quite insoluble in water and are considered to be neither potassic fertilizers nor ores for price-competitive potassic fertilizers.

Production

Domestic production data were developed by the U.S. Geological Survey from a semiannual voluntary canvass of U.S. operations. Of the seven operations canvassed for both semiannual surveys, six responded. Data were estimated for the nonrespondent operation for both surveys. Data from the responding operators represented about 98% of the total production listed in table 1. Five companies produced potash from seven operations in three States. Most domestic production was from southeastern New Mexico where one company operated two mines and a second company operated one mine with multiple products. The second company also operated a deep-solution mine in Michigan. The third State with potash production was Utah where three companies produced potash from three operations.

Potash producers in the United States produced MOP, SOP, and SOPM. Published production data of all types and grades of potash in the United States have been adjusted since mid-1997 to protect the proprietary data of companies producing SOP and SOPM, which together are known as sulfates.

In 2003, production of potash in the United States decreased by about 8% from the previous year to 1.1 Mt (table 1). Mississippi Potash Inc. (MPI), [owned by Mississippi Chemical Corp. (MCC)] produced MOP from two potash operations—Mississippi Potash East (East Facility) and Mississippi Potash West (West Facility)—near Carlsbad, NM. MPI also operated the augmented compacting facility at the former National Potash Co. mill site—Mississippi Potash North—to convert standard MOP to granular MOP. MCC filed for reorganization under Chapter 11 of the U.S. Bankruptcy Code on May 15, 2003. The subsidiaries MPI and Eddy Potash, Inc.

[1]"Because the amount of potassium in the common salts of potassium varies, the industry has established a common standard of measurement of defining a product's potassium content [or purity], in terms of equivalent percentages of potassium oxide (K_2O). A K_2O equivalent of 60 percent, [51] percent, and 22 percent is the customary minimum standard for muriate of potash, sulfate of potash, and double sulfate of potash magnesia products, respectively" (IMC Global, Inc., 2004, p. 8). All tonnages are reported in metric tons K_2O equivalent, unless otherwise specified. All percentages are computed on unrounded K_2O equivalent values.

were included in this filing. MCC attributed its financial problems during the past 5 years to "the combination of the depression in the agricultural sector…and the extreme increase in price level and price volatility of domestic natural gas…." The 1997 bank collapse in Thailand led to reduced demand for agricultural products in Asia and reduced demand and prices for potash from 1998 through 2002. The East Facility, which had production capacity of approximately 305,000 metric tons per year (t/yr) of white potash, comprised a potash mine, refinery, and compaction plant and was operating on a schedule of "10 days working/4 days off" per 2 weeks. Domestic potash production declined in part owing to starting on June 20, MPI temporarily closing down the West Facility for about a month and the East Facility for about 3½ months to reduce potash stocks (Mississippi Chemical Corp., 2003, p. 25).

The two mines will eventually become one mine. During fiscal year 2001, the East Facility began mining toward the West Facility, and the company anticipates connecting these two facilities by the end of fiscal year 2004, which the company expects to provide improved ore grades, operational flexibility, and economies of scale (Mississippi Chemical Corp., 2003, p. 11).

IMC Global Inc. sold three-fourths of its 19.9% share of Compass Minerals International (CMI) [the present owner of Great Salt Lake Minerals Corp. (GSL)] to Salt Holdings Corp. and the SOP business line in Carlsbad to GSL. "Beginning in 2004, GSL will be taking over IMC Global's Carlsbad SOP business [market]. The acquisition included the customer list but no assets…" (Young, Traub, and Siegner, 2004, p. 11). This entailed releasing, in November, the Carlsbad employees that operated the SOP circuit. At the end of the year, the IMC Potash Carlsbad Inc. SOP stockpile was reduced to zero. Through its subsidiary IMC USA Inc. LLC, IMC Global Inc. owned the mine at Hersey, MI, which produced white granular MOP and halite.

In Utah, Reilly Industries, Inc. continued production of white MOP and manure salts at its Reilly-Wendover Division's near-surface brine operation. The Moab Salt, LLC solution mine and mill continued production of white MOP and halite from a deep ore zone for Intrepid Mining, LLC of Denver, CO. CMI of Overland Park, KS, operated the GSL plant near Ogden, which used brines from the Great Salt Lake, solar evaporation ponds, and some beneficiation plus conversion of purchased MOP to produce SOP.

Mine Safety Appliances Company sold the potassium metal production site in Evans City, PA, near Pittsburgh, PA, which was known as Callery Chemical Division, to BASF AG of Ludwigshafen, Germany, in November (BASF AG, 2003§[2]).

Consumption

For 2003, apparent consumption rose by about 3% owing to a 2% increase in imports and despite a more than 11% decrease in exports.

According to the Potash & Phosphate Institute (unpub. data, 2003), agricultural and industrial MOP shipments to the nine largest consuming States represented 62% of the combined Canadian and United States producers' total sales to the United States. In decreasing order of tonnage, the States were Illinois, Iowa, Ohio, Indiana, Minnesota, Missouri, Wisconsin, Alabama, and Michigan. Agricultural MOP shipments to the eight largest consuming States represented 60% of the Canadian and United States producers' agricultural MOP sales to the United States. In decreasing order of tonnage, the States were Illinois, Iowa, Indiana, Minnesota, Missouri, Ohio, Wisconsin, and Michigan. Industrial (nonagricultural) MOP shipments to the five largest consuming States represented 65% of combined Canadian and United States producers' industrial MOP sales to the United States. In decreasing order of tonnage, the States were Alabama, Ohio, Wisconsin, Utah, and Texas.

Agricultural plus industrial MOP sales to the five largest consuming States represented 61% of the U.S. producers' domestic total sales. In decreasing order of tonnage, the States were Texas, Illinois, Missouri, Michigan, and New Mexico. Agricultural MOP sales to the six largest consuming States represented 68% of the U.S. producers' domestic agricultural MOP sales. In decreasing order of tonnage, the States were Texas, Missouri, Illinois, Michigan, Kansas, and California. Industrial MOP sales for 2003 to the three largest consuming States represented 66% of the producers' U.S. domestic industrial MOP shipments. In decreasing order of tonnage, the States were Texas, New Mexico, and Colorado.

Foreign Trade

U.S. exports declined by more than 11% to about 329,000 t, of which 50% was MOP, 25% was SOP, 24% was SOPM, and 1% was NOP (table 7). Of the total exports of K_2O equivalent by world region, 66% went to the Latin America nations, 22% went to the Asian Pacific region, 8% went to Canada, 3.5% went to the Ivory Coast, and the remaining 0.5% went to Europe, the Middle East, and other African countries. Exports of MOP to all regions declined by 20%, SOP increased by 9%, SOPM declined by 10%, and NOP increased by 31%. The exports of NOP were small owing to the closure of the sole production site in Mississippi. Overall exports to Latin American nations declined by 14% compared with those of 2002, of which MOP declined by 25%, SOP increased by 25%, SOPM increased by 10%, and NOP increased by 132%. The Asian Pacific region declined by 15% of which MOP declined by 5%, SOP declined by 3%, SOPM declined by about 34%, and NOP declined by 49%. Exports to Canada declined by about 6% of which MOP declined by 15%, SOP increased by 13%, SOPM declined by about 9%, and NOP declined by 38%. The shipment of MOP to Canada can only be explained by the IMC Global Inc. central Michigan potash plant shipping into southern Ontario, and U.S. fertilizer dealers returning carloads of solidified MOP back to the potash mills of Canada because the potash would not flow out of the rail cars. Canadian potash plants occasionally load rail cars with very hot MOP directly from the driers. Hot MOP can agglomerate in transit and not flow out of the hopper car at the dealer's site.

Potash imports into the United States for 2003 rose by about 2% to 4.72 Mt compared with 2002. MOP imports rose by about 2% to 4.58 Mt, and NOP imports climbed by about 58% to about 71,400 t. SOP imports declined by 8% to 62,000 t, while mixed sodium potassium nitrates, mostly from Chile increased by about 35% to 3,110 t. Canada supplied about 92% of the MOP imports and 90% of all imports (table 4).

[2]References that include a section mark (§) are found in the Internet References Cited section.

Transportation

Marine transportation costs increased significantly in 2003. An observer of that market commented that the increased Chinese demand for the raw materials of steelmaking and supplemental steel imports for the country's booming economy was part of the driving force behind increased marine transportation costs (Hayley-Bell, 2003c). Along with the increased Chinese demand, a strong worldwide increase in demand for steaming coal helped to reduce the available shipping capacity; increased shipping rates perhaps related to oil and gas price increases also contributed to increased marine transport costs (Hayley-Bell, 2003d). Earlier, inadequate replacement orders in the Baltic dry indices (BDI)-size merchant ships, in the last few years, contributed to the lack of increased shipping capacity. In the last 2 years, new shipping tonnage was mainly added in containerships, cruise ships, and petroleum tankers. Another possible reason for the reticence of BDI-size shipbuilding is the lack of an acceptable design of double-hulled bulkers that was agreed upon by all stakeholders (Hayley-Bell, 2003b). The negative effect on potash producers was that, for contract prices quoted ex-ship at the purchasing country in late 2002 or early 2003, the producers had to absorb the more than 200% increase in transportation costs, which decreased their profitability (Hayley-Bell, 2003a; Potash Corporation of Saskatchewan, 2004, p. 24).

World Review

Estimated world potash production increased by about 8% to about 28 Mt. Belarus, Canada, Germany, and Russia produced about 77% of the world's estimated MOP production and each withheld some capacity to maintain a supply-demand balance (table 10). The farmers of countries of the Commonwealth of Independent States had neither accumulated enough currency, nor did they have equity against which to borrow, to purchase fertilizer, seed, and pest protection. Therefore, in 2003, Belarus consumed only 0.5 Mt of MOP and Russia consumed only 0.8 Mt. Fertilizer, seed, and profit-from-harvest-sales would return the Russian farmers to supplying most of the food demand for their own country and the worldwide potash industry to an increase of at least 5 Mt of potash consumption.

Potash Corporation of Saskatchewan (PotashCorp) in Canada claimed to own 69% of the world's excess capacity and total capacity of 7.3 Mt, which was 23% of world capacity and from which PotashCorp produced 4.3 Mt (Potash Corporation of Saskatchewan, 2004, p. 13-14). Using simple arithmetic, total excess world capacity was estimated to be between 4.8 and 6 Mt.

European Union.—The Common Agricultural Policy of the European Union reduced the farming subsidies through modified "decoupling" the subsidy from the type of produce grown. The 10% set-aside policy will continue but will allow "energy crops" to be grown in the set-aside hectares (Fertilizer Week, 2003d). The hope is to keep the farmers profitable and fertilizer consumption relatively level for the fertilizer producers. In 2003, Europe suffered from a heat wave and drought that suppressed crop production, and consequently fertilizer purchases, as well as river transportation of fertilizer and harvested grain because of low river water levels.

Belarus.—PA Belaruskali announced a new mine named Krasnaya Sloboda to be constructed in the Soligorsk potash district (Fertilizer Week, 2003a). The mine is planned to have a raw ore production capacity of 6 million metric tons per year (Mt/yr), which will augment the decreasing reserves of the four currently operating mines by shipping production to the Soligorsk 2 refinery about 28 kilometers westward for beneficiation.

Belgium and France.—Enterprise Minère et Chemique (EMC) of France expressed an interest in eventually divesting itself of its 44% ownership of Tessenderlo Group [owner of Tessenderlo Chemie NV (TCN) and marketer of SOP for TCN] (Fertilizer Week, 2003c). The sale is necessary to help finance the closures of the Alsatian potash mines and refineries. TCN was the second largest producer of SOP in the world and expected to continue in the market. EMC also expressed an interest in eventually divesting its 100% ownership of the fertilizer trading business Société Commerciale des Potasses et de l'Azote.

Brazil.—Companhia Vale do Rio Doce (CVRD) (undated§) announced a 37% per year capacity expansion to 510,000 t/yr from 372,000 t/yr by 2006. At the expanded rate of crude ore production, CVRD expected the mine to continue operation through 2017. Accordingly, it had begun to evaluate additional potash reserves for development and use after 2017 (Fertilizer Week, 2003b). Brazil imported about 83% of the Latin American and Caribbean purchases of potash and increased its imports by about 40% from last year owing to expectations of strong export grain demand, which proved to be true.

Canada.—The IMC Esterhazy, Saskatchewan, plant capacity expansion of 450,000 t/yr was started at the beginning of 2003 (IMC Global Inc., 2003). That increased total Canadian capacity to 9.1 Mt/yr. The firm with the largest capacity in Canada again used about 58% of capacity to keep North America ending stocks of potash from rising above one-quarter of annual production because when stocks rise above that level, price negotiators of purchasing countries start to force down prices for new contracts.

In August, PotashCorp announced an $80 million investment at their Rocanville, Saskatchewan, refinery. Potash production at the facility was scheduled to be expanded by approximately 400,000 t/yr, and its compaction capacity to 1.5 Mt/yr. The project was expected to be completed in the first quarter of 2005, with the majority of the funds to be spent in 2004 (Potash Corporation of Saskatchewan, 2003a).

In October, PotashCorp purchased 26% of Arab Potash Company from Jordan Investment Corporation, an arm of the Ministry of Finance of the Jordanian Government, for approximately $173 million (Potash Corporation of Saskatchewan, 2003b).

Chile.—In October, Sociedad Quimica y Minera de Chile S.A. (SQM) started the process of purchasing the PCS Yumbres SCM potassium nitrate production facility from PotashCorp. The purchase was expected to be completed in 2004 (Potash Corporation of Saskatchewan, 2004).

China.—The Qinghai Salt Lake Industry Group was working on the financing of a second potash operation on Qinghai Salt Lake in addition to the existing 360,000-t/yr MOP evaporation field and beneficiation plant. The second operation was intended to produce 600,000 t/yr of MOP. The startup date for the new facility was not available (Fertilizer Week, 2003g).

Xinjiang Luobupuo Potash Science and Technology Development Co. Ltd. obtained a government loan to expand the company's 10,000-t/yr SOP plant in Xianjiang Province to

204,000 t/yr by early 2005. The company is a joint venture of Sanwei Mineral Co., Delong Group Corp., Hami Gold Mine, and Nonferrous Metal Industries Co. The source of potassium for the plant is also in the Lop Nur Basin in Xinjiang Province (at about 90° east and 40° north). The reported source was an unnamed potassium ore or reserve-type and contained 125 Mt of SOP (Fertilizer Week-Asia, 2004).

China accounted for about 40% of the Asian Pacific region's imports for 2003 which increased by about 10% compared with those of 2002.

Germany.—K+S Kali GmbH announced its intention to develop a 5-meter-thick sylvinite seam of 27% K_2O for the Werra Group's mining and processing facilities of Hattorf, Wintershall, and Unterbriezbach. The extractable reserves were expected to be 31 Mt of MOP (Fertilizer Week, 2003e; K+S Aktiengesellschaft, 2004, p. 57).

Jordan.—The Executive Commission for Privatization of Jordan chose to sell the Government's 26% ownership in Arab Potash Company in early 2001. The company had become profitable and was expanding its facilities. In July, PotashCorp was named the preferred bidder (Fertilizer Week, 2003f). The October agreed upon purchase price was approximately $178 million (Potash Corporation of Saskatchewan, 2004, p. 35).

Russia.—JSC Uralkaliy negotiated a $75 million (€67 million) loan for equipment modernization, a company-owned powerplant, and railroad rolling stock from the European Bank of Reconstruction and Development (2004§). In June 2003, JSC Uralkali and Canpotex International Pte. Ltd. of Canada mutually canceled the joint potash marketing agreement they had as of January 2001. JSC Uralkali chose other traders to support their international marketing (Green Markets, 2003).

United Kingdom.—Cleveland Potash Ltd. (CPL) constructed a carnallite beneficiation pilot plant in 2002 to evaluate the possibilities of carnallite mining and refining (British Geological Survey, 2003, p. 85). It is not clear if CPL will use solution mining or mechanical mining for this new source. Israel Chemicals Ltd. has owned CPL since 2002, and also owns the Dead Sea Works (DSW) which crystallizes carnallite ($KCl•MgCl_2+6H_2O$) from the Dead Sea in its onshore solar ponds, then washes away the magnesium chloride to produce MOP. DSW collects the magnesium chloride as brine for producing magnesium products or returns the brine to the Dead Sea.

Outlook

With the U.S. dollar declining, because of uncertainty over the future cost of energy in the United States and concerns over the sustainability of the U.S. current account deficit, increased export sales of U.S. agricultural products on the world market are expected because U.S. commodities are relatively cheaper. As a consequence, increased sales of agriculture inputs such as domestic fertilizers are expected, either as foodstuffs or fertilizers. Since the U.S. consumption of potash has generally leveled off, the expected improvement in sales of potash would be small unless there were niche markets that U.S. agriculture could fill, and not a long-term trend. The worldwide stocks of grains have declined for the fifth consecutive year, and cereal stocks are at a two-decade low. There is a need for a turnaround in grain production to rebuild stocks to cover unforeseen droughts, floods, and wars around the world. If the United States can be one of the leaders in rebuilding these stocks, then that would lead to an increased domestic demand, at least temporarily, for fertilizers. The world demand, except for Western Europe and Japan, who are still struggling for recovery, is expected to trend upwards in the 1.5% to 2.5% range. The Commonwealth of Independent States countries, excluding Russia, are expected to increase their demand for potash by more than 2.5% owing to joining the European Union and finding increased demand for their agricultural products from a larger, more affluent population. The Asia Pacific region, led by the growth of the economies in China, India, and Thailand, will see stronger gross domestic product growth, which will lead to increased imports of fertilizers or grains and other foods (U.S. Department of Agriculture, 2004).

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TABLE 1
SALIENT POTASH STATISTICS[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

		1999	2000	2001	2002	2003
United States:						
Production:[3]						
Gross weight		2,500	2,600	2,500	2,600	2,400
K_2O equivalent		1,200	1,300	1,200	1,200	1,100
Sales by producers:						
Quantity:						
Gross weight[3]		2,500	2,600	2,400	2,500	2,500
K_2O equivalent[3]		1,200	1,200	1,100	1,200	1,200
Value[4, 5]		280,000	290,000	260,000	280,000	280,000
Average value:[6]						
Gross weight	dollars per metric ton	$110	$110	$110	$110	$110
K_2O equivalent	do.	$230	$230	$230	$230	$230
Exports:						
Gross weight		1,080	922	883	894	801
K_2O equivalent		459	367	366	371	329
Imports for consumption:[7, 8]						
Quantity:						
Gross weight		7,360	7,580	7,480	7,630	7,810
K_2O equivalent		4,470	4,600	4,540	4,620	4,720
Value, customs		566,000	554,000	537,000	615,000	646,000
Consumption, apparent:[9]						
Gross weight[10]		8,700	9,400	9,000	9,200	9,500
K_2O equivalent[10]		5,100	5,600	5,300	5,300	5,400
World, production, marketable K_2O equivalent		27,300 r	27,000	26,300 r	26,400 r	28,500 e

eEstimated. rRevised.

[1]Includes muriate of potash, sulfate of potash, potassium magnesium sulfate, and some parent salts. Excludes other chemical compounds that contain potassium.

[2]Data are rounded to no more than three significant digits, unless otherwise specified.

[3]Data rounded to within 100,000 metric tons (t) to avoid disclosing proprietary data.

[4]Free-on-board mine.

[5]Data are rounded to no more than two significant digits.

[6]Rounded to the nearest $5 to avoid disclosing proprietary data.

[7]Excludes potassium chemicals and mixed fertilizers.

[8]Includes nitrate of potash.

[9]Calculated from sales plus imports minus exports.

[10]Data rounded to within 200,000 t to avoid disclosing proprietary data.

TABLE 2
PRODUCTION OF CRUDE ORE IN NEW MEXICO

(Thousand metric tons)

Period	Crude salts[1] (mine production) Gross weight	Crude salts[1] (mine production) K_2O equivalent
2002:		
January-June[2]	6,000	600
July-December[2]	6,000	700
Total	12,000	1,300
2003:		
January-June[2]	6,000	700
July-December[2]	5,000	500
Total	11,000	1,200

[1]Sylvinite and langbeinite.
[2]Data are rounded to the nearest thousand.

TABLE 3
SALES OF NORTH AMERICAN MURIATE OF POTASH, BY STATE OF DESTINATION[1]

(Metric tons K_2O)

State	Agricultural potash 2002	Agricultural potash 2003	Nonagricultural potash 2002	Nonagricultural potash 2003
Alabama	79,600	75,900	216,000	209,000
Alaska	1,190	4,220	2,810	6,440
Arizona	2,890	2,290	3,020	3,080
Arkansas	75,100	75,900	35	24
California	74,000	68,400	11,700	9,310
Colorado	12,900	14,300	16,500	14,900
Connecticut	2,080	1,400	935	1,250
Delaware	19,400	19,100	42,400	43,000
Florida	124,000	138,000	17,200	13,300
Georgia	127,000	128,000	812	1,040
Idaho	44,000	32,500	847	1,030
Illinois	568,000	586,000	27,200	27,200
Indiana	343,000	335,000	10,500	10,000
Iowa	456,000	456,000	4,790	3,770
Kansas	33,400	38,500	9,620	8,260
Kentucky	109,000	113,000	8,700	5,080
Louisiana	63,100	72,600	6,100	2,510
Maine	3,250	4,190	211	368
Maryland	23,500	21,100	1,510	1,770
Massachusetts	1,540	3,320	9,720	12,600
Michigan	171,000	172,000	6,370	9,380
Minnesota	286,000	301,000	8,680	10,500
Mississippi	34,400	44,000	4,750	191
Missouri	287,000	294,000	2,040	2,440
Montana	20,500	19,300	187	168
Nebraska	56,200	61,700	1,940	2,100
Nevada	--	--	48	182
New Hampshire	350	479	292	280
New Jersey	6,530	7,090	961	1,270
New Mexico	12,300	13,800	23,900	31,800
New York	54,800	53,800	2,940	4,300
North Carolina	123,000	109,000	300	523
North Dakota	31,500	34,900	37	99
Ohio	313,000	278,000	100,000	96,800
Oklahoma	26,300	28,700	5,790	5,620
Oregon	37,900	37,700	378	380
Pennsylvania	50,200	48,500	9,700	11,300

See footnotes at end of table.

TABLE 3--Continued
SALES OF NORTH AMERICAN MURIATE OF POTASH, BY STATE OF DESTINATION[1]

(Metric tons K_2O)

State	Agricultural potash		Nonagricultural potash	
	2002	2003	2002	2003
Rhode Island	--	--	86	13
South Carolina	58,800	48,700	72	72
South Dakota	21,100	24,600	399	298
Tennessee	124,000	145,000	7,680	5,570
Texas	116,000	112,000	37,200	47,700
Utah	2,540	3,180	18,800	55,600
Vermont	2,280	2,910	47	145
Virginia	77,700	76,800	616	1,170
Washington	45,000	42,100	1,360	1,430
West Virginia	4,010	2,980	987	1,130
Wisconsin	204,000	203,000	65,900	82,400
Wyoming	2,290	2,640	5,990	7,330
Total	4,330,000	4,360,000	698,000	754,000

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

Source: Potash & Phosphate Institute.

TABLE 4
SALES OF NORTH AMERICAN MURIATE
OF POTASH TO U.S. CUSTOMERS, BY GRADE[1]

(Thousand metric tons K_2O)

Grade	2002	2003
Agricultural:		
Standard	160	144
Coarse	2,150	2,220
Granular	1,630	1,590
Soluble	396	407
Total	4,330	4,360
Nonagricultural:		
Soluble	157	152
Other	541	603
Total	698	754
Grand total	5,030	5,110

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

Source: Potash & Phosphate Institute.

TABLE 5
PRICES OF U.S. POTASH, BY TYPE AND GRADE[1, 2]

(Dollars per metric ton of K_2O equivalent)

Type and grade	2002		2003	
	January-June	July-December	January-June	July-December
Muriate, 60% K_2O minimum:				
Standard	160	150	165	175
Granular	150	155	155	155

[1]Average prices, free on board mine, based on sales.
[2]Data rounded to nearest $5.

TABLE 6
U.S. EXPORTS OF POTASH, BY TYPE[1]

	Approximate average K_2O equivalent content (percentage)	Quantity (metric tons)	
		Gross weight	K_2O equivalent[e]
2002:			
Potassium chloride, all grades	61	334,000	204,000
Potassium sulfate	51	148,000	75,700
Potassium magnesium sulfate	22	407,000	89,500
Potassium nitrate	45	4,600	2,070
Total	XX	894,000	371,000
2003:			
Potassium chloride, all grades	61	268,000	163,000
Potassium sulfate	51	162,000	82,400
Potassium magnesium sulfate	22	365,000	80,300
Potassium nitrate	45	6,020	2,710
Total	XX	801,000	329,000

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

Source: U.S. Census Bureau, adjusted by the U.S. Geological Survey.

TABLE 7
U.S. EXPORTS OF POTASH, BY COUNTRY[1]

(Metric tons of product)

Country	Potassium chloride		Potassium sulfates, all grades[2]		Potassium nitrate		Total	
	2002	2003	2002	2003	2002	2003	2002	2003
Argentina	6	18	21	4,670	--	--	27	4,690
Australia	--	--	18,800	15,900	1	30	18,800	15,900
Barbados	620	800	201	200	--	16	821	1,020
Belgium	2	4	556	--	--	216	558	220
Belize	2,030	2,820	--	--	--	--	2,030	2,820
Brazil	48,900	15,800	268	3,150	35	64	49,300	19,000
Canada	6,810	5,780	94,200	89,000	2,760	1,720	104,000	96,500
Chile	51	36	22,000	17,600	--	--	22,000	17,600
China	--	--	41,600	45,600	--	--	41,600	45,600
Colombia	24,600	4,550	33,200	23,600	5	7	57,900	28,200
Costa Rica	14,200	20,100	27,300	31,700	--	--	41,500	51,800
Cote d'Ivoire	--	12,500	17,800	18,300	--	--	17,800	37,800
Dominican Republic	15,000	24,800	3,450	10,600	145	2,440	18,600	13,700
Ecuador	3,000	7	2,220	13,700	--	--	5,220	42
France	45	2	2,900	37	--	3	2,940	3,200
Guadeloupe	2,560	--	1,000	3,200	--	--	3,560	2,970
Guyana	4,600	--	--	--	--	--	4,600	2,630
Honduras	6,050	18	2,580	2,610	--	--	8,630	30,800
Jamaica	5,040	13,900	15	--	24	24	5,080	13,900
Japan	24,600	23,500	120,000	77,400	--	--	145,000	101,000
Korea, Republic of	--	--	15,200	19,300	2	7	15,200	19,300
Malaysia	--	--	10,700	10	262	--	11,000	10
Martinique	6,860	19,100	2,630	3,190	--	--	9,490	22,300
Mexico	133,000	57,200	78,800	82,700	1,190	951	213,000	141,000
Netherlands	35	57	1,450	23	--	1	1,480	81
New Zealand	--	--	5,790	1,990	--	--	5,790	1,990
Nicaragua	2,750	6,000	--	--	--	19	2,750	6,020
Panama	7,460	4,180	759	1,160	--	--	8,220	5,330
Peru	--	13	21,900	37,500	--	--	21,900	37,500
South Africa	--	--	2,100	--	--	--	2,100	--
Thailand	--	--	--	3,300	--	--	--	3,300
Venezuela	24,800	55,700	26,900	16,400	--	--	51,700	72,100
Other	686 r	1,290	545	3,780	172	519	1,400 r	2,630
Total	334,000	268,000	555,000	527,000	4,600	6,020	894,000	801,000

rRevised. -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes potassium magnesium sulfate.

Source: U.S. Census Bureau, adjusted by the U.S. Geological Survey.

TABLE 8
U.S. IMPORTS FOR CONSUMPTION OF POTASH, BY TYPE[1]

	Approximate average K_2O equivalent content (percentage)	Quantity (metric tons)		Value (thousands)	
		Gross weight	K_2O equivalent[e]	Customs	C.i.f.[2]
2002:					
Potassium chloride[3]	61	7,380,000	4,500,000	$559,000	$590,000
Potassium sulfate	51	132,000	67,500	23,800	26,500
Potassium nitrate	45	101,000	45,300	27,900	31,800
Potassium sodium nitrate mixture	14	16,400	2,300	4,490	4,820
Total	XX	7,630,000	4,620,000	615,000	653,000
2003:					
Potassium chloride[3]	61	7,510,000	4,580,000	577,000	602,000
Potassium sulfate	51	122,000	62,000	21,900	24,600
Potassium nitrate	45	159,000	71,400	42,300	48,500
Potassium sodium nitrate mixture	14	22,200	3,110	4,170	4,870
Total	XX	7,810,000	4,720,000	646,000	679,000

[e]Estimated. XX Not applicable.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Cost, insurance, and freight.
[3]Contains imports listed under Harmonized Tariff Schedule of the United States code 3104.10.0000.

Source: U.S. Census Bureau, adjusted by the U.S. Geological Survey.

TABLE 9
U.S. IMPORTS FOR CONSUMPTION OF POTASH, BY COUNTRY[1]

	Potassium chloride (metric tons)		Potassium sulfate (metric tons)		Potassium nitrate (metric tons)		Potassium sodium nitrate (metric tons)	
Country	2002	2003	2002	2003	2002	2003	2002	2003
Belarus	309,000	394,000	--	--	--	--	--	--
Belgium	--	--	10,400	13,100	20	--	--	--
Brazil	--	460	--		--	--	--	--
Canada	6,810,000	6,930,000	20,200	25,200	39	--	500	593
Chile	150	50	9,120	14,200	75,600	114,000	15,900	21,600
China	22	--	--	--	225	686	--	--
Denmark	--	--	6	19	5,970	7,050	--	--
France	--	--	92	130	158	--	--	--
Germany	5,430	804	92,000	68,800	2,010	1,630	--	--
Hong Kong	--	--	--	--	1	29	--	--
India	--	--	237	--	2	90	--	--
Israel	71,800	163	--	--	15,800	34,100	--	--
Japan	--	--	247	--	746	839	--	--
Mexico	--	--	5	--	8	169	--	--
Netherlands	--	318	--	--	5	29	17	--
Norway	--	10	--	--	--	--	--	--
Poland	--	--	--	--	132	46	--	--
Russia	184,000	182,000	--	--	--	--	--	--
Sweden	--	--	--	18	--	--	--	--
United Kingdom	74	102	--	--	--	--	--	--
Total	7,380,000	7,510,000	132,000	122,000	101,000	159,000	16,400	22,200

See footnotes at end of table.

TABLE 9--Continued
U.S. IMPORTS FOR CONSUMPTION OF POTASH, BY COUNTRY[1]

	Total					
	Quantity (metric tons)		Value (thousands)			
			Customs		C.i.f.[2]	
Country	2002	2003	2002	2003	2002	2003
Belarus	309,000	394,000	$25,400	$33,400	$28,100	$38,300
Belgium	10,400	13,100	1,680	1,720	1,770	2,140
Brazil	--	460	--	69	--	93
Canada	6,830,000	6,960,000	517,000	535,000	543,000	552,000
Chile	101,000	150,000	23,600	30,400	26,200	34,000
China	247	686	146	376	162	414
Denmark	5,970	7,070	2,110	2,110	2,810	2,950
France	250	130	156	148	181	158
Germany	99,400	71,300	17,200	12,700	19,300	14,200
Hong Kong	1	29	2	10	3	16
India	239	90	19	42	22	49
Israel	87,600	34,300	12,500	14,500	14,500	17,100
Japan	993	839	508	262	565	282
Mexico	13	169	27	75	29	84
Netherlands	22	347	22	53	24	59
Norway	--	10	--	2	--	3
Poland	132	46	64	15	76	19
Russia	184,000	182,000	14,800	14,700	16,600	17,300
Sweden	--	18	--	5	--	7
United Kingdom	74	102	91	131	99	150
Total	7,630,000	7,810,000	615,000	646,000	653,000	679,000

-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Cost, insurance, and freight.

Source: U.S. Census Bureau, adjusted by the U.S. Geological Survey.

TABLE 10
MARKETABLE POTASH: WORLD PRODUCTION, BY COUNTRY[1, 2]

(Thousand metric tons of K_2O)

Country	1999	2000	2001[e]	2002[e]	2003[e]
Belarus	4,553	3,786	3,700	3,800	4,230
Brazil	348	352	319 [r, 3]	337 [r, 3]	340
Canada	8,475	9,202	8,224 [3]	8,189 [r, 3]	9,200
Chile	355 [r]	344 [r]	354 [r]	363 [r]	360
China[e]	260	380	385	450	500
France	345	320	244	130	--
Germany	3,543	3,407	3,550	3,450	3,600
Israel	1,700 [r]	1,750 [r]	1,770 [r, 3]	1,920 [r, 3]	1,960
Jordan	1,080	1,160	1,180 [r, 3]	1,170 [r, 3]	1,230
Russia[e]	4,200	3,700	4,300	4,400	4,740
Spain[e]	656	653 [3]	471	407	510
Ukraine[e]	50	85	75	60	60
United Kingdom[e]	495	600	532	540	620
United States[4]	1,200	1,300	1,200	1,200	1,100
Total	27,300 [r]	27,000	26,300 [r]	26,400 [r]	28,500

[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 April 24, 2004.
[3]Reported figure.
[4]Rounded to within 100,000 metric tons to avoid disclosing proprietary data.