

**Exporting Potash Fertilizer to Nepal**  
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**AGR 1110**

## **Part I: Product Information**

### **Product Description**

Potash contains a variety of minerals, most importantly potassium (Natural Resources Canada, 2012). Potassium is the seventh most frequent element found in the earth's crust (North American Potash Developments Inc., 2014). The minerals potash contains include: potassium chloride, potassium magnesium chloride, potassium magnesium sulphate, potassium sulphate, and potassium nitrate (Stone, 2013). The main potash product is potassium chloride (KCl) or muriate of potash (MOP) (Stone, 2013). These potash products are naturally a pink colour (Stone, 2013). Potash is mined from underground deposits that were once sea beds that evaporated (Potash Corp., 2013). Raw ore is processed into more useful products, which are any potassium salts, which are water soluble (al Rawashdeh and Maxwell, 2014).

Potassium in fertilizer is one of the three primary nutrients for plants, along with nitrogen and phosphorus. These macronutrients are needed in large quantities for plant growth and development (OMAFRA, 2012). As a fertilizer, potash helps with root strength and disease resistance, as well as assisting in the retention of water (Potash Corp., 2013). It also intensifies the taste, colour and texture of food (Potash Corp., 2013). Potassium is also fundamental in plant cells (OMAFRA, 2012). It is needed in equal amounts to nitrogen (OMAFRA, 2012). Potassium deficiency is shown by the yellowing or burning of the outside of the leaf of the plant (OMAFRA, 2012). In fruit and vegetable plants, a potassium deficiency may leave you with misshaped fruit or vegetables (OMAFRA, 2012). A low level of potassium may leave fruits and vegetables with a shorter shelf life (OMAFRA, 2012). Applying too much potassium may affect the ability of the plant to take calcium and magnesium from the soil (OMAFRA, 2012). This will negatively impact the plant, as those nutrients are important as well (OMAFRA, 2012). A high level of potash may lead to a deficiency of magnesium and calcium (OMAFRA, 2012).

## **Product Availability**

Potash is a resource that is only found in a couple different places around the world (Stone, 2013). Canada is home to forty-six percent of the world's potash supply, mostly found beneath the plains of Saskatchewan (Natural Resources Canada, 2012). Out of the ten potash mines located in Canada, nine of the mines are located in Saskatchewan (Natural Resources Canada, 2012). Potash is also found in Russia, in the brine of the Dead Sea in the Middle East and in a few small pockets scattered throughout the world (Stone, 2013).

## **Obtaining and Processing the Product**

Most potash is mined from underground deposits that were once sea beds that have evaporated (Potash Corp., 2013). Deep underground mining methods use the "room and pillar" method, leaving pillars and timber to support the mine roof (North American Potash Developments Inc., 2014). To break the potash loose of the walls, there are two favoured methods (North American Potash Developments Inc., 2014). One is the blasting method, using explosives to blast and break down ore (North American Potash Developments Inc., 2014). This method is favoured when the variance in ore thickness is large (North American Potash Developments Inc., 2014). The blasting method requires a lower initial cost, but will end up costing more in time (North American Potash Developments Inc., 2014). The other method is continuous mining, where machines cut smoothly and have a high capacity (North American Potash Developments Inc., 2014). Conveyor belts can be used to haul the ore up and out of the mine shaft when the continuous mining method is used (North American Potash Developments Inc., 2014). It is more often used when the potash seam is thick and uniform (North American Potash Developments Inc., 2014). The machinery for continuous mining has a high initial cost,

but will end up being the cheaper method if mining for any significant amount of time (North American Potash Developments Inc., 2014).

Potash can also be recovered from brine through solar evaporation, or by solution mining as well (Stone, 2013). Solution mining is used when the mine is very deep, or has irregular potash deposits (North American Potash Developments Inc., 2014). This method uses heat brine (a salt water solution) to dissolve the potash and salt from the walls (North American Potash Developments Inc., 2014). After the potash has dissolved, submersible pumps pump the solution to evaporation ponds where the potash and salt settle (North American Potash Developments Inc., 2014). Floating dredges eventually collect the potash, after this it is taken to be further processed (North American Potash Developments Inc., 2014).

The raw ore is usually a red or pink colour (Potash Corp., 2013). Raw ore is processed into more useful products, which are any potassium salts, which are water soluble (al Rawashdeh and Maxwell, 2014). The processing procedure includes 5 steps (Potash Corp., 2013). The first step involves crushing and grinding the ore (Potash Corp., 2013). In this step the raw ore is crushed into smaller pieces, so that the clay particles are separated from the potash crystals (Potash Corp., 2013). Clay particles are then removed using size separators, as the potash and salt crystals are much larger than the clay particles (Potash Corp., 2013). The next step separates the potash from the salt, by way of floatation (Potash Corp., 2013). Reagents are added that only attach to potash crystals, creating an air bubble that cause the potash particles to rise to the top (Potash Corp., 2013). Now that the potash is separated from the salt, it must be separated from the brine (Potash Corp., 2013). To do this the solution is put in a centrifuge (Potash Corp., 2013). The potash is then dried in ovens, and is then sorted by mesh screens for size (Potash Corp., 2013). The next step fuses some of the finer product, creating a “board” that can be broken up

again in to granular potash (Potash Corp., 2013). The final step is storage (Potash Corp., 2013). Potash is stored in warehouses on the site of the mine, where it is stored according to grade (Potash Corp., 2013).

### **Application of Product**

Most of the agriculture done in Nepal is done by subsistence farmers (Calkins, 1982). Subsistence farmers have low income and have less advanced equipment than farmers in North America (Calkins, 1982). With no large fertilizer spreaders like we have in North America, farmers in Nepal would have to spread the potash fertilizer by hand. There are two ways of doing this, which include broadcasting and micro-dosing (Aune, 2011). Broadcasting involves spreading fertilizer randomly throughout the field, hitting areas and not certain spots. Micro-dosing is a method where you apply a small amount of fertilizer directly in the planting pocket (Aune, 2011). This method is more cost efficient, as you will apply less fertilizer, but the fertilizer you spread is more effective, as the fertilizer is applied directly where it is needed and used (Aune, 2011). Broadcasting fertilizer spreads the fertilizer on the whole field, even in between the rows where there is no plants to take up these nutrients. In the hill regions of Nepal, the fertilizer may be prone to leaching if not taken up by the plant (Collins, 1999). With the slopes of the hill, rainwater may carry the fertilizer away from the fields (Collins, 1999). This will cause high nutrient concentrations in drainage water, and the nutrients will not do any good for the plants if they are all drained away (Collins, 1999). Broadcasting fertilizer is not very cost effective due to this, making micro-dosing a more practical method of applying the potash fertilizer in Nepal.

Potash fertilizer is often applied along with nitrogen and phosphorus, as they are the other two primary nutrients. This is because these nutrients are used up first, as they are the most

important for the growth of the plant (OMAFRA, 2012). Many soils are always deficient in these nutrients because of this. The farmers of Nepal must be educated, so that they can tell if their crops are deficient in any of these nutrients. This will allow them to make the decision whether or not their crops need the potash fertilizer, or whether they should apply the potash fertilizer along with nitrogen and phosphorus.

### **Benefits to Canada**

Potash export to Nepal would benefit Canada economically. A report done in 1972 stated that Saskatchewan was home to a potash reserve of 107 billion tonnes (Stone, 2013). A reserve of this size would allow for the mining of potash for several thousand years at the current rate of production (Stone, 2013). Canada exported \$6.7 billion worth of potash in 2011 (Natural Resources Canada, 2012). These exports are through three major potash producers; Agrium, Mosaic, and PotashCorp (Stone, 2013). These producers provide jobs for 5 041 Canadian workers through ten potash mining and processing operations (Natural Resources Canada, 2012). This is obviously a benefit to Canada, as the industry employs people nationwide. These companies are putting money in the pockets of their respective employees, which are hardworking Canadians. These people spend their money in Canada, benefitting the economy as a whole.

The potash producing companies do not just create jobs in the mine and processing the ore. The final product must also be transported. Most of the potash is put on trains to the west coast, where it is put on ships all around the world (Potash Corp., 2013). The potash industry creates these jobs for the train operators, and the sailors that are on the boats that will take the potash where it is supposed to go overseas. This shows that there are secondary jobs created by

the industry. The people working these jobs are also spending time in Canada, and therefore are spending money in Canada, boosting the country's economy.

### Cost of Product

Potash is quite an expensive commodity, as a metric tonne of potash will cost just under \$300 (Potash Corp., 2013). This cost is always changing, as the price is influenced by the demand for the product (Stone, 2013). As seen in the graph, the price has changed dramatically over the past five years. This is comparable to potash fertilizer found on Alibaba.com, as it is found on that website for \$600-\$700 per metric ton (Alibaba.com, 2014). This shows that potash fertilizer can be produced cheaper in Canada than anywhere else, making Saskatchewan potash the most practical potash product for the people of Nepal to purchase and use as fertilizer in their own fields.



<http://www.infomine.com/investment/metal-prices/potash/5-year/>

## **Potential Canadian Companies to Provide Product and Transportation**

The largest fertilizer company, Potash Corporation of Saskatchewan Inc. (PotashCorp), employs 2 520 people (Natural Resources Canada, 2012). It has 6 locations, 5 in Saskatchewan and one in New Brunswick with its corporate headquarters in Saskatoon, Saskatchewan (Potash Corp., 2013). It produces potash fertilizer as well as nitrogen and phosphorus fertilizer (Potash Corp., 2013). Another Canadian based company that produces potash is Agrium (Stone, 2013). It has its headquarters in Calgary, Alberta (Stone, 2013). It has one potash mine in Saskatchewan (Stone, 2013).

Canpotex is an offshore marketing company for potash which is equally owned by three companies that mine potash in Saskatchewan (Potash Corp., Agrium, and Mosaic), it serves these offshore markets from its offices in Saskatoon, Vancouver, Singapore, Shanghai and Tokyo (Potash Corp., 2013). Canpotex directs and manages the shipments of potash (Canpotex Limited, 2014). It has two major ports out of North America, one at Vancouver, British Columbia and one at Portland, Oregon (Canpotex Limited, 2014). Its business is done on a Cost and Freight basis (CFR), where Canpotex manages the charter and vessel to allow the company to maximize efficiency and minimize cost (Canpotex Limited, 2014).

## **Part II: Export Potential to Nepal**

### **Introduction to Agriculture in Nepal**

Nepal is a small, landlocked country in between China and India (Nepal Tourism Board, 2012). It has a total land area of 147,181 square kilometers (Nepal Tourism Board, 2012). It has a population of roughly 27 million people (Nepal Tourism Board, 2012). Agriculture is a huge

part of the economy of Nepal (Government of Nepal, 2014). It provides jobs for 66 percent of the population and contributes to 36 percent in the GDP (Government of Nepal, 2014). Even with these numbers Nepal still struggles to produce enough food to feed the growing population (USAID, 2014). Just under 50 percent of the Nepalese population is malnourished, with nearly half of the children under five chronically malnourished (USAID, 2014). Farmers of Nepal are subsistence farmers, producing only enough food to feed their family (Calkins, 1982).

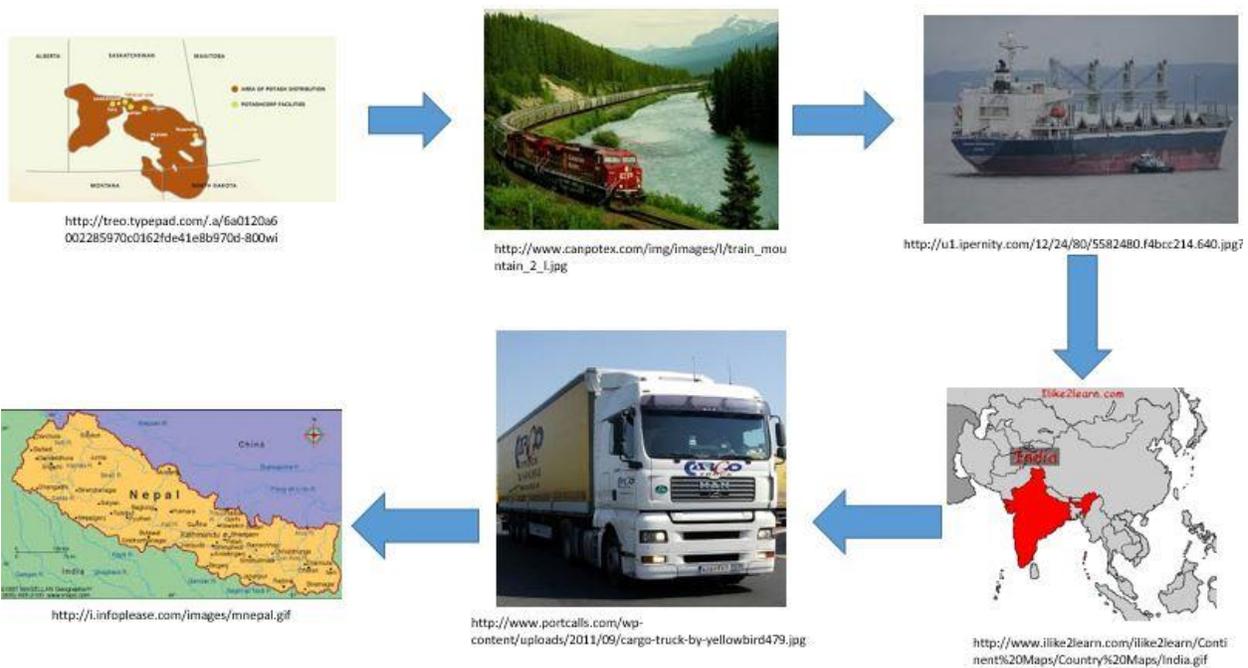
### **Benefits to Nepal**

As farmers of Nepal continue to crop their land and rob it of its essential nutrients, crop yields have decreased (Adhikary, & Karki, 2006). The crops are using all the nutrients available. Potash is part of the solution to this problem. There is not enough organic manure to replenish the lost nutrients (Adhikary, & Karki, 2006). Adding potash as fertilizer adds potassium back into the soil. A study done in the Pokhara valley on potatoes showed that crops that received the potassium fertilizer yielded higher than the crops that did not receive potassium fertilizer (Adhikary, & Karki, 2006). This shows that adding potash, which is mostly potassium, will increase yield. This will help Nepal to better feed its population by getting higher yield, thus producing more food on the same amount of land.

Most farmers in Nepal are subsistence farmers, growing just enough food to feed their family (Calkins, 1982). If all of the farmers of Nepal experienced an increase in yield, they might be left with more food than is needed to feed their family. Once this begins to happen, farmers will be able to sell their excess product to make a profit. This means that they can use this profit to buy equipment that they did not previously have, to make their life easier. The extra money made from the higher crop yields would allow the people of Nepal to increase their quality of life.

## Transportation

After being processed, potash can be transported from the mine by train to the Canadian west coast. From there it can be put on a boat and shipped to India through Canpotex Limited as this company already ships potash to India as well as other places around the globe (Potash Corp., 2013). From India it can be trucked into Nepal and distributed to local handlers. Cost of this transportation is unknown.



## Storage of Product

Potash fertilizer is water soluble, and therefore must be kept out of wet or damp conditions (Potash Corp., 2013). It should be kept off the ground or on a cement pad to keep it off damp soil. Fertilizer is normally stored in warehouses in North America to ensure that no

weather or wet conditions can reach the product (Potash Corp., 2013). Potash will not spoil though, it will stay good for use until it is ready to be spread. It can be kept stored until it is needed.

### **Marketing Potash in Nepal**

Potash fertilizer could be sold by cooperatives in Nepal, as they already are (Shrestha, 2010). The cooperatives would be able to buy potash in bulk, and would have better facilities than the farmers to store the fertilizer. The cooperatives would be able to sell the fertilizer as it is needed, or they could possibly put smaller amounts of fertilizer in containers to be sold. This would ensure that the farmers did not waste and would not have to store the potash fertilizer. For example, potash fertilizer could be put in ten kilogram paper bags, and farmers could buy this from the cooperative directly. Farmers would not be stuck with an excess of fertilizer. If put in paper bags, the farmers would be able to store any excess fertilizer, as long as they kept the fertilizer inside, away from damp or wet conditions.

### **Summary**

Canada would benefit greatly from the export of potash fertilizer to Nepal. The potash industry already employs many Canadians, and a greater demand for potash would only help this industry and the Canadian economy. Nepal would also benefit from the import of potash fertilizer, as it would give the farmers of Nepal greater yields from their crops. This would help the Nepalese people feed their families and the growing population, and may even lead to farmers expanding out of subsistence agricultural production. There will be difficulties in the export to Nepal. Cost is a major factor, as potash fertilizer is expensive before it must be transported from Canada all the way to Nepal. Marketing the fertilizer to the farmers of Nepal is

another major problem. Fertilizer is usually sold in bulk, and farmers of Nepal would not come close to needing a whole tonne of fertilizer. If the fertilizer was sold in smaller packages, it would more easily be affordable and used by the farmers of Nepal. Storage of the potash would not be easy either, as the potash fertilizer must be kept out of wet and damp conditions. The people of Nepal do not have the facilities to store the fertilizer inside where it can be kept dry. To be more competitive in the future, Canadian potash producers could start packaging their product in smaller containers or use bags. This would help solve some of the problems of marketing the product to smaller markets, and would definitely help solve the problem of storage of the product.

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