



2016 Minerals Yearbook

POTASH [ADVANCE RELEASE]

POTASH

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In 2016, domestic production decreased by 32% to 500,000 metric tons (t) of potassium oxide (K_2O) equivalent¹ from 740,000 t of K_2O equivalent in 2015. U.S. sales of potash were 3% lower in 2016 compared with those in 2015, and apparent consumption decreased by 9% to 5.0 million metric tons (Mt) of K_2O in 2016 from 5.5 Mt of K_2O in 2015 (table 1). The large decrease in production was due to Intrepid Potash, Inc. closing an underground mine in New Mexico and ceasing production of muriate of potash (MOP) from its other underground mine. In 2016, world potash production of 39.3 Mt was 3% lower than that in 2015 (tables 1, 5).

Potash denotes a variety of mined and manufactured salts, all of which contain the element potassium in water-soluble form. 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 sulfate of potash magnesia (SOPM) [$K_2SO_4 \cdot 2MgSO_4$ or langbeinite or double sulfate of potash magnesia]. 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.

Production

Domestic production data were developed by the U.S. Geological Survey (USGS) from a semiannual voluntary canvass of U.S. operations. All 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 proprietary data. Three companies produced potash from seven operations in two States.

In southeastern New Mexico, Intrepid Potash, Inc. produced MOP and SOPM from one solution and one underground mine and The Mosaic Company produced SOPM from one underground mine. Intrepid ceased production of MOP at its East underground mine in April 2016 and limited production to only SOPM from that facility. Intrepid closed its other underground mine (West Mine), which produced MOP, in the second quarter of 2016. After that time, the company produced MOP in New Mexico only at its lower-production-cost HB solar solution mine, citing increased foreign competition, market oversupply, and weak prices as factors in ceasing underground MOP production (Intrepid Potash, Inc., 2017, p. 3).

¹The 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 rounded K_2O equivalent values, except for trade data.

IC Potash Corp. (ICP) (Toronto, Ontario, Canada) continued drilling and permitting activities at its Ochoa project east of Carlsbad in Lea County, NM. The company completed an updated preliminary economic assessment in November and revised the project to include an option to market polyhalite directly as a slow-release fertilizer. ICP originally planned to produce SOP but switching to polyhalite would reduce capital costs by eliminating the need to construct a processing plant. ICP planned to decide on the future direction of the project in 2017 (Green Markets, 2016d).

In Utah, Intrepid produced MOP from a solution mine in Moab and from a brine recovery facility in Wendover; Compass Minerals International, Inc. produced SOP at a solar evaporation facility in Ogden on the Great Salt Lake. Compass continued with expansion of the Ogden facility that would increase its production capacity from 290,000 t/yr of SOP to 500,000 t/yr of SOP by using both brine and purchased MOP. The \$90 million project was expected to be completed in 2017 (Compass Minerals International, Inc., 2017, p. 11).

Consumption

Domestic apparent consumption of all forms of potash in 2016 decreased by 9% from that of 2015, owing to lower agricultural use and a drop in industrial potash uses, primarily for oil-well-drilling additives, during the first half of the year. Fertilizer consumption increased slightly in the second half of 2016 as the price of potash decreased gradually. World consumption of all forms of potash in 2016 was 39.6 Mt of K_2O , compared with 39.5 Mt in 2015 (Prud'homme, 2017, p. 58). 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 nutrient fertilizers 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 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, in 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.

Prices

The price of standard-grade MOP, in terms of K_2O , produced in the United States averaged \$550 per metric ton in the first half of 2016, \$470 per ton in the second half, and \$510 per ton for the entire year compared with \$595 per ton in 2015, according to sales data reported to the USGS (table 2). The Vancouver, British Columbia, Canada, spot market price for MOP (gross weight of product), which is the benchmark price for North American potash shipments, began the year at \$295 per ton and ended the year at \$215 per ton (Fertilizer Week, 2017).

Foreign Trade

Total U.S. imports of all forms of potash (K_2O equivalent) decreased by 9% from those of 2015. Potassium chloride accounted for 98% of the import tonnage. Canada was the leading source for imports, accounting for 85% of all types of potash. Russia was a distant second with 6% of total potash imports. Total customs import value decreased by 22% from that of 2015, owing to lower international potash prices (table 4).

The United States is not a significant exporter of potash. In terms of K_2O content, SOP and SOPM accounted for 83% of exports. In 2016, exports of all forms of potash (K_2O equivalent) decreased by 6% from those of 2015 (table 3).

World Review

World production of potash was 39.3 Mt in 2016, 3% lower than that in 2015. Canada, Russia, China, and Belarus were the leading producing countries, by order of output, accounting for 75% of total production (table 5). Global potash capacity increased to 54.9 Mt in 2016 from 53.0 Mt in 2015 (Prud'homme, 2017).

Belarus.—JSC Belaruskali continued developing two projects in 2016: an 800,000-metric-ton-per-year (t/yr) expansion to its processing facilities at Soligorsk and a new mine in the Petrikov district. The expansion to Soligorsk was expected to be completed incrementally between 2017 and 2021. The new mine was planned to have an initial production capacity of 1.5 million metric tons per year (Mt/yr) of MOP. The projects were expected to be completed by 2021 and increase the company's capacity to 15.1 Mt/yr of MOP (Fertilizer International, 2016).

Canada.—Canada was the leading potash producer in the world, with 38% of global production capacity. In 2016, three companies in Canada produced potash: Agrium Inc., Mosaic, and Potash Corp. of Saskatchewan Inc. (PotashCorp). In 2016, Agrium and PotashCorp announced a merger agreement, which was approved by shareholders of the companies in November.

The companies expected to complete the merger in 2017, pending regulatory approval in Canada and the United States. The combined company would have 24% of world MOP capacity (Green Markets, 2016a). Production capacity in Canada was projected to increase incrementally to 37.6 Mt/yr of MOP in 2021 from 33.6 Mt/yr in 2016, owing to one new mine and expansions at three other mines (Prud'homme, 2017).

PotashCorp, the world's leading potash producer, completed an expansion of 3.0 Mt/yr at its Rocanville, Saskatchewan, mine, which offset the indefinite closure of its 2-Mt/yr Picadilly Mine in New Brunswick. The Picadilly Mine was idled in January because of a global oversupply of potash and low potash prices (Potash Corp. of Saskatchewan Inc., 2017, p. 4).

Mosaic planned to complete a 1.0-Mt/yr expansion to its Esterhazy, Saskatchewan, mine by 2018, which would increase its total production capacity in Canada to 12.9 Mt/yr of MOP (Fertilizer International, 2016).

German potash producer K+S Aktiengesellschaft commissioned its 2.86-Mt/yr Bethune solution mine in Saskatchewan in 2016 and planned to start production in 2017 at close to the initial capacity of 2 Mt/yr of MOP. K+S planned to add 0.86 Mt/yr of MOP capacity after 2022 (Green Markets, 2016e).

BHP Billiton Group held exploration rights to about 14,500 square kilometers in Saskatchewan, which included five potash properties. The company continued development activities at the Jansen project east of Saskatoon. The Jansen Mine was designed to produce up to 8 Mt/yr of MOP, but BHP was not expected to begin production until well after 2020, depending on market conditions (Green Markets, 2016b).

Russia.—PJSC Uralkali continued work on modernization of its processing facilities and construction of new mines at Solikamsk, Polovodovsky, and Ust-Yayvinsky that would increase its capacity incrementally to 18.7 Mt/yr of MOP after 2020 from 12.4 Mt/yr of MOP in 2016. Uralkali accelerated the schedule for expansion after its Solikamsk-2 mine was flooded in late 2014, reducing Uralkali's production capacity by 2 Mt/yr. The company planned to complete a new underground mine at Solikamsk-2 by 2020 to mine the remaining reserves (PJSC Uralkali, 2017, p. 25).

EuroChem MCC, OJSC had two mines under development in 2016. 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 of MOP. The first phase was projected to be completed by 2018, and the second phase was expected to be completed after 2020. The Usolskiy project, which would exploit the Verkhnekamskoe deposit, also was planned to be completed in two phases. The 2.3-Mt/yr first phase was expected to begin production of MOP in 2017. The opening of the 1.4-Mt/yr second phase was scheduled for after 2020 (Green Markets, 2016c).

JSC Acron Group continued development of its Talitsky Mine project through its subsidiary, Verkhnekamsk Potash Co. The mine was planned to have an initial capacity of 1.3 Mt/yr of MOP and then increase to full capacity of 2.0 Mt/yr of MOP 2 years later. Acron delayed commissioning of its mine until after 2022 (Prud'homme, 2017).

Turkmenistan.—Belaruskali and two other Belarusian companies continued with construction of a new potash mine in Lebab Oblast, which would be operated in a joint venture with state-owned Turkmenkhiya State Concern. Completion of the underground mine and processing plant with a capacity of 1.4 Mt/yr of MOP was expected after mid-2017 (Fertilizer International, 2016).

Outlook

Potash is an essential fertilizer nutrient that cannot be substituted. About 90% of world potash consumption is in fertilizer products. The need for food to feed an increasing world population will require continued increases in potash production and consumption. Additionally, increased ethanol production from corn and other crops will require a proportional increase in fertilizer use.

According to the International Fertilizer Association, world potash consumption for all uses is projected to increase to 40.6 Mt of K₂O in 2017 from 39.6 Mt in 2016, owing to projected global increases in fertilizer and industrial uses, mainly in Asia and South America. In 2017, world potash production is forecast to increase slightly from 39 Mt of K₂O in 2016 (Prud'homme, 2017).

Potash exploration and development is expected to remain very active during the next decade. Global potash production capacity is expected to increase to 57.6 Mt/yr of K₂O in 2017 from 54.9 Mt/yr of K₂O in 2016 because of increased production from projects in Canada, China, Russia, and Turkmenistan. In 2016, about 25 potash-mining projects were in progress worldwide and were expected to be completed between 2017 and 2021. The majority of the new capacity would be from projects in Belarus, Canada, China, Russia, and Turkmenistan. Other significant potash projects were under development in Australia, Brazil, Canada, Congo (Brazzaville), Eritrea, Ethiopia, Kazakhstan, Laos, Peru, Thailand, and the United Kingdom. None of these projects, however, were expected to be completed before 2022 (Prud'homme, 2017).

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TABLE 1
SALIENT POTASH STATISTICS^{1,2}

(Thousand metric tons and thousand dollars unless otherwise specified)

	2012	2013	2014	2015	2016	
United States:						
Production:³						
Gross weight	2,100	2,200	1,800	1,800	1,400	
K ₂ O equivalent	900	960	850	740	500	
Sales by producers:						
Quantity:³						
Gross weight	2,200	2,000	2,000	1,500	1,400	
K ₂ O equivalent	980	880	930	620	600	
Value ^{3,4}	750,000	630,000	680,000	550,000	410,000	
Average value:⁵						
Gross weight	dollars per metric ton	340	315	345	350	290
K ₂ O equivalent	do.	770 ^r	715	735	880	680
Exports:						
Gross weight	566 ^r	611 ^r	292 ^r	387 ^r	350	
K ₂ O equivalent	202 ^r	257 ^r	100	106 ^r	99	
Imports for consumption:^{6,7}						
Quantity:						
Gross weight	7,010	7,660	8,200	8,250	7,490	
K ₂ O equivalent	4,240	4,650	4,970	5,000	4,550	
Value, customs	2,890,000	2,750,000	2,390,000	2,720,000	2,120,000	
Consumption, apparent:^{3,8}						
Gross weight	8,700	9,100	9,900	9,400	8,600	
K ₂ O equivalent	5,000	5,300	5,800	5,500	5,000	
World, production, marketable K ₂ O equivalent	32,800	36,100 ^r	41,200 ^r	40,700	39,300	

^rRevised. do. Ditto.

¹Table includes data available through June 21, 2018. Includes muriate of potash, sulfate of potash, potassium magnesium sulfate, and some parent salts. Excludes other chemical compounds that contain potassium.

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

³Data are rounded to no more than two significant digits.

⁴Free on board mine.

⁵Rounded to the nearest \$5 to avoid disclosing proprietary data.

⁶Excludes potassium chemicals and mixed fertilizers.

⁷Includes nitrate of potash.

⁸Defined as sales plus imports minus exports.

TABLE 2
PRICES OF U.S. POTASH, BY TYPE AND GRADE^{1,2}

(Dollars per metric ton of K₂O equivalent)

Type and grade	2015			2016		
	January– June	July– December	Yearly average	January– June	July– December	Yearly average
Muriate, 60% K₂O minimum:						
Standard	610	585	595	550	470	510
Granular	610	500 ^r	555 ^r	345	300	320

^rRevised.

¹Average prices, free on board mine, based on sales.

²Table includes data available through June 21, 2018. Data rounded to nearest \$5.

TABLE 3
U.S. EXPORTS OF POTASH, BY TYPE¹

	Approximate average K ₂ O equivalent content (percent)	Quantity (metric tons)		Principal destinations, by gross weight
		Gross weight	K ₂ O equivalent ^c	
2015:				
Potassium chloride	61	27,700	16,900	Mexico, 67%; Canada, 18%; China, 3%.
Potassium sulfate ²	24	350,000	84,700	Canada, 25%; Colombia, 16%; Mexico, 13%.
Potassium nitrate	45	8,870 ^r	3,990 ^r	Mexico, 72%; Canada, 10%; Netherlands, 6%.
Total	XX	387,000	106,000	Canada, 24%; Mexico, 18%; Colombia, 15%.
2016:				
Potassium chloride	61	22,300	13,600	Mexico, 58%; Canada, 28%; Honduras, 2%.
Potassium sulfate ²	26	320,000	81,600	Canada, 26%; China, 11%; Mexico, 11%.
Potassium nitrate	45	8,040	3,620	Mexico, 67%; Canada, 19%; Belgium, 4%.
Total	XX	350,000	98,800	Canada, 27%; Mexico, 15%; China, 10%.

^cEstimated. ^rRevised. XX Not applicable.

¹Table includes data available through June 21, 2018. Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes 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 TYPE¹

	Approximate average K ₂ O equivalent content (percent)	Quantity (metric tons)		Value (thousands)		Principal sources, by gross weight
		Gross weight	K ₂ O equivalent ^c	Customs	C.i.f. ²	
2015:						
Potassium chloride ³	61	7,990,000	4,870,000	2,570,000	2,630,000	Canada, 86%; Russia, 9%; Israel, 2%.
Potassium sulfate ⁴	51	134,000	68,400	62,900 ^r	66,300 ^r	Germany, 49%; Canada, 34%; Egypt, 9%.
Potassium nitrate ⁵	45	122,000	55,100	88,400	92,000	Chile, 85%; Germany, 12%; China, 1%.
Potassium sodium nitrate mixture ⁶	14	1,830	256	534	563	Canada, 65%; Mexico, 22%; Chile, 7%.
Total	XX	8,240,000	5,000,000	2,720,000	2,790,000	Canada, 84%; Russia, 8%; Chile, 3%.
2016:						
Potassium chloride ³	61	7,310,000	4,460,000	2,030,000	2,100,000	Canada, 86%; Russia, 6%; Belarus, 3%.
Potassium sulfate ⁴	51	113,000	57,700	40,700	42,100	Germany, 52%; Canada, 34%; Chile, 7%.
Potassium nitrate ⁵	45	66,000	29,700	43,900	45,800	Chile, 74%; Germany, 19%; India, 1%.
Potassium sodium nitrate mixture ⁶	14	4,130	578	1,910	1,990	Canada, 65%; China, 18%; Netherlands, 2%.
Total	XX	7,490,000	4,550,000	2,120,000	2,190,000	Canada, 85%; Russia, 6%; Belarus, 3%.

^cEstimated. ^rRevised. XX Not applicable.

¹Table includes data available through June 21, 2018. Data are rounded to no more than three significant digits; may not add to totals shown.

²Cost, insurance, and freight.

³Harmonized Tariff Schedule of the United States (HTS) code 3104.20.0000.

⁴HTS code 3104.30.0000.

⁵HTS code 2834.21.0000.

⁶HTS code 3105.90.0010.

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

TABLE 5
MARKETABLE POTASH: WORLD PRODUCTION, BY COUNTRY OR LOCALITY¹

(Thousand metric tons, K₂O equivalent)

Country or locality	2012	2013	2014	2015	2016
Belarus	4,840	4,243	6,340 ^r	6,468	6,180
Brazil	347	311	311	293 ^e	301
Canada	8,976	10,196	10,818	11,462 ^r	10,768
Chile	1,018	1,153	1,130	1,200	1,200
China	3,770 ^e	5,300 ^e	6,110 ^e	5,710 ^{r,e}	6,200
Germany	3,149	3,075	3,130 ^e	3,110 ^r	2,800
Israel	1,830	2,268 ^r	2,213 ^r	1,540 ^r	2,050
Jordan	1,094	1,046	1,255	1,413	1,202
Laos	43	86	211 ^e	350 ^r	350
Russia	5,563	6,100	7,439	6,954 ^r	6,480
Spain	632 ^e	711 ^e	685 ^e	690 ^e	670
United Kingdom	549	549	610 ^e	610	450
United States ²	900	960	850	740	500
Uzbekistan	112	85	110	158 ^r	130
Total	32,800	36,100 ^r	41,200 ^r	40,700	39,300

^eEstimated. ^rRevised.

¹Table includes data available through November 23, 2017. All data are reported unless otherwise noted. Totals and estimated data are rounded to no more than three significant digits; may not add to totals shown.

²Rounded to no more than two significant digits.