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POTASH

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Potash

By Stephen M. Jasinski

Domestic survey data and tables were prepared by Annie Hwang, statistical assistant, and the world production table was prepared by Glenn J. Wallace, international data coordinator.

In 2012, domestic production decreased by 12% to 900,000 metric tons (t) potassium oxide (K_2O) equivalent from 1 million metric tons (Mt) K_2O equivalent in 2011.[1] U.S. sales of potash were slightly lower in 2012 than in 2011 and apparent consumption decreased by 14%, to 5.0 Mt K_2O in 2012 from 5.8 Mt K_2O in 2011 (table 1). In 2012, world potash production decreased to 33.1 Mt from 38.2 Mt in 2011 (table 1).

Potash denotes a variety of mined and manufactured salts, all of which contain the element potassium in water-soluble form. The majority of domestic potash was produced near Carlsbad, NM, with most of the potash coming from the mineral sylvite. In agriculture, the term potash refers to potassic fertilizers, which are 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•$2MgSO_4$ 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.

Legislation and Government Programs

On December 3, 2012, the U.S. Secretary of the Interior issued Secretarial Order 3324 related to the codevelopment of oil, natural gas, and potash within the 201,000-hectare (ha) Designated Potash Area (DPA) in southeastern New Mexico. The DPA was established in 1939 by the Secretary of the Interior, and more than 75% of total U.S. potash production has been from that region. Initially, 17,400 ha of oil and gas leases were withdrawn in the region to protect potash deposits. The size of the DPA has increased gradually since 1939, resulting in periodic conflicts between the oil and gas and potash industries. The order calls for the use of new technologies, such as horizontal drilling, for oil and gas production and designates oil and gas development areas to protect potash mines. The 2012 order superseded the DPA Secretarial Order that was issued in 1986 (U.S. Department of the Interior, Bureau of Land Management, 2012).

Production

Domestic production data were developed by the U.S. Geological Survey from a semiannual voluntary canvass of U.S. operations. All of the seven operations canvassed for production data responded to the surveys.

Potash companies in the United States produced MOP, SOP, and SOPM. Published production data of all types and grades of potash in the United States are adjusted to avoid disclosing the proprietary data of companies that produce SOP and SOPM, which together are known as sulfates.

Three companies produced potash from seven operations in three States. Most production was from southeastern New Mexico, where Intrepid Potash, Inc. (Intrepid) operated two mines and The Mosaic Company (Mosaic) operated one mine. Mosaic also operated a deep-solution mine in Michigan. In Utah, Intrepid produced potash from a solution mine in Moab and from a solar evaporation facility in Wendover; Great Salt Lake Minerals Corp. (GSLM) (a subsidiary of Compass Minerals International, Inc.) operated a solar evaporation facility in Ogden that only produced SOP.

In April 2012, Intrepid received approval from the U.S. Bureau of Land Management to begin construction of its HB Solar Solution Mine in Carlsbad, NM. The mine had been operated as a conventional underground potash mine by the previous owner, from 1934–96. In November, Intrepid began pumping potash-enriched brine from the HB Mine into a new solar evaporation pond. Construction of the mill began in the fourth quarter of 2012, and was expected to be completed in late 2013. First production from the HB Mine was planned upon completion of the mill. The company planned to increase production gradually during about 1 year to reach full capacity of 200,000 metric tons per year (t/yr) (Intrepid Potash, Inc., 2013, p. 7).

IC Potash Corp. (ICP) (Toronto, Ontario, Canada) continued to develop its Ochoa project east of Carlsbad in Lea County, NM. The company began a feasibility study and continued drilling and permitting. ICP planned to produce SOP and SOPM from a polyhalite deposit. The project was to consist of an underground mine and surface processing facilities. The company reported reserves of more than 400 Mt K_2O and resources of more than 800 Mt K_2O, with a potential for more than 100 years of mine life. ICP expected to begin production in 2016 (IC Potash Corp., 2013).

Three companies were developing potash projects in the Holbrook Basin formation in the eastern part of Arizona. According to the Arizona Geological Survey, the Holbrook Basin contains up to 2.5 billion tons of potash resources (Rauzi, 2008). Two of the companies, Passport Potash Inc. and Prospect Global Resources Inc., were actively engaged in development activities. Prospect was conducting a prefeasibility study and planned to produce potash by late 2015. In October, Prospect signed a 10-year agreement to supply Sichuan Chemical Industry Holding (Group) Co., Ltd. of China with

[1]The potash industry has established a common standard of measurement for defining a product's potassium content (or purity) because the potassium content of its common salts varies in terms of equivalent percentage of potassium oxide (K_2O). A K_2O equivalent for muriate of potash is 60%; sulfate of potash, 51%; and double sulfate of potash magnesia products, 22%. All tonnages are reported in metric tons, K_2O equivalent, unless otherwise specified. All percentages are computed on unrounded K_2O equivalent values.

at least 500,000 t/yr of potash, which would be about 25% of the projected output (Prospect Global Resources Inc., 2012). Passport was engaged in a prefeasibility study and exploration activities, but did not have a schedule for project completion (Passport Potash Inc., 2013).

Consumption

Apparent consumption of all forms of potash in 2012 decreased by 14% from that of 2011. The principal use of potash was as an agricultural fertilizer (plant nutrient) as a source of soluble potassium, which is 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 using industrial processes. Modern agricultural practice uses large quantities of these primary nutrients and 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 potash 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 beyond relatively short distances can reduce their desirability. In addition to its use as a fertilizer, potassium chloride is used in refining secondary aluminum, producing potassium hydroxide, electroplating, oil-well drilling mud, snow and ice melting, steel heat-treating, and water softening.

Potassium hydroxide is used in industrial water treatment and in soap manufacturing, and is the precursor of potassium carbonate, several forms of potassium phosphate, and many other potassic chemicals. Potassium carbonate is used to produce animal feed supplements, cement, fire extinguishers, food products, and textiles. It is also used in brewing beer, pharmaceutical preparations, and as a catalyst for synthetic rubber manufacturing. Generally, these nonfertilizer uses have accounted for about 15% of annual potash consumption in the United States and 8% worldwide.

Foreign Trade

Total U.S. imports of all forms of potash (K_2O equivalent) decreased by 15% from those of 2011. Potassium chloride accounted for 97% of the import tonnage. Canada was the leading source for imports, accounting for 78% of all types of potash. Russia was a distant second with 4% of imports. Total import value decreased by 36% from that of 2011, owing to lower international potash prices (table 4).

The United States is not a significant exporter of potash. In 2012, exports of all forms of potash (K_2O equivalent) increased by 16% from that of 2011, owing to an increase in potassium chloride exports (table 3).

World Industry Structure

World production of potash decreased to 33.1 Mt in 2012 from 38.2 Mt in 2011. Canada, Russia, and Belarus were the leading producing countries, by order of output, accounting for 59% of total production (table 5). Global potash capacity increased slightly to 45.4 Mt in 2012 from 45.1 Mt in 2011 (Heffer and Prud'homme, 2013).

In 2012, about 170 new potash projects were under development worldwide. Most of the projects initially were to be completed by 2017, but in 2012, many of the projects were postponed to beyond 2017 because of forecasts that capacity increases over the next several years would outpace consumption. Of the 170 projects, 45 were being developed by leading producers, 75 by smaller companies, and 50 were still in the exploration phase. With the exception of projects in China, all projects were planned for the export market. Significant projects were under development in Argentina, Brazil, Canada, Chile, Congo (Brazzaville), Eritrea, Ethiopia, Kazakhstan, Laos, Mexico, Peru, Russia, Thailand, Turkmenistan, the United Kingdom, and Uzbekistan (Prud'homme, 2013).

World Review

Canada.—About 100 companies were actively exploring and developing potash projects, primarily in Saskatchewan. However, only a few were expected to be completed by 2017. Expansion plans of the three major producers, Agrium Inc., Mosaic, and Potash Corp. of Saskatchewan (PotashCorp), continued on schedule during 2012, despite a decline in world production and sales from that of 2011. Agrium planned to complete an expansion to its Vanscoy Mine in Saskatchewan in 2014, which would increase its production capacity to 3.0 million metric tons per year (Mt/yr) MOP from 2.0 Mt/yr MOP (Agrium Inc., 2013, p. 25).

In 2012, Mosaic completed expanding its Esterhazy and Colonsay Mines by 1.3 Mt/yr MOP. Additional expansion projects were in progress at Colonsay and Esterhazy that would add an additional 1.4 Mt/yr of capacity by 2017 (Mosaic Company, The, 2013, p. 10–11).

PotashCorp, the leading potash producer in the world, completed expansion projects at its Allan and Cory Mines in Saskatchewan in 2012. Production capacity increased by 1 Mt/yr at each mine, and both mines were expected to ramp up to full capacity by 2014. PotashCorp had two projects that were in progress: a new mine and expanded mill in New Brunswick and a mine and mill expansion in Rocanville, Saskatchewan. Construction in New Brunswick was expected to be completed in 2013 and in Rocanville in 2014. The company planned to increase its overall potash production capacity from 11.9 Mt/yr MOP in 2012 to 18.1 Mt/yr MOP in 2017 (Potash Corp. of Saskatchewan, 2013, p. 58).

German potash producer, K+S Aktiengesellschaft, began construction of its Legacy Mine in Saskatchewan in 2012. The 2.0-Mt/yr MOP solution mine was expected to be completed by 2016. A second phase of the mine would expand the facility by 0.9 Mt/yr after 2017 (K+S Aktiengesellschaft, 2013).

BHP Billiton Group postponed completion of its Jansen project in Saskatchewan until after 2017 because of market conditions. BHP planned to construct an underground mine with an initial capacity of 8.0 Mt/yr. The company reported that the project had measured resources of 5.33 billion metric tons (Gt), with an average grade of 25.7% K_2O and an additional 1.29 Gt of internal resources at the same grade (BHP Billiton Group, 2013).

Vale S.A. postponed indefinitely the development of the Kronau solution mine near Regina, Saskatchewan, because of economic conditions. Vale had planned to start production in 2012. (Patel, 2012).

Western Potash Corp. received a positive feasibility study in December for its Milestone potash project in Saskatchewan. The company planned to construct a 2.8-Mt/yr solution mine 30 kilometers southeast of Regina. Construction was planned to begin in 2014 and to be completed in 2016 (Western Potash Corp., 2012).

Karnalyte Resources Inc. awarded contracts for the design and construction of its solution mining project in Wynyard, Saskatchewan, in September. The company planned to process carnallite ore to produce a low-sodium potash product. Karnalyte planned to start construction in 2014 and to begin production in 2015. The project would be developed in three phases: the first phase is expected to have an initial capacity of 625,000 t/yr and the second and third phases are expected to add 750,000 t/yr (Karnalyte Resources Inc., 2012).

Russia.—Leading Russian producer, Uralkali, completed expansion at the Berezniki-4 facility, to increase its total production capacity by 1.5 to 13 Mt/yr. The company planned to increase production capacity to 15.7 Mt/yr by the end of 2017, through expansion at its Solikamsk facilities and debottlenecking at both Berezniki and Solikamsk (Fertilizer International, 2013b).

EuroChem MCC, OJSC had two mines in the initial stages of development in 2012. The VolgaKaliy Project, which would mine potash ore from the Gremyachinskoe deposit, was scheduled to be completed in two phases, each with a production capacity of 2.3 Mt/yr MOP. The first phase was projected to open in 2017, and the second phase was expected to be completed after 2019. Total proven and probable reserves of the project were reported to be 492 Mt, with an average grade of 39.5% KCl (Fertilizer International, 2013b).

The Usolskiy project, which would exploit the Verkhnekamskoe deposit, also was planned to be completed in two phases. The first phase was not expected to commence until after 2018, with a production capacity of 2.3 Mt/yr MOP. The second phase was planned to open in the future and add 1.4 Mt/yr MOP to the production capacity. Total proven and probable reserves were reported to be 420 Mt, with an average grade of 30.8% KCl (Fertilizer International, 2013b).

JSC Acron began development of the Talitsky Mine project through its subsidiary, Verkhnekamsk Potash Co. The mine was planned to have an initial capacity of 1.3 Mt/yr MOP and then increase to full capacity of 2.0 Mt/yr 2 years later. Acron delayed commissioning of its mine until 2021, and expected to reach full capacity in 2023. Total reported reserves were 157 Mt K_2O (Fertilizer International, 2013a).

Outlook

Potash is an essential fertilizer nutrient that cannot be substituted. More than 90% of world consumption is in fertilizer products. Growing world population and its need for food will require continued growth in potash production and consumption.

According to the International Fertilizer Industry Association, world potash consumption for all uses is projected to increase at a rate of 3% per year through 2017 (Heffer and Prud'homme, 2013).

Potash exploration and development is expected to remain very active over the next decade. A significant number of new mines were projected to start up before 2025 in Argentina, Australia, Brazil, Chile, China, Eritrea, Ethiopia, Kazakhstan, Laos, Turkmenistan, the United Kingdom, and Uzbekistan. However, many of these projects were likely to be delayed owing to changes in demand, company financial performance, permitting procedures, and other factors. The areas of largest expansion over the next decade are expected to be in Eastern Europe, Central Asia, and North America (Fertilizer International, 2013b).

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TABLE 1
SALIENT POTASH STATISTICS[1, 2]

(Thousand metric tons and thousand dollars unless otherwise specified)

		2008	2009	2010	2011	2012
United States:						
Production:[3]						
Gross weight		2,500	1,700	2,200	2,300	2,100
K_2O equivalent		1,100	720	930	1,000	900
Sales by producers:						
Quantity:[3]						
Gross weight		2,400	1,500	2,400	2,300	2,200
K_2O equivalent		1,100	630	1,000	990	980
Value[3, 4]		740,000	500,000	660,000	740,000	750,000
Average value:[5]						
Gross weight	dollars per metric ton	305	330	275	320	340
K_2O equivalent	do.	675	800	630	745	765
Exports:						
Gross weight		694	705	813	675	676
K_2O equivalent		222	303	297	202	234
Imports for consumption:[6, 7]						
Quantity:						
Gross weight		9,560	3,670	7,840	8,210	7,010
K_2O equivalent		5,800	2,220	4,760	4,980	4,240
Value, customs		3,260,000	1,720,000	2,620,000	3,450,000	2,220,000
Consumption, apparent:[3, 8]						
Gross weight		11,000	4,500	9,400	9,800	8,500
K_2O equivalent		6,700	2,500	5,500	5,800	5,000
World, production, marketable K_2O equivalent		33,700	20,600 r	34,100	38,200 r	33,100

rRevised. do. Ditto.

[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 are rounded to no more than two significant digits.

[4]Free on board mine.

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

[6]Excludes potassium chemicals and mixed fertilizers.

[7]Includes nitrate of potash.

[8]Calculated from sales plus imports minus exports.

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

(Dollars per metric ton of K_2O equivalent)

Type and grade	2011			2012		
	January–June	July–December	Yearly average	January–June	July–December	Yearly average
Muriate, 60% K_2O minimum:						
Standard	740	715	730	705	715	710
Granular	690	670	680	700	655	680

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

TABLE 3
U.S. EXPORTS OF POTASH, BY TYPE[1]

	Approximate average K_2O equivalent content (percentage)	Quantity (metric tons)		Principal destinations, by gross weight
		Gross weight	K_2O equivalent[e]	
2011:				
Potassium chloride, all grades	61	65,100	39,700	Honduras, 34%; Mexico, 26%; Canada, 14%.
Potassium sulfate[2]	26	594,000	154,000	Canada, 13%; Chile, 12%; Mexico, 11%.
Potassium nitrate	45	16,400	7,400	Mexico, 41%; Netherlands, 34%; Canada, 7%.
Total	XX	675,000	202,000	Canada, 13%; Mexico, 13%; Chile, 11%.
2012:				
Potassium chloride, all grades	61	157,000	95,900	Brazil, 31%; Ecuador, 17%; Mexico, 16%.
Potassium sulfate[2]	26	503,000	131,000	Canada, 18%; Mexico, 16%; Colombia, 9%.
Potassium nitrate	45	15,700	7,090	Netherlands, 40%; Mexico, 34%; Thailand, 10%.
Total	XX	676,000	234,000	Mexico, 17%; Canada, 15%; Brazil, 11%.

[e]Estimated. XX Not applicable.
[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; data adjusted by the U.S. Geological Survey.

TABLE 4
U.S. IMPORTS FOR CONSUMPTION OF POTASH, BY TYPE[1]

	Approximate average K_2O equivalent content (percentage)	Quantity (metric tons)		Value (thousands)		Principal sources, by gross weight
		Gross weight	K_2O equivalent[e]	Customs	C.i.f.[2]	
2011:						
Potassium chloride	61	8,000,000	4,880,000	3,340,000	3,420,000	Canada, 82%; Russia, 14%; Israel, 3%.
Potassium sulfate	51	89,900	45,900	54,900	56,200	Germany, 59%; Canada, 28%; Chile, 9%.
Potassium nitrate	45	115,000	51,700	59,100	60,400	Chile, 84%; Israel, 8%; Germany, 4%.
Potassium sodium nitrate mixture	14	1,520	213	345	353	Canada, 42%; Brazil, 36%; Chile, 17%.
Total	XX	8,210,000	4,980,000	3,450,000	3,530,000	Canada, 81%; Russia, 14%; Israel, 3%.
2012:						
Potassium chloride	61	6,740,000	4,110,000	2,040,000	2,100,000	Canada, 81%; Russia, 4%; Israel, 1%.
Potassium sulfate	51	107,000	54,600	55,100	57,300	Germany, 56%; Canada, 28%; Chile, 12%.
Potassium nitrate	45	159,000	71,600	125,000	129,000	Chile, 90%; Israel, 6%; Germany, 4%.
Potassium sodium nitrate mixture	14	529	74	263	295	Chile, 70%; Canada, 30%.
Total	XX	7,010,000	4,240,000	2,220,000	2,290,000	Canada, 78%; Russia, 4%; Chile, 3%.

[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.

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

TABLE 5
MARKETABLE POTASH: WORLD PRODUCTION, BY COUNTRY[1, 2]

(Thousand metric tons of K_2O equivalent)

Country	2008	2009	2010	2011	2012
Belarus	4,968	2,485	5,223	7,304 [r]	4,906
Brazil	383	453	448 [r]	424 [r]	425 [p, e]
Canada	10,455 [r]	4,318 [r]	9,788	11,055	8,984
Chile	559	691	964	861 [r]	1,053
China[e]	2,750	3,200	3,600 [r]	3,800 [r]	4,100 [e]
Germany	3,280	1,825	3,024	3,215 [r]	3,120 [e]
Israel	2,170	1,656 [r]	1,790 [r]	1,736 [r]	2,154
Jordan	1,223	683	1,185	1,355 [r]	1,094
Russia	5,992	3,727	6,283	6,498 [r]	5,472
Spain	435 [e]	481 [r]	419 [r]	436 [r]	436 [e]
United Kingdom	411 [r]	411 [r, e]	427	470 [r]	470 [e]
United States[3]	1,100	720	930	1,000	900
Total	33,700	20,600 [r]	34,100	38,200 [r]	33,100

[e]Estimated. [p]Preliminary. [r]Revised.
[1]World total, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes data available through July 31, 2014.
[3]Rounded to no more than two significant digits.