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Phosphate and potash as examples for non-metallic raw material markets

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9 Phosphate and potash as examples for non-metallic raw material markets

Magnus Ericsson, Susanne Gylesjö

The two elements phosphate and potash are crucial for the production of fertilisers and hence to the global supply of food. Production, corporate structures, prices and future trends are discussed in these brief chapters. Both phosphate and potash are good examples of minerals which are produced in large quantities and which will play a very important role in the future global economy but still they have received much less attention than what they deserve. The conclusion of these introductory texts is that phosphate and potash are at least as important to European economy and global developments as many of the smaller but high tech minerals which are in focus of today's political discussion.

9.1 Phosphate

Phosphate is the natural form of the element phosphorus (chemical symbol P). Together with potash and nitrogen it is essential for the growth of all plants. The most common form of phosphates in nature is as phosphate rock. More than 90 % of all phosphate mined is used for the production of fertilisers. Other applications include animal feed, detergents, food and beverages and in water treatment (as a flocculant directly before water treatment).

Phosphate rock is the raw material for the production of phosphoric acid which together with ammonia can form mono- or di-ammonium phosphate which is granulated and used as a fertiliser. Together with nitrogen and potassium, phosphorus is a principal component of NPK fertilisers. In order to make different grades of marketable phosphoric acid comparable they are recalculated to diphosphorus pentoxide (P_2O_5). There is no substitute for phosphorus.

The world's phosphate reserves are estimated to be around 67 000 Mt. Morocco and West Sahara dominates the reserves with roughly 75 % of total reserves. The second largest reserves are found in China 5.5 % of total, followed by Algeria, Syria, Jordan and South Africa with 2.2-3.3 %. Phosphate reserves are hence very much concentrated in one country and the unresolved conflict between Morocco and Western Sahara is already an open conflict which may affect future supply of phosphate rock (Table. 1). There are considerable phosphate reserves on the continental shelves and in sea mounts in the Atlantic and the Pacific Oceans.

Table 1: Phosphate rock reserves (source: USGS 2011)

	Mt
Morocco and Western Sahara	50 000
China	3 700
Algeria	2 200
Syria	1 800
South Africa	1 500
Jordan	1 500
USA	1 400
Russia	1 300
Other countries	600
Sum	67 000

Phosphate rock prices peaked at over 100 US $/t in 2007 and 2008. In mid 2009 prices reached over 400 US $/t which is more than eight times more than only two years earlier. Prices fell back in early 2009 but remained at high levels in a historic perspective. In 2010 prices have bounced back again and spot prices reached above 150 US $/t in the third quarter.

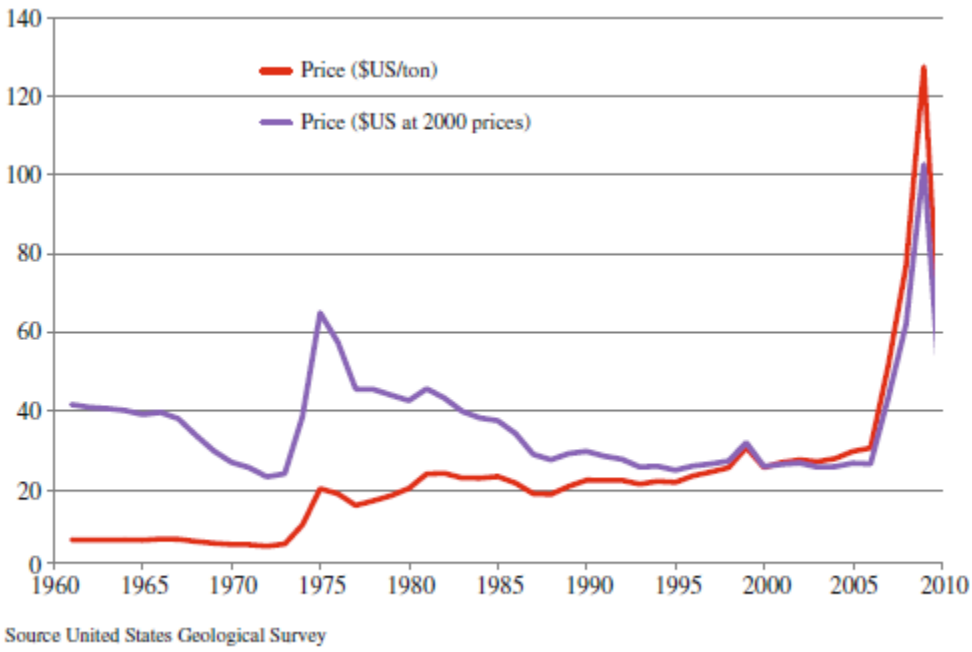

Figure 1: Phosphate rock price US $/t.

9.1.1 Phosphate Production

Total world production of phosphate rock in 2010 was 176 Mt. Production in 1989 was only marginally lower at 165 Mt, but in the past 20 years large changes in location of phosphate rock production has taken place. China is by far the leading phosphate rock producer in the world. In the past 20 years it has increased its production by 325 % from 20 Mt in 1989 to 65 Mt in 2010. The USA, which used to be the dominating producer, has more or less cut its production in half from 50 Mt to 26 Mt in the same period. Russian has also sunk and even

more dramatically from 38 Mt in 1989 to just 10 Mt in 2010. Morocco is the third most important producer more or less on the same level as the US has increased its production volumes from 18 Mt to 26 Mt in the past 20 years. Arab countries and Israel together account for 27 % of total world production of phosphate rock.

	Mt
China	65
Morocco and Western Sahara	26
USA	26
Russia	10
Tunisia	7.6
Jordan	6.0
Brazil	5.5
Egypt	5.0
Israel	3.0
Syria	2.8
Other countries	19
Sum	176

Figure 2: Phosphate rock production 2010 (source: Raw Materials Data 2011)

9.1.2 Corporate concentration

Recorded corporate concentration for phosphate rock mining is fairly low, partly depending on the fact that no details are available for Chinese or Russian producers. It is important to note that some of the major metal mining companies such as Vale, BHP Billiton have shown interest in establishing a foot hold in phosphate mining.

State controlled production in the market economies is just below 30 %, if all Chinese production is considered to be state controlled the figure leaps to 66 % which is one of the highest levels of all minerals.

Rank (world, 2009)	Company name	State ownership	Country	Controlled production 2009 (Mt)	Share of world 2009 (%)
1	OCP	yes	Morocco	24.0	14.46
2	Mosaic Co, The		USA	14.1	8.52
3	Cie de Phosphate des Gafsa	yes	Tunisia	7.0	4.22
4	Potash Corp of Saskatchewan		Canada	6.7	4.03
5	Jordan Posphate Mines Co	yes	Jordan	6.0	3.61
6	Bunge Ltd		USA	3.0	1.83
7	General Co for Phosphates and Mines	yes	Syria	3.0	1.81
8	CF Industries Holdings Inc		USA	2.8	1.69
9	Millennium Investments Elad		Israel	2.7	1.62
10	State of Egypt	yes	Egypt	2.5	1.51
11	Foskor	yes	South Africa	2.3	1.39
12	Incitec Pivot Ltd		Australia	2.0	1.20
13	JR Simplot Co		USA	2.0	1.20
14	Agrium Inc		Canada	1.9	1.14
15	Entr. National de Fer et des Phosphates	yes	Algeria	1.8	1.08
16	Yara International ASA	yes	Norway	1.2	0.70
17	Monsanto Co		USA	1.0	0.60
18	Anglo American plc		UK	0.8	0.50
19	Office Togolaise des Phosphates	yes	Togo	0.8	0.48
20	Ste Senegalaise des Phosphates	yes	Senegal	0.7	0.42

Figure 3: Controlling phosphate mining companies 2009 (source: Raw Materials Data 2010)

9.1.3 Outlook

Demand for phosphate, as for potash, will continue to be growing at slightly higher speed than GDP. Use of fertilisers in food production in the developed economies will remain static but the increased use of bio-fuels will spur growth. In the developing countries fertiliser use will continue to grow. No technological changes affecting these patterns are likely to take place as both potash and phosphates are non-substitutable.

Given the high prices and steadily increasing demand trend new capacity is planned and gradually coming on stream. During 2010 a new 4 Mt mine in Peru was opened (Vale's Miski Mayo project owned jointly with Mitsui and Mosaic Co). Towards the end of the year the 5 Mt Saudi Arabian Al-Jalamid mine was taken into operation. It seems highly likely that Saudi Arabia will quickly emerge as the 4-5 largest producer of the world further strengthening the Arab control over phosphate mining.

The first off shore mine is proposed in Namibia in the Sandpiper/Meob project showing that the vast, untapped resources of the oceans will be utilised as soon as the market is ready.

In all there are projects with a total capacity of over 50 Mt in the pipe line already for 2015. The worries for a situation where the world would run short of phosphate resources are totally unfounded.

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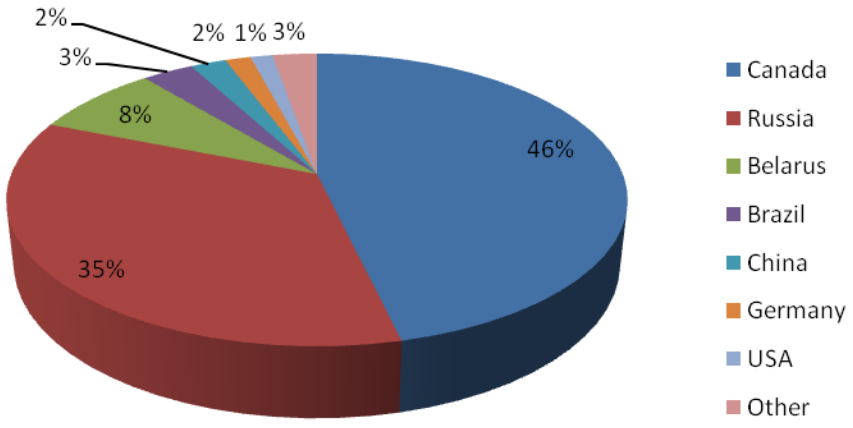
9.2 Potash

The term potash refers to a variety of mined and manufactured salts, all of which contain the element potassium in water-soluble form. In this report when we use the term potash production we mean the production of potassium oxide (K_2O) equivalent which is often used to allow comparison of the potassium content of marketable products.

Potash is used as a major agricultural component in 160 countries and around 90% of total produced potash is used as fertilisers. There are no cost-effective substitutes for potassium as an essential plant nutrient and an essential nutritional requirement for animals and humans. Low-content potash alternatives such as animal manure and guano, glauconite and compost have a high transportation cost per metric tonne which makes them less desirable. The largest importers of potash are the heavily populated countries of China, India and Brazil.

The world's potash reserves are estimated to be around 9 500 Mt, where Canada and Russia account for more than 80% (Figure 4).

Almost 80% of global capacity of KCl comes from conventional underground mines, 6% from underground solution mines and the remainder is obtained by harvesting natural brines from potassium-rich water bodies, typically using solar evaporation.

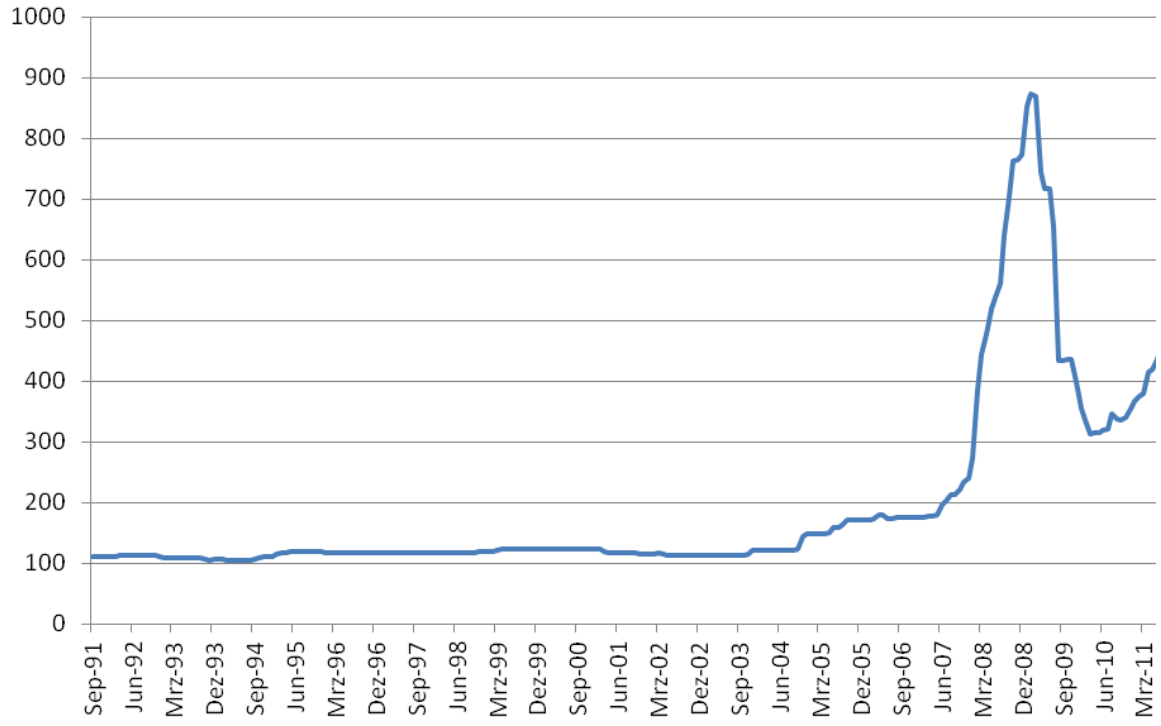


Source: USGS 2011

Figure 4: Global potash reserves by countries (as % of global reserves)

In 2009, the effects of the financial crisis in combination with high potash prices (Figure 5) and low demand led to collapse of the potash market, forcing the producers to reduce their output of potash. Global capacity utilisation fell to less than 50%, a dramatic drop compared to last time demand fell in 2006 but the overall utilised capacity was 77%. However most markets began to recover fast and in 2010 potash producers had returned to pre-crisis production levels and 2010 turned out to be a successful year for the potash industry. The better recovery in demand than expected is being driven by the highest commodity prices since 2008. In 2010 the utilised capacity was above 85%.

Figure 2. Monthly price USD/metric tonne for KCl



Source: World Bank

Figure 5: Monthly price of US $/metric tonne for KCl

9.2.1 Potash Production

Economically mineable potash deposits are rare and potash is only produced in 12-13 countries. Canada, Belarus and Russia are the major producing countries of potash representing 65% of world production in 2010, followed by China, Germany and Israel (Figure 6).

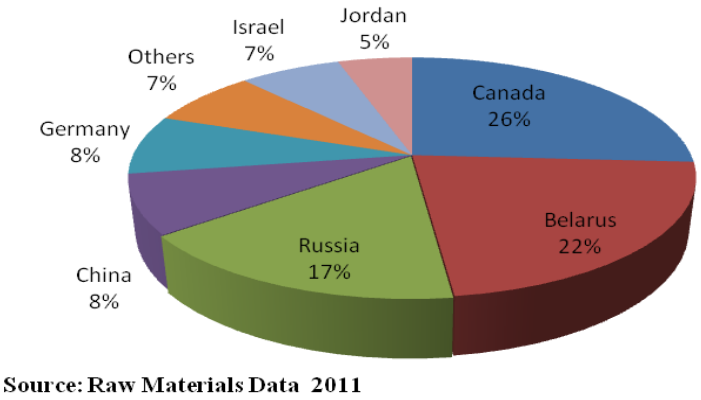
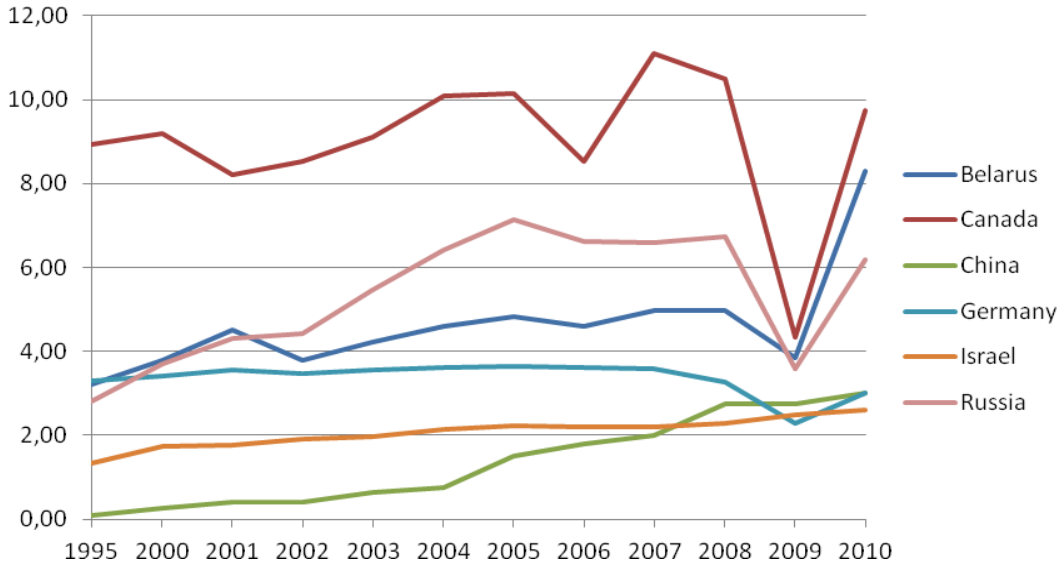


Figure 6: 2010 Potash production by country

Global potash production shows an increase over the years except for a drop in 2006 and, more significantly, in 2009 (Fig 53). Potash has almost always been in oversupply and many producers have adjusted their production levels and operated below capacity. In 2006 a drop in demand forced producers to lower their production, most notable in Canada and Russia, but already in 2007 many producers started to run at optimum capacity levels as the demand increased. The potash market collapsed again in 2009, and this time production dropped dramatically in all producing countries but China and Israel. However, in 2010 the market had recovered well and global production was back to the levels it was before the economic crisis.



(Source: Raw Materials Data 2011)

Figure 7: Historical potash production (Mt)

9.2.2 Corporate concentration

The potash industry is concentrated around a few major producers (Table 2). In 2010 the top five producing companies accounted for almost 80% of the production (K_2O) whereas in 1990 the top five accounted for less than 40%. There is a consolidation trend in the potash industry. In 2011two deals announced in 2010 were finalised; Russian potash producer Uralkali OJCS merged with Silvinit JSC and changed its name to Uralkali United Company and K+ S AG took over Potash One (now renamed K+S Potash Canada), whereas the BHP's bid for PCS (Potash Corp of Saskatchewan) in 2010 failed.

Canadian distribution is controlled by Canpotex, an export organization wholly owned by Canada's three major producers. Likewise, Belrusian and Russian distribution is controlled by the Belarusian Potash Company (BPC). Collectively, Canpotex and BPC control over 70% of global potash exports.

Table 2: Potash controlling companies 2010 (Source: Raw Materials Data 2011)

Rank (world, 2010)	Company name	Country
1	Belaruskali	Belarus
2	Potash Corp (share in Qinghai Salt Lake Potash not included)	Canada
3	Mosaic Co	USA
4	Uralkali	Russia
5	Silvinit	Russia
6	K+S AG	Germany
7	Israel Chemicals	Israel
8	Agrium Inc	Canada
9	Arab Potash	Jordan
10	Vale SA	Brazil
11	Intrepid Potash Inc	USA

9.2.3 Outlook

15 years prior to the recession global potash demand grew about 3% annually. Production is likely to increase over the following years due to the higher demand as farmers have increased purchases. Not only population growth but also a higher demand for a more protein based diet, as a result of the rise in wealth of emerging economies, will require a higher food output and thus more fertilisers.

Producers have been preparing for this growth with expansion and debottlenecking projects at existing mines but greenfield mines will also be needed to meet this increasing demand.

An underground greenfield mine with a capacity of 2Mt/year is estimated to cost around 4.1 billion CAD to develop and would take 7-8 years from start of development to full capacity output. Several potash producers have announced expansion of their existing mines as well as greenfield mines. For example in 2003 Potash Corp began a 7.5 billion CAD expansion program of its potash mines in Canada which will increase the capacity with 52% by 2015, Mosaic will increase their annual capacity with over 60% by 2015, K+S will start a new mine in Canada by 2015 and Uralkali will increase its potash capacity by 80%, including two new

mines, over the next ten years. Capacity expansions are dominated by brownfield projects, primarily in Canada and Russia, although Latin America has got several greenfield projects coming on-stream. For example the Brazilian miner Vale is evaluating new potash projects both in Argentina and Brazil. Global production is expected to increase to over 45 Mt by 2015.

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