

# **Reduce Potash Import Dependence in China**

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## 1 Introduction

China has 19% of the world's population but only 8% of the world's arable land. Due to the scarcity of land, China's agricultural production systems are among the most intensive in the world. Therefore, China heavily depends on chemical.

The application of potash fertilizer is an important agronomic measure for achieving higher yields. Apart from increasing yields, the application of potash fertilizer significantly improves the quality of crops. Since potassium is one of the three elements of fertilizer, developing domestic plays a crucial role in changing the severe potassium deficiency situation and increasing food production in agricultural fields.

Nowadays, China has been the world's largest consumer of fertilizer, especially the consumption of potash fertilizer. However, the potash reserves in China only take up 2% of the global proved reserves. Most of the resources are located in the Northwest Plateau region, increasing the difficulty in exploitation and transportation. To meet the huge demand for potash, China is heavily dependent on imports and has been a long time.

The extent of dependency on importation is not only determined by the domestic production capacity, but also determined by the potassium resource reserves, global markets, national policies and various of factors. This project studies the internal and external development environments of Chinese potash producers. By taking Qinghai Salt Lake Potash Co., Ltd., the largest potash production base in China as an example, this research aims to analyze the current potash market in China and make recommendations that help to enhance potash self-sufficiency.

## 2 Background

### 2.1 What is Potash?

The term "potash" refers to a group of potassium (K) bearing minerals and chemicals. Common potash fertilizer includes potassium carbonate ( $K_2CO_3$ ); potassium chloride (KCl), potassium sulfate ( $K_2SO_4$ ) and potassium nitrate ( $KNO_3$ ). Among all the varieties, the compound, Potassium Chloride (KCl), is a dominating force in the world potash market.

In agriculture and horticulture, the term "potash" refers to the nutrient forms of the element potassium (K). Potash is a potassium-rich salt that is mined from underground deposits formed from evaporated sea beds millions of years ago. Potassium is an essential element for all plant, animal and human life.

Potassium bearing minerals are mined from underground ore deposits, salt lakes and brines. Then, the ore must be beneficiated and purified using dry and slurry processes. Common potassium-containing minerals include sylvinite, sylvite, carnalite for potassium chloride, polyhalite, langbeinite for potassium sulfate, and niter for potassium nitrate.

Minerals should be crushed and ground for the purpose of separating the potash minerals from the clay and other salts. After that, potash ore should be rinsed and agitated with a saturated salt solution to remove clay and impurities. The next step is flotation separation or electrostatic separation. During this process, potassium-containing minerals are extracted and separated from other salts such as sodium chloride. After a final rinse with saturated brine water, the finished product is dewatered, centrifuged, dried, and compacted to desired particle sizes. Then, crystallization is required to make the products pure and totally soluble. The

finished products can be used as potassium fertilizer directly or be processed into compound fertilizers which contain two or three kinds of nutrients.

## 2.2 Why is potash important?

Potash plays an important role in agriculture because potassium is an essential nutrient for plant growth. Potassium is one of the three necessary nutrients to maintain normal growth and development of plants. Its content accounts for 0.2% - 10% of crop dry matter weight.

Potassium in plants has a variety of important physiological functions. It is associated with the movement of water, nutrients, and carbohydrates in plant tissue. It is also involved with enzyme activation within the plant, which affects protein, starch and adenosine triphosphate (ATP) production which can regulate the rate of photosynthesis. Potassium also helps regulate the opening and closing of the stomata, which regulates the exchange of water vapor, oxygen and carbon dioxide.

The application of potash fertilizer can significantly improve crop nutrient uptake capacity and photosynthetic rate. Studies show that the application of potash fertilizer could effectively increase crop yields and the content of soil organic matter, total nitrogen, and available phosphorus. For example, the application of potash fertilizer in rice production could improve yield, mechanical resistance of rice, quality of rice grain and content of soil nutrients (Liu, et al., 2017).

Fertilizers are responsible for between 40 and 60 percent of the world's food supply. About 95% of potash is used for fertilizer in agriculture with the remaining 5% used in commercial and industrial products such as soap. Where potassium is deficient in the soil, potash fertilizers can correct the problem and boost crop yields and quality. (What is Potash? (n.d))

### 3 Domestic Potash Market

#### 3.1 Consumption

China is the largest consumer of potash in the world and agricultural use takes up 95% of the consumption. The increasing population and the limited arable land boost the high demand for potash. Only 12.6% of the country's total land area can be cultivated while the total arable land of the country shows a declining trend in recent years as a result of new construction, natural disasters, and environmental requirements. According to the Ministry of Natural Resources, the total arable land fell to 134.86 million hectares in 2017, a decline of 60,900 hectares compared to the previous year. At the same time, Land used for construction reached 39.59 million hectares, with 534,400 hectares newly added in 2017 (Ministry of Land and Resources of the People's Republic of China, "2017 China Land and Resources Bulletin", 2018).

Moreover, more than 40 percent of China's arable land is suffering from degradation (Yu.J. & Wu. J., 2018), reducing its capacity to produce food for the world's biggest population. The rich black soil in northern Heilongjiang province, which forms part of China's breadbasket, is thinning, while farmland in China's south is suffering from acidification, the report said, citing agriculture ministry statistics. Degraded land typically includes soil suffering from reduced fertility, erosion, changes in acidity and the effects of climate change as well as damage from pollutants.

The government is growing increasingly concerned about the country's food supply due to this situation. The country has to feed nearly 1.4 billion people (20% of the world population) with only 10% of the farmland in the world. As a result, the application of fertilizer became the

main solution to increase the crop yield and improve crop quality for the purpose of ensuring food supply.

Potash is used as an important fertilizer in agriculture. At present, China's potash consumption ranks first in the world, accounting for about 20%-25% of the world potash consumption. Due to the large population, China has a large demand for food (S. Wang, Vice General Manager of Salt Lake Co Ltd, personal communication, January 9, 2019). With the decrease of arable land, the demand for potash was high. From 2004 to 2011, the consumption of potash in China was maintained at around 5-7 million tonnes of K<sub>2</sub>O equivalent. Since potash prices declined in 2012, the increase in the application rate of potash in China accelerated as well.

In China, about 70% of potash used in agriculture is applied as simple fertilizer which supplies only one nutrient element, such as potassium chloride and potassium sulfate. Compound fertilizer which contains two or three nutrients of N, P, K only takes up 30% of the potash market share. Farmers or agricultural cooperatives usually purchase potash from local fertilizer dealers and apply potash according to soil conditions and crop varieties.

South China and Northeast China are the main potash consumption areas in China since they are the main planting zones in China. South China is an important rice-producing region and rapeseed- producing region in the country, while Northeast China is an important corn, soybean, wheat and rice producing area. Other main planting regions such as the North Plain and Eastern China are also large potash consumers.

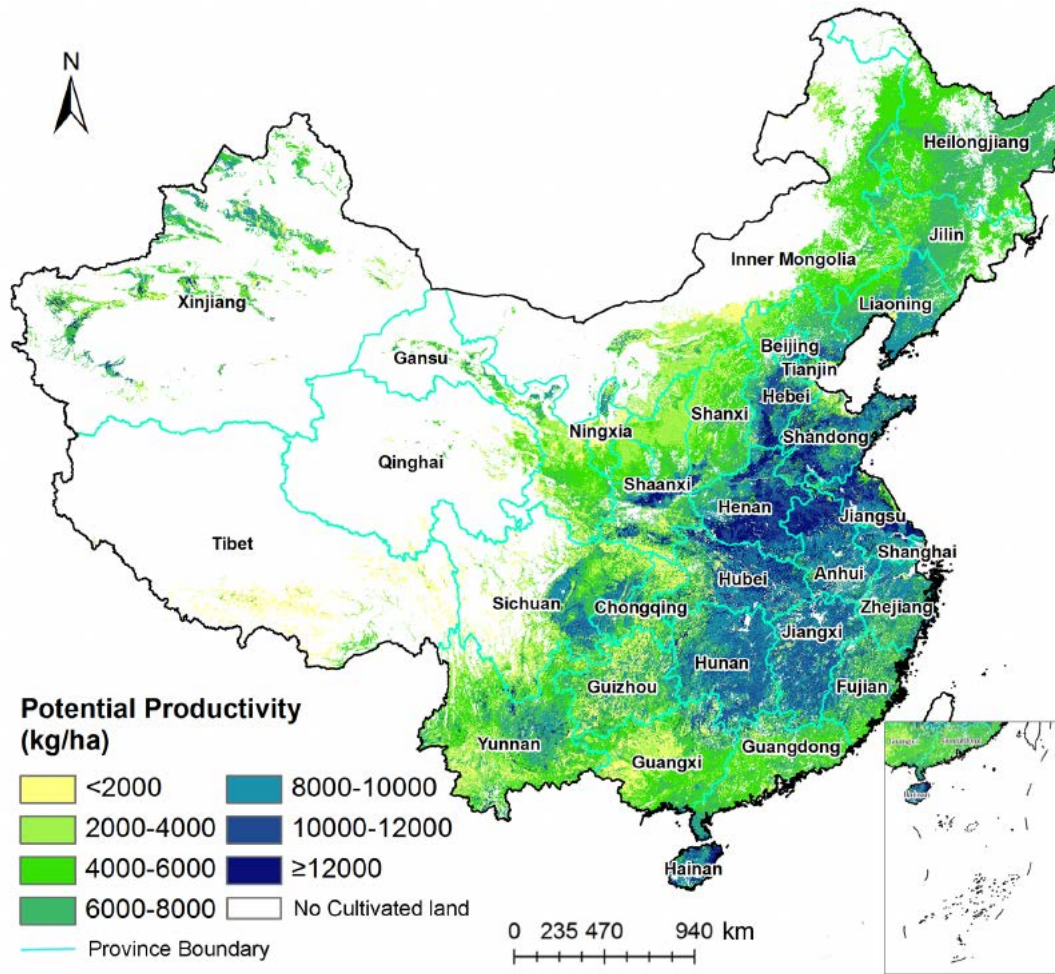


Figure 1: Distribution of Potential Productivity in China (2012)



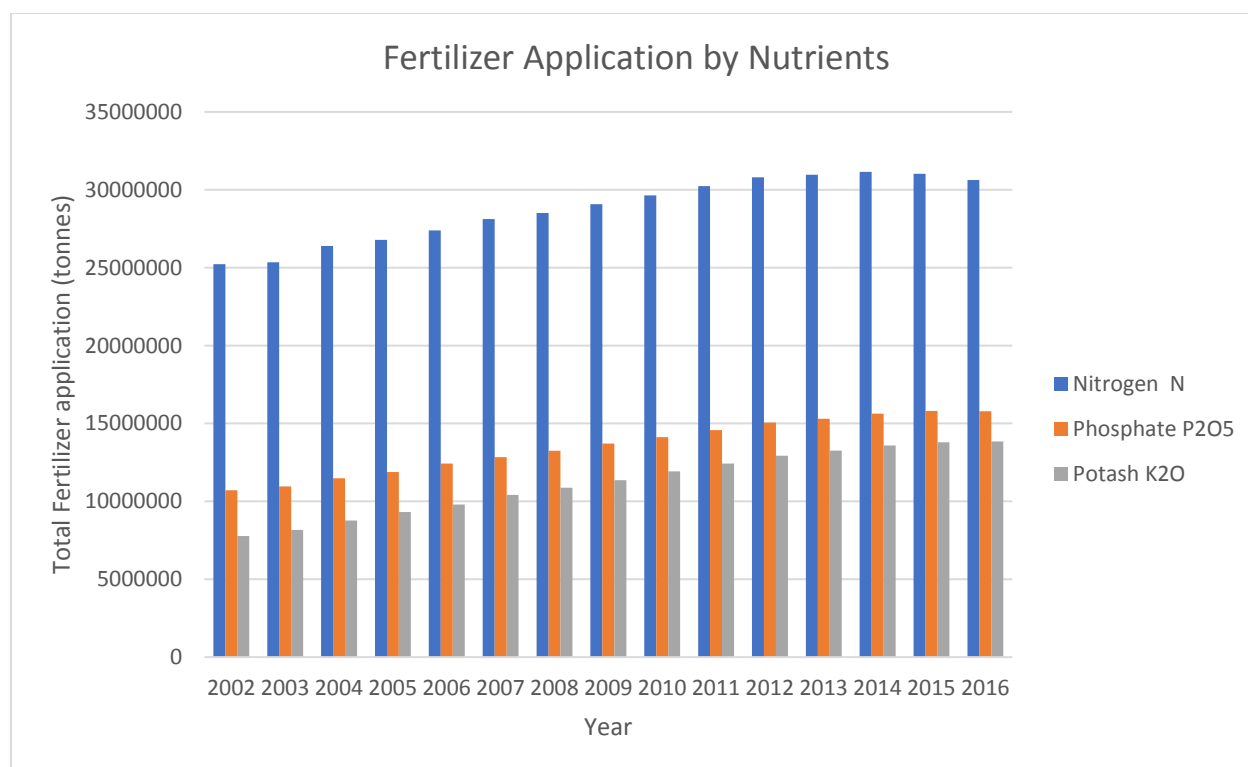


Figure 2: Fertilizer Application in China (Data Source: FAO)

### 3.2 Resource Distribution

Total worldwide geological potash deposits (known) amount to an estimated 210 billion tonnes of K<sub>2</sub>O (potassium oxide is a measure for potassium content). According to current estimates, up to 16 billion tonnes of K<sub>2</sub>O are recoverable using current technology (Potash Facts (n.d)).

The largest recoverable potash reserves are concentrated in the northern hemisphere. Canada alone has almost 10 billion tonnes of recoverable K<sub>2</sub>O, which account for approximately 60% of global potash reserves.

The next largest potash reserves are in Russia (up to 2.2 billion tonnes of K<sub>2</sub>O) and Belarus (up to 1.0 billion tonnes). In Russia, the two existing potash mining companies, Uralkali and

Silvinit, concentrate their operations on a large deposit in the Urals, which has been mined since 1931. The Belarusian deposits near Minsk have been mined for potash crude salts by the local company Belaruskali since the beginning of the 1960s.

Although potassium resources are abundant globally, their distribution is uneven. Potash deposits are mainly found in Europe, North America, Central Asia, and Southeast Asia. China's potash resources account for only 1.8% of the world's potassium reserves (Qinghai Salt Lake Industry Co., Ltd. 2018).

China's potash reserves are located in the southwestern and northwestern area of the country. China started the exploration of potash in the 1950s. Since the discovery of the Qarhan Salt Lake potash deposit in the Qaidam, Chinese geologists have made important achievements in the exploration and scientific research of potash minerals. After years of research, 5 potassium salt mines were zoned. The potash mines are:

**Lop Nur potash deposit in the Tarim Basin, Xinjiang Uygur Autonomous Region;**

It is located in the Tarim Basin, Xinjiang Uygur Autonomous Region. The region sits at the eastern end of the Taklimakan Desert, where dust storms rage across the landscape. Potash was discovered in the mid-1990s. Lop Nur means “enormous land of lakes” in Mongolian. It used to be a salt lake but was largely dried up currently. The discovery of potash turned the area into a large-scale mining operation. The main potash deposits found at Lop Nur today are brine potash, and this site is the second-largest source of potash in China.

**Qarhan Potassium Salt Mine in the Qaidam Basin, Qinghai Province;**

It is located in the Qaidam Basin, Qinghai Province. Lake Qarhan is the largest salt lake in China, covering some 5,856 square kilometers (2,261 square miles). The lake is a playa which contains nine smaller but more permanent shallow salt lakes. This site has become the largest

potash producing area in China and the country's largest potassium production industry, such as the Qinghai Salt Lake Industry Co. Ltd, is centered around Lake Qarhan.

**Zabuye Potassium Salt Mine in the Gangdisi Mountains in the interior of Tibetan Plateau;**

It is located in the Gangdisi Mountains in the interior of Tibetan Plateau. The Zabuye Salt Lake is approximately 247 square kilometers and it is rich in Li, B, K and other useful minor elements. It is a carbonate-type salt lake and has become an important Potassium deposit.

**Sichuan Basin Potassium Salt Mine Area in Northwestern China;**

Potassium deposits including underground brine mines and sedimentary type deposits.

**Takino potash deposit in the Yunnan Province.**



Figure 3: Distribution of Potassium Resources in China

The Qarhan mining area is the largest in scale among the 5 main potash mines. Lake Qarhan is the largest salt lake in China, covering some 5,856 square kilometers (2,261 square miles). China's largest potassium production industry, including the Qinghai potash fertilizer plant, is centered around Lake Qarhan.

### 3.3 Production

At present, China is the fourth largest potash producer after Canada, Russia, and Belarus. The total potash production in China was 7,470 thousand tonnes(K<sub>2</sub>O equivalent) in 2016, accounting for 12.4% of the world's total in 2016. Qarhan Salt Lake is the largest potash production base in China. The lake is rich in natural resources such as potassium, sodium, magnesium, boron, lithium, and bromine. The total resource reserves are more than 60 billion tons, of which only 540 million tons of potassium chloride reserves, accounting for 50% of the proven potassium reserves in the country.

Chinese potash industry began in 1958, 9 years after the establishment of the People's Republic of China (1949). In 1955-1956, the Qinghai Provincial Communications Department Highway Bureau discovered the famous Qarhan dry salt flat in the Qarhan area when building the Dunge Highway through the Qaidam Basin. Test results showed the salt deposit in this area contained KCl and geologists pointed out that the Qarhan area was rich in potassium resources. This provided an opportunity for the country to develop the potash industry. The first 953 tonnes of potash which contained KCl was produced in 1958 near the Qarhan Salt Lake, almost a century after Germany produced the first potash product in the world in 1860.

The Chinese government held the production of potash to a high standard and poured considerable money and materials into exploring potassium resources and producing potash. However, this had not been very productive over a long period due to backward technology and resource scarcity. As is shown above, most of the reserves distribute on the northwest and the southwest of China, where the altitudes are high. This made it more difficult to exploit resources and produce potash.

The government attached importance to the potash production industry. To explore potassium resource and produce potash, the government formulate long-term schemes in the 1950s and organized scientific teams and workers to live and investigate in the Gobi Desert. In 1956, the Qarhan Potassium Salt Mine was discovered; in 1995, the Lop Nur potash deposit was discovered**Error! Bookmark not defined.**; in 2006, the Qinghai Salt Lake Industry Group Co. developed and applied new potassium chloride production technology, making the potash production from Qarhan Salt Lake surpassed 100t. After generations of hard work, China became the fourth largest potash producer and achieved a 50% self-sufficiency rate.

Nowadays, there are more than 150 potash fertilizer enterprises in China, including 32 resource-based potash producers (directly produce potash from mines), and 118 processing potash enterprises (mainly use potassium chloride to produce other kinds of potash, such as potassium nitrate). Qinghai Province is the largest potash producing area, taking up around 80.79% of the country's potash production, while Xinjiang takes up 14.01% of the total potash production(Qinghai Salt Lake Industry Co., Ltd. 2018).

The potash production in 2002-2017 is shown below.

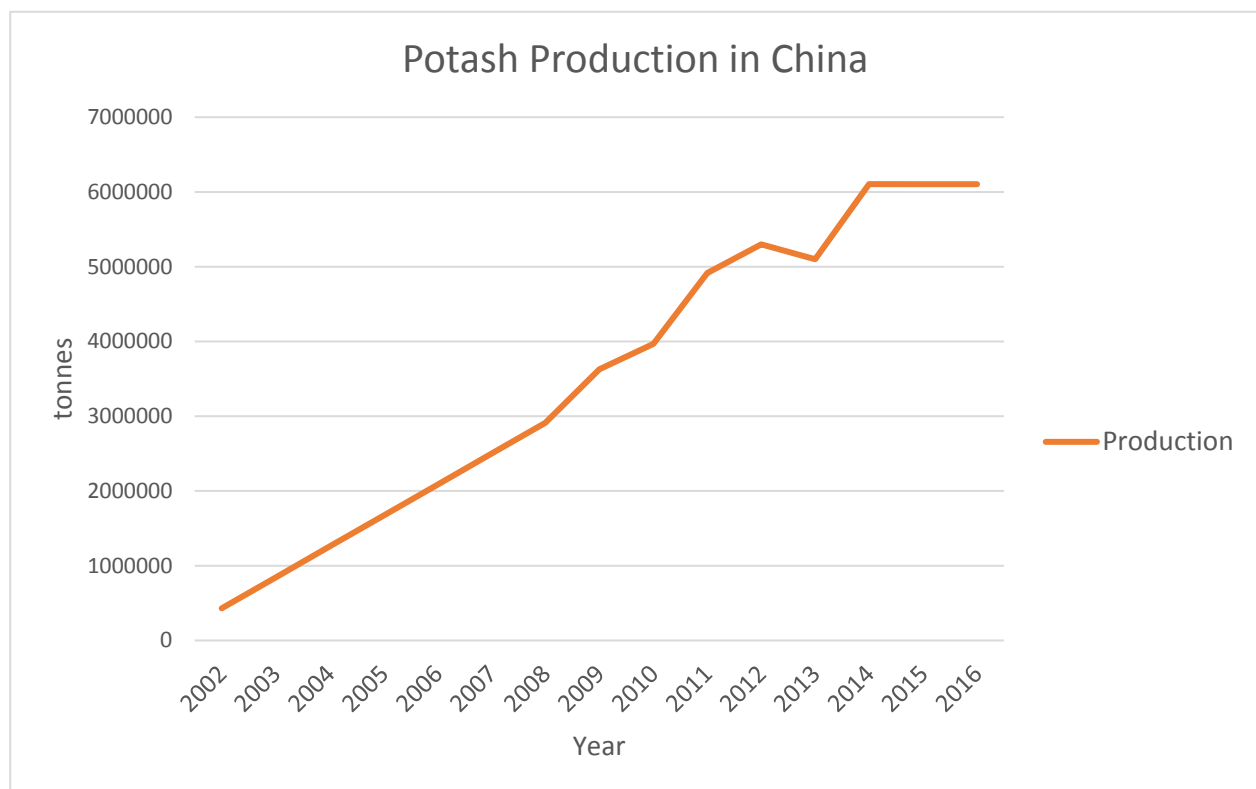


Figure 4: Potash Production in China (Data Source: FAO)

### 3.4 Import

China's dependence degree of potash import was high in the early years since the potash industry started late. The dependence degree of potash import was over 90 percent in a very long period of time. The cumulative import of potassium chloride in the latest 40 years has exceeded 130 million tonnes.

In recent years, the self-sufficient rate of potash started declined in recent years as a result of the improvement of productivity. The dependence degree of potash import has reduced to 43.8% in 2017(Qinghai Salt Lake Industry Co., Ltd. 2018).

Potash is imported from Russia, Belarus, Canada, Israel, Germany, the United States, Chile, Laos, Jordan, and other countries. Canada, Russia, Belarus are the largest importers, accounting for more than 90 percent of the import volume.

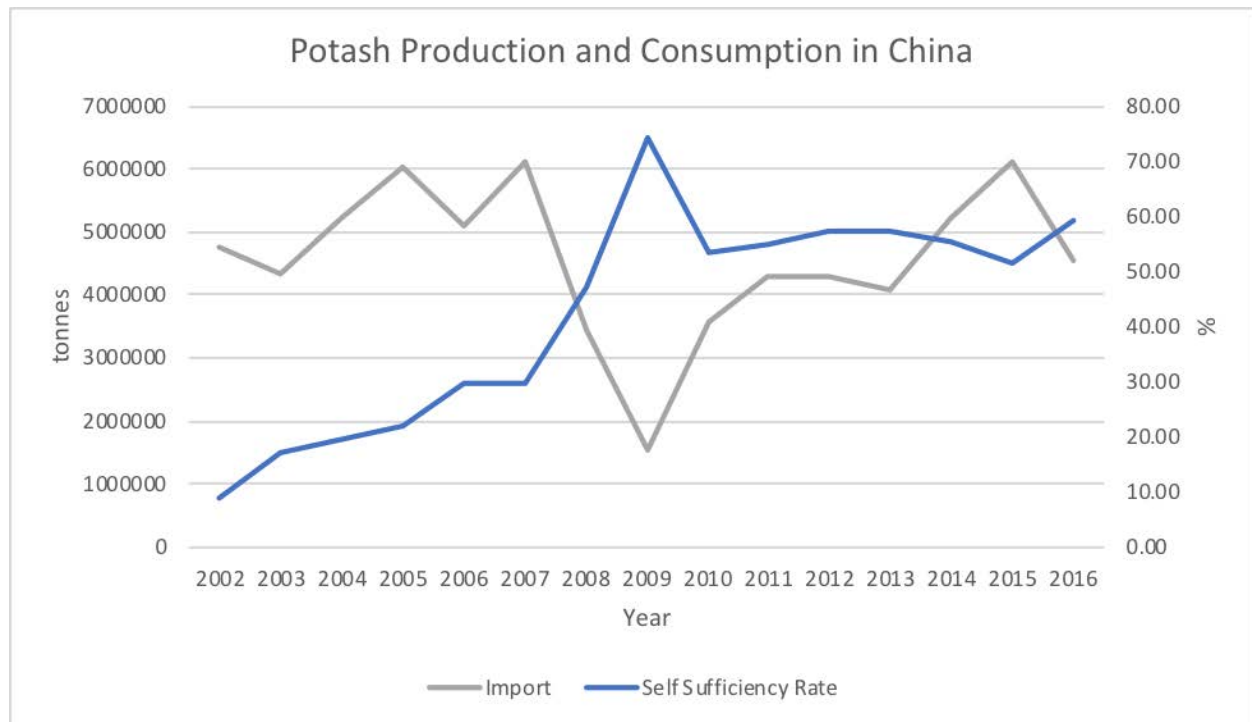


Figure 5: Potash Import in China(Data Source: FAO)

2012		2013		2014		2015		2016		2017	
Source	Amount	Source	Amount	Source	Amount	Source	Amount	Source	Amount	Source	Amount
Russia	2875	Russia	2458	Russia	2613	Belarus	2600	Russia	2414	Canada	2343
Canada	1006	Canada	1332	Belarus	1763	Canada	2281	Canada	1471	Belarus	1697
Belarus	828	Belarus	810	Israel	1306	Russia	2175	Belarus	115	Russia	1529
Israel	821	Israel	75	Canada	1298	Israel	949	Israel	837	Israel	941
Jordan	459	Germany	296	Jordan	574	Jordan	688	Jordan	492	Jordan	668
Germany	247	Jordan	249	Germany	205	Laos	322	Germany	199	Germany	199.8
Chile	66	Chile	120	Chile	115	Germany	281	Laos	152	Laos	113
Uzbekistan	39			Laos	90	Chile	127	Lithuania	34.5	Chile	39
				Lithuania	46	Uzbekistan	9.6	Chile	31.6	Uzbekistan	2
				Vietnam	16	Spain	3	Spain	1	USA	0.06
				Spain	2	USA	0.7	USA	0.5	日本	0.03
				USA	0.5						
Total	6342		6029		8029		9438		6820		7533

Table 1: Importer of Potash

(Unit of Measurement: Thousand tonnes of KCl, Data Source: Qinghai Salt Lake Industry Co., Ltd)

## 4 Challenges and Opportunities-SWOT Analysis Based on Qinghai Salt Lake Industry Co., Ltd

### 4.1 Enterprise Introduction

Qinghai Salt Lake Industry Co., Ltd is a state-owned company. It is located in Golmud City, Qinghai Province, adjoining the Qarhan Salt Lake. It was established in 1958 and was a potash leading enterprise in China.

The company has a 2.786 billion CNY registered capital, 83.9 billion CNY total assets, and nearly 18,000 registered employees. Salt Lake Co., Ltd. has 8 holding companies, 6 branch offices, 10 wholly-owned subsidiaries, 6 shareholding subsidiaries, 1 national salt lake resource



comprehensive utilization research center, and 1 provincial enterprise circular economy research and development center**Error! Bookmark not defined.** The Company's main products include potassium chloride, polyvinyl chloride (PVC), methanol, potassium hydroxide, potassium carbonate, lithium carbonate, etc. It has become the largest potash producer in China with a 5 million tonnes/year production capacity of potash (Qinghai Salt Lake Industry Co., Ltd. 2018).

## 4.2 Strengths

### 4.2.1 Resource Advantage

The company is adjoining the Qarhan Salt Lake, the largest potash deposit in China so it has a unique resource advantage. The company can make full use of the geographical advantage to exploit potassium resources. Apart from potassium, Qarhan Lake is rich in lithium, sodium, and magnesium. This would help the company expand its business and increase revenue.

### 4.2.2 Technical Advantage

With decades of years of development, Salt Lake has advanced technology for extracting potassium from brine, extracting magnesium from brine and extracting lithium from brine. It has 5 Invention patents, 26 utility model patents, and the WIPO Medal for Inventors. It has become the only company in the world to master all potassium chloride processing technologies. Different processes and technology can be used to produce different grades of chlorine potassium based on different raw materials. (S. Wang, Vice General Manager of Salt Lake Co Ltd, personal communication, January 9, 2019)

### 4.3 Opportunities

#### 4.3.1 Policy Environment

In 2013, General Secretary Xi Jinping announced the strategic concept of building the Silk Road Economic Belt and the 21st-century Maritime Silk Road, which was known as the Belt and Road Initiative. This provided a development opportunity for potash producers in Western China. The "Belt and Road", especially the "Belt", connect countries situated on the original Silk Road through Central Asia, West Asia, the Middle East, and Europe. The initiative would create a cohesive economic area by building both hard infrastructures such as rail and road links and soft infrastructures such as the trade agreements and a common commercial legal structure with a court system to police the agreements.

As an important supporting part of the Belt and Road, Qinghai Province is improving related communication mechanism at a faster speed to strengthen and extend cooperation with Belt and Road countries and regions at the government level. The province is also focusing on improving the railway, road, and air transport networks, related infrastructure to provide a better business environment for local enterprises. The Province will support enterprises to involve in foreign trade and optimize the trade structure. These will help the enterprise establish the trade with Russia, Europe, Central Asia, West Asia, and South Asia, expanding international market and reducing trade costs.

Apart from the Belt and road Initiative, the Chinese government is encouraging domestic potash exports. Due to the large domestic demand for potash, the volume of export is low. In January 1st, 2019, the Chinese government implemented a zero-tariff treatment to the potash export. This provides better opportunities for the potash industry. This especially benefits the

processing-type potassium sulfate producers in the short term. The export volume will increase but it will not cause domestic potassium resources deficiency. On the one hand, the domestic potassium sulfate demand is inefficient. On the other hand, due to the Increase in production capacity, potassium sulfate producers are suffering from losses caused by overcapacity and oversupply. In the long run, the zero-tariffs policy will help to enhance the influence and competitiveness of Chinese potash products in the international market.

#### 4.3.2 Domestic Demand

Salt Lake has become the fourth potash manufacturer in the world, which has great influence in Salt Lake has become the fourth potash manufacturer in the world, which has great influence in the world and the country's potash market. Although the supply of potash in the world is strong and adequate, the external dependence in China is still close to 50%. Due to the population increase and farmland shrinking, potassium is still an inadequate chemical element for soil and crops. The large national demand for potash creates a development condition for domestic potash producers to expand production, especially for large enterprises. Since the country is increasing attention to environmental protection property of plants, some small and medium-sized potash enterprises that fail to meet environmental standards will lose competitive advantages, making the domestic supply decline. Large enterprises with more advanced technology will occupy a greater domestic market share and enhance international competitiveness.

#### 4.4 Weakness

##### 4.4.1 Financial Pressure

Potash project is currently the main project of Salt Lake, accounting for more than 65% of the operating revenue. Although the potash project brings positive gains to the enterprise, Salt Lake got an enterprise loss for the first time in 2017. This is caused by other fledgling projects such as the lithium and magnesium integrated project. The project would make a great influence in the local economies in the long term but the infrastructure is still poor currently. The construction investment was enormous and made the enterprise bear more financial pressure.

The enterprise has a large ratio of liabilities as well. By the end of 2018, the total assets of Salt Lake were 75.032 billion CNY, the total liabilities were 56.245 billion CNY, and the asset-liability ratio was 74.96%**Error! Bookmark not defined.** (S. Wang, Vice General Manager of Salt Lake Co Ltd, personal communication, January 9, 2019). This situation cannot be changed in a short time, and what's worse, it would be more difficult to raise funds from the capital market due to the huge loss.

##### 4.4.2 Transportation Costs

Most of the resources are located in the Northwest Plateau region, increasing the difficulty in exploitation and transportation. This made domestic potash lose the price competitive advantage in comparison with importing potash. On the one hand, the gap between domestic potash offer and the CIF price of importing potash is not too large. Take potassium chloride as an example, the quotation from Salt Lake was 2350 CNY/tonne (S. Wang, Vice General Manager of Salt Lake Co Ltd, personal communication, January 9, 2019) while the CIF price from Belarus

was around 2400 CNY/tonne (Chinese Potash (n.d). On the other hand, as is shown in Figure 6, main potash importing ports locate in the south and east coastal regions in China and are much closer to the planting areas compared with Qinghai Province. For example, the railway transportation cost from Qinghai Province to Heilongjiang, the main rice production province in Northeast China is 28260.50 CNY per freight (60 tonnes) while the freight cost from Yingkou Harbor in Liaoning Province to Heilongjiang is only 7297.60**Error! Bookmark not defined.** CNY (12306 China Railway. (2018). Retrieved from <https://www.12306.cn/index/>).

In addition, potash transportation in China mainly relies on long-distance railway transportation from the west to the east, while the railway transportation resources in the western region have been occupied by coal, crude oil, and other mineral products for a long time. This results in a long-term unsatisfactory of potash transportation, which is unfavorable to the supply of domestic potash market.

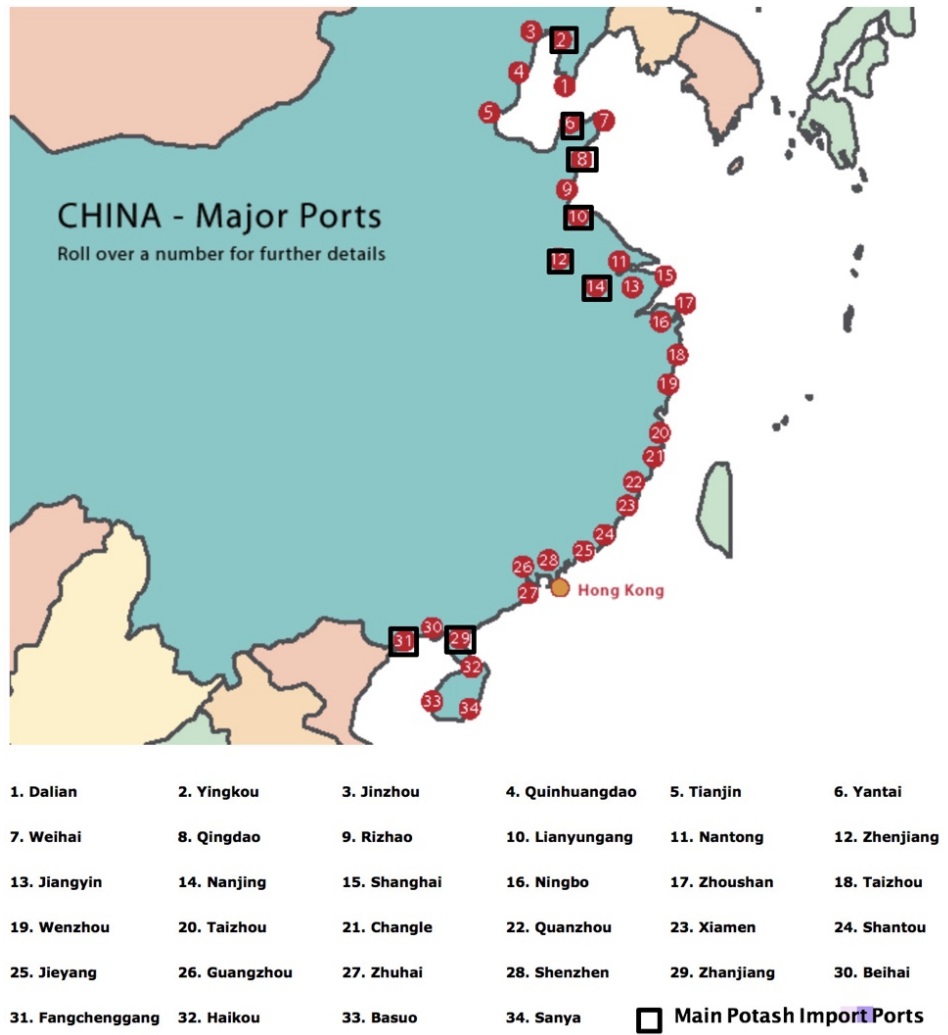


Figure 6: Major Potash Import Ports in China

## 4.5 Threats

### 4.5.1 Professional Demand

China's potash industry started a-century later than in European countries. Although Salt Lake mastered one of the most advanced methods to produce potash, the enterprise is inexperienced in utilizing the technology. Exploring and improving new technology still an essential part of enterprise development. In addition, the enterprise is located in a high-altitude area which is rich in potassium resources. The high altitude has a great influence on the

chemical process and equipment. Equipment should be able to resist droughts, sandstorms, salinization, and large diurnal temperature. Since the area is remote, it is difficult to attract and retain talents. This may be a disadvantage to achieve diversified production and management.

#### 4.5.2 Energy Conservation and Environment Protection Requirements

The Qaidam Basin is one of the four major basins in China. It is also one of the highest basins and major sources of sand. The ecological protection and construction of the Qaidam Basin is a significant objective of the sustainable development in Qinghai Province. In 2018, the government of Qinghai Province issued an 8-year comprehensive treatment emphasizing ecological protection in the area. (S. Wang, Vice General Manager of Salt Lake Co Ltd, personal communication, January 9, 2019)

Industrial production is a high-polluting industry and as a key enterprise, Salt Lake is a major concern of the Qinghai Province. The government regards the ecological of the Qaidam area as a primary task and requires the enterprise to strengthen the work of energy saving and emission reduction. It requires Salt Lake to develop environmentally friendly production technology and use clean energy.

## 5 Development Recommendations

### 5.1 Looking for Policy Support

Potash industry relies on the vigorous support of the government. As a leading enterprise of potash, Salt Lake should look for more policy support to get out of the current circumstance.

First, the government should increase its R&D Investment to encourage the development of mining and process technology. It would help the enterprise utilize the advantages of its resources effectively. Not only potassium but also magnesium and lithium are rich in the

Qaidam Salt Lake. Ensuring the smooth utilization of the salt lake helps the enterprise achieve productivity improvement and cost reduction.

Second, since the comprehensive utilization of the salt lake resources requires a large amount of natural gas and coal, the government should increase the overall coordination of resource allocation, and give potash industry priority and price reduction to use natural gas and coal. This would effectively help the enterprise reducing costs and improve productivity.

Third, it is necessary for the government to strengthen the economic development of the Qaidam area. It should formulate reasonable resources, land, taxation, research and development, transportation, and talent introduction policies to strengthen infrastructure and transportation network, attract and retain talents. It would create favorable conditions to expand production and improve productivity.

## 5.2 Developing Overseas Market

The enterprise should explore the feasibility of using overseas resources. Due to the limit of potassium resource in China, the government started to seek stable and low-cost potassium resources and build overseas potash plants overseas. International cooperation would provide a long-term resource.

In recent years, some domestic enterprises have developed potassium resource in Canada, Congo, Laos and other countries. These enterprises cooperated with related overseas enterprises and can make the best of its capital advantages, technological advantages, talent advantages, and market advantages.

Salt Lake should judge the situation and analyze its own conditions to find out the most feasible plan. It is necessary to do a preliminary survey to know the partner's background,



development prospects, and technological progress. It should choose countries with social and political stability, economic stability and policy guarantees, such as Canada and Laos. Also, using the national Belt and Road Initiative to select cooperative countries can obtain more policy and financial support from the country.

## 6 Conclusion

Potash is an important industry for the country because it affects food production and food security. Although China's potash industry developed rapidly and China has become the fourth largest potash producer in the world, domestic supply is still cannot meet the large demand. Improving the self-sufficiency rate of potash provides a guarantee for crop yield and food security, so both the Chinese government and potash producers are actively seeking development possibilities to expand and increase production.

The government poured a large amount of money into R&D, infrastructure construction, transportation network construction. As a government-sponsored industry, the development of the potash industry needs more support from the government. Besides financial support, strengthening the region's economy would be helpful to attract talents, reduce production and transportation costs and increasing production capacity. Apart from this, implementing a series of policies which are helpful to international cooperation would provide opportunities to make full use of overseas technique and resources advantages.

As for the producers, they are expected to strengthen new mining and production technologies. For those large-scale integrated production enterprises, adjusting industrial structure is also necessary because of this influence the profitability and ability to attract financing. At the same time, since the country is deficient in potassium resource, strengthening

international communication and cooperation becomes a solution to gain access to more raw materials.

In conclusion, increasing production and improving self-sufficiency rate is an arduous task because of the disadvantage of resource and geographical constraints. To achieve this goal, the government should invest more funds and create good policy and economic conditions for the industry development. At the same time, potash producers are required optimize the industrial structure, strengthen talent training, and improve production and management technology. In the future, overseas cooperation would become a new way to promote Chinese potash industry and it is the prospective development direction to reduce potash import dependence.

## 7 Critical Thinking

Developing domestic potash industry and improving potash sufficiency rate are important to China for many reasons. First, excessive dependence on import will make China at a disadvantaged position in trade talks. The global potash market is considered a duopoly between two large potash firms, Canpotex(Canadian Potash Exporters) and BPC(Belarusian Potash Company). Canpotex was founded by three large potash producers in North America and mainly managed the North American potash exporting industry. Belarusian Potash Company (BPC) was established in Belarus and currently sells potash fertilizers produced by JSC Belaruskali, one of the world's biggest producers in Belarus. The duopoly makes potash importing countries lose pricing power in trade negotiations. As an important agricultural input, potash influence not only crop yields but also production costs. When entirely dependent on import, if the importing price rises, the cost of planting will increase. As a result, food price will

increase and this may lead to increased wage demands and inflation. Improving potash self-sufficiency rate can reduce the effect of global markets on potash price in China to some extent. This would help to stabilize food prices.

Besides, with higher domestic production, China can strengthen its pricing power in importing contracts negotiation. In recent years, China and India potash contract prices are determined earlier compared with other countries in the world. This is because China and India are large importing countries, and the contracts can a benchmark for others. Since 2006, the India price has assumed a premium of between US\$8/t and US\$17/t over China. The reason is that China has a stronger potash industry. Due to the development of the domestic potash industry, potash price in China can be controlled at a lower price and the potash stock is sufficient in the short term. Compared with India, China is in no hurry to negotiate and can haggle for a lower price. In recent years, China's potash contract price has become the lowest in the world. For example, potassium chloride contract in China is settled at \$290/tonne CFR in 2019, while it is at \$320/tonne CFR in Europe, and at \$310/tonne CFR in Korea, the Philippines, and Japan(World Fertilizer 2018). Without sufficient and low-cost domestic potash, China will lose its bargaining power and cannot receive a lowball potash contract price.

Also, the potash industry is an important part of the China Western Development Strategy. It was one of the first 10 projects of this strategy in the 1990s. As one of the pillar industries in West China, the potash industry drives regional economic development by promoting employment and increasing income. Compared with investing in other chemical industries, investing in potash has a lower risk and can be more effective in the short term. This is because potash has a solid base and a long development history. The cost of expanding and enhancing

current projects would be lower than building a new project, and the construction period would be lower. In general, potash projects in China are profitable and supporting domestic potash industry can promote the economy.

Potash industry is a resources-based industry which requires large funds and energy. Supporting this kind of industry, government investment in manufacturing and service sector would be small and it may sacrifice some environmental benefits. However, it is necessary for regional economic development. Industrialization plays a vital role in the economic development of underdeveloped regions. West China has a unique potassium resources advantage to develop the potash industry. At the same time, the economic level is lagged behind the middle and the east areas. At least so far, rapid economic growth is more important than developing sector industries so potash is still an emphasis fostering. In the long term, the government will try to turn the resource advantage to economic advantage. In the future, with the economic growth and the development of the potash industry, the government would shift its focus to the tertiary industry such as education healthcare and tourism industry. It would increase its investment in environmental protection as well.

Apart from investment in local potash production, seeking overseas resources became a popular solution to improve potash self-sufficiency rate. According to China Industrial Economy Information Networks, by the end of 2018, China has invested 34 overseas potash projects in 12 countries, such as Laos, Canada, Congo, and Thailand. These projects have different progress. Some of them have started production while others are still in construction, bidding or getting mining rights. Building plants directly is the mainstream method that the Chinese government

used to utilize the overseas resource. It usually takes around 8 years to build an overseas potash producing plant, as stated by the China Industrial Economy Information Networks.

In my opinion, investing in domestic producers is more important in the short term in comparison with, building overseas plants because the latter has a long construction period and many uncertain factors. Lacked knowledge of the local environment, economy and policies make building plants risky. Also, building a new firm from the beginning costs a lot of money. It will cause a huge loss if the plant cannot launch anything.

However, starting new plants is not the only way to utilize global resources. Overseas merger and acquisition, and brownfield projects may also be feasible ways. Overseas merger and acquisition mean purchase potash manufacturer entities directly. Equipment, technology, and staffs of the acquired firm can be retained. This saves time in construction and avoids problems caused by unawareness of local environment and policies.

The brownfield project means starting a project based on prior projects. By contrast, the greenfield project means a work which is not following a prior work. I advocate brownfield projects here which means that China can purchase existing projects or invest in current projects expansion and reform. In return, China can obtain part of the sales rights at a low price. In other words, the invested projects or enterprise should use some of the sales rights and pricing rights to exchange investment. The cost and difficulty of new construction are far greater than expansion and promotion. Without large funds and time, this is less risky and less difficult.

In conclusion, increasing production and improving self-sufficiency rate is necessary and important in China because high a self-sufficiency helps to stabilize potash price and food price,

improve negotiation positions in trade talks and brings about social benefit. It is a long and arduous process as well. In the short term, investors should focus on domestic producers. In the long run, investment in overseas market can become a new solution. Apart from building plants, various forms of cooperation should also be considered. Based on the full investigation and analysis, China should have a long-term plan to achieve this goal with a rational investment allocation.

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