POTASH.

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The greater part of the potash consumed in this country is used as fertilizer. Of the elements essential to plant growth potassium is one of the three or four that ordinarily become deficient or exhausted in cultivated soils. Its use under proper conditions has a stimulating effect on plant growth, and for certain crops a special application of it has come to be regarded as almost essential, as is illustrated by the present demand, even at abnormally high prices, for potash for agricultural use. Much of the present small output in this country is being used in fertilizers, and the need of potash for particular crops is indicated by the fact that the scarcity and demand in the United States have not prevented considerable shipments of our own product to Cuba for agricultural use, presumably for tobacco.

The need of potash in certain industries is acute. It is essential in the manufacture of the best liquid soap and some higher-grade cake soaps and of some finer grades of glass. It is absolutely necessary in the manufacture of certain explosives, although the great bulk of modern explosives are made without potash. Potash now enters largely into the manufacture of matches. The several potash salts find many particular uses in industries so varied as tanning, dyeing, metallurgy, electroplating, and photography. They are also used in medicine and for miscellaneous chemical purposes. On the whole, the chemical requirements, though minor as regards actual quantities consumed, are the most urgent of the demands for potash and in case of an abnormal restriction of the supply are the first to be provided for.

The output of potash salts and potash products in the United States during 1916 has been reported to the amount of 35,739 short tons, having a mean potash content of about 27 per cent K_2O and a total potash content of 9,720 short tons of K_2O. This is almost exactly 10 times the production reported for 1915, although it is still perhaps less than 5 per cent of the normal potash consumption. In 1913 the only potash known to have been produced within this country was made from wood ashes.

Practically all the possibilities predicted in the many recent publications of the United States Geological Survey discussing potash sources found some fulfillment in the production of 1916. The almost entire stoppage of supplies from abroad and the meager stocks on hand with which to meet the requirements have at times carried the price of potash from a normal figure of 50 to 75 cents to $5 or $6 a unit (1 per cent of potash per ton of material).

The forms in which potash has been produced and marketed are so diverse that it is difficult to make a summation of actual tonnage that will have any real significance. Therefore the tonnage reports of all forms have been reduced to terms of available or water-soluble potash (K_2O) contained in the product, which is the standard commercial unit by which the potash value of these materials is usually expressed.

Summary of potash production in 1916.

Source.	Available potash (K_2O) (short tons).	Value at point of shipment.
Natural salts or brines	3,994	$1,937,600
Alunite and silicate rocks, including recoveries through furnace dust	1,850	715,000
Kelp	1,556	781,100
Wood ashes (potashes, pearlash)	412	270,000
Distillery waste (molasses)	1,845	500,900
Miscellaneous organic sources	63	38,130
	9,720	4,242,730

The foregoing list does not include many fertilizer materials previously on the market, such as cottonseed meal and tobacco stems, some of which are largely or chiefly valued for their potash content and whose price has accordingly risen in the present market. These materials, being by-products of other industries, are not produced primarily because of their content of potash. The total given therefore represents the marketed production of potash salts and products manufactured especially or chiefly for their potash value.

The largest output of potash has come from the alkali lakes in western Nebraska, which have afforded the most readily available supply of moderately high grade potash salts, obtained by direct drying of the raw material with perhaps as few technical complications as could be involved in any chemical operation. The great deposit at Searles Lake, Cal., is only just being brought to the producing stage, the enterprise having suffered many reverses, technical and otherwise. The production of potash from alunite has been fairly regular, without much expansion. Some progress has been made in extracting potash from silicate rocks, at least one plant having successfully produced glassmaker's potassium carbonate from greensand. Some feldspar has been mined, ground, and so treated that a small percentage of its potash was rendered soluble and thus

available for use in fertilizers, but no account of this material is included in the figures for 1916, as little of it was marketed within that year. So far as has been ascertained none of the leucite, mica schist, sericite schist, or similar rocks high in potash have yet yielded any commercial quantity of water-soluble salts.

The production of potash from organic materials has been attempted in various forms. Much publicity has been given to the efforts to obtain potash and potash fertilizers from kelp, and a great deal of development work has been done in that connection. The manufacture of high-grade potash fertilizer salts from molasses distillery waste has also been developed and bids fair to be a permanent industry; in 1916 the output so obtained exceeded the production from kelp. The manufacture of potash from wood ashes by the old-time methods continues with a small but significant contribution to the total tonnage.

It must be recognized that much if not most of the present production of potash is maintained on the basis of war prices, and there is no doubt that a large part of it can not be continued after these prices drop. Some of the developments have promise of permanence, but unfortunately these are as yet on a small scale. The only exception, perhaps, is the Searles Lake project, which now bids fair to yield enough potash to take the edge off the market by supplying the absolute necessities for home consumption in the chemical industries, but this project is as yet hardly under way. So far as can now be predicted there is no domestic source adequate to supply more than a small percentage of the domestic consumption. This statement does not by any means preclude all hope of future success.

The activity of private initiative in the search for sources of potash is increasing. Some very wide fields in the possibility of recovering potash as a by-product—for example, from cement-mill and blast-furnace flue dusts—are now being opened. Although the prospects seem bright for some of these attempts, it can not be said that knowledge has proceeded far enough to insure success on the extensive scale needed to make the country independent of foreign supplies. Perhaps, too, the real hope for a solution of the problem lies in the possibility of discovering, in association with some of the very extensive and little-known domestic deposits of rock salt, a supply of potash that may compete with the foreign sources on equal terms. Valuable potash deposits exist in the Permian in central Germany, the Oligocene (Tertiary) in Alsace, the lower Miocene (Tertiary) in Galicia, the supposed Eocene or Oligocene (Tertiary) in northeastern Spain, and beds of undetermined geologic age in India—everywhere in conjunction with deposits of common salt, dolomite, and gypsum—and it would be strange if occurrences of this sort were confined entirely to the salt deposits of Europe and Asia.

Governmental agencies have served and are still serving a useful purpose in aiding development. They have led the search for possible sources of raw materials of all kinds. By publicity they have stimulated a healthy interest which has undoubtedly led to good results.

As is well known, practically all the potash normally used in this country has formerly come from Germany. In addition to the potash materials used as ingredients of fertilizers, such as kainite and manure salts, almost the entire supply of the basic salts potassium chloride (muriate) and potassium sulphate was received direct from German ports until 1914, a small amount finding its way through Belgium and the Netherlands. In 1914 this importation was greatly reduced, and at the end of January, 1915, it was practically ended by the promulgation of an embargo on the export of potash from Germany. The large imports from Germany during 1915 were doubtless composed of shipments made during January, before the embargo went into effect, and of cargoes gathered up on the way or taken from storage in other parts of the world. Odd lots of potash came late in 1915 from many sources in Europe, North and South America, and even from Asia and Africa. The same condition prevailed in 1916, except that the imports from Germany were entirely shut off, and odd lots seem to have been derived from still more remote sources.

The present situation of this country concerning potash, with a view to possible emergency requirements, though not ominous, requires most careful consideration. It may be assumed that the stocks of high-grade salts of German origin remaining in the United States and, indeed, throughout the world except in the central allied countries are now practically exhausted. The actual domestic production of high-grade salts, moreover, is still very small and is limited to a very few sources, and the difficulties in the way of refining the large bulk of low-grade potash materials would probably be great.