Phosphorous Fertilizers in Kazakhstan: Production, Market and Forecast

Sample PDF

Moscow
September, 2013
CONTENTS

Annotation ........................................................................................................................................ 6

Introduction ..................................................................................................................................... 8

1. Technology of production of phosphate fertilizers, raw materials used in Kazakhstan ........................................................................................................................................ 9

2. Production of phosphorous fertilizers in Kazakhstan in 2002-2012 .................................. 13
   2.1. Dynamics and volumes of production .................................................................................. 13
   2.2. The structure of production, and the current state of the major manufacturers ............. 15
       LLP "Kazphosphate" (Taraz, Zhambyl region) .................................................................. 16

   3.1. Prices of the domestic market, a comparison with the prices in Russia and in Ukraine ................................................................................................................................. 23
   3.2. Regulation of the market of phosphorous fertilizers in Kazakhstan. Export-import prices ................................................................................................................................. 25

4. Foreign trade operations with phosphorous fertilizers in Kazakhstan in 2002-2012 ............ 29
   4.1. Imports .............................................................................................................................. 32
   4.2. Exports ............................................................................................................................. 39

5. Consumption of phosphorous fertilizers in Kazakhstan in 2002-2012 .......................... 44
   5.1. Balances of production-consumption ............................................................................... 44
   5.2. Largest consumers of phosphorous fertilizers. The current state of the agro-industrial complex ......................................................................................................................... 48
   5.3. Phosphogypsum as a waste product of the phosphorous fertilizers production. Its recycling and possible use. Environmental issues and government regulations ....................... 55

6. Forecast of production and consumption of phosphorous fertilizers in Kazakhstan for the period up to 2020 ................................................................. 61
LIST OF TABLES

Table 1. Production of phosphorous fertilizers by enterprises of Kazakhstan in 2002-2012, thousand tons
Table 2. Some financial indicators of LLP "Kazphosphate" in 2009-2012, million tenge
Table 3. Average annual export-import prices of Kazakhstan for various types of phosphorous fertilizers by countries in 2004-2012, $/ton
Table 4. Average annual export-import prices of various types of phosphorous-containing fertilizers in Kazakhstan in 2002-2012, $/ton
Table 5. Main indicators of foreign trade of Kazakhstan with phosphorous fertilizers in 2002-2012, thousand tons, million $
Table 6. Imports of phosphorous fertilizers in Kazakhstan in 2002-2012, tons, thousand $
Table 7. Imports of phosphorous fertilizers to Kazakhstan in 2004-2012 by countries-suppliers, tons, thousand $
Table 8. Exports of phosphorous fertilizers in Kazakhstan in 2002-2012 by types, tons, thousand $
Table 9. Exports of phosphorous fertilizers in Kazakhstan in 2004-2012 by countries-recipients, tons, thousand $
Table 10. Balance of production-consumption of ammophos in Kazakhstan in 2002-2012, thousand tons, %
Table 11 Balance of production-consumption of superphosphate in Kazakhstan in 2002-2012, thousand tons, %
Table 13. Some indicators of the agriculture of Kazakhstan by regions in 2007-2012
LIST OF FIGURES

Figure 1. The application of phosphates
Figure 2. Dynamics of production of phosphorous fertilizers in Kazakhstan in 2002-2012 (thousand tons), growth rates of production (%)
Figure 3. Dynamics of production of phosphorous fertilizers by branches of LLP "Kazphosphate" by types in 2005-2012, thousand tons
Figure 4. Domestic price indices for phosphorous fertilizers in Kazakhstan and Russia in 2002-2012 (% to the previous year)
Figure 5. Dynamics of annual average export-import prices on superphosphate and ammophos in Kazakhstan in 2002-2012, $/ton
Figure 6. Dynamics of exports and imports of phosphorous fertilizers in Kazakhstan in gross weight (thousand tons) in 2002-2012
Figure 7. Dynamics of imports of simple and complex phosphorous fertilizers in Kazakhstan in 2002-2012, tons
Figure 8. Dynamics of the pattern of imports of phosphorous fertilizers in Kazakhstan by types in 2002-2012, %
Figure 9. Dynamics of exports of simple and complex phosphorous fertilizers in Kazakhstan in 2002-2012, tons
Figure 10. Dynamics of domestic consumption of ammophos and superphosphate (in physical weight) in Kazakhstan 2002-2012, thousand tons
Figure 11. Dynamics of major indicators of the ammophos market (in physical weight) in Kazakhstan in 2002-2012, thousand tons
Figure 12. Regional structure of the fertilizers application (recalculated per 100% of nutrients) in Kazakhstan in 2011-2012, %
Figure 13. Application of mineral fertilizers for crops of different cultures by agricultural enterprises of Kazakhstan in 2012, %
Figure 14. Production and consumption of phosphorous fertilizers in Kazakhstan in 2011-2012 and a forecast up to 2020, thousand tons
Annotation

This report is the first publication of the research of the market of phosphorous fertilizers in Kazakhstan.

The purpose of the study is the analysis of the Kazakhstan market of phosphorous fertilizers.

The objects of study are phosphorus-containing fertilizers, particularly superphosphate and ammophos.

This work is a desk research. As information sources, data of the Agency of Statistics of the Republic of Kazakhstan, the UN database in foreign trade, the database of "InfoMine", the materials of the sectoral and regional press, annual and quarterly reports of companies, as well as web-sites of companies-producers were used.

In addition, in preparation of the report materials of interviews with specialists of companies, that release these products, were also used.


The geography of research: the Republic of Kazakhstan - a comprehensive detailed analysis of the market.

The report consists of 6 sections, contains 64 pages, including 14 figures and 13 tables.

The first chapter of the report presents brief characteristics of the production technology of phosphorous fertilizers, the data on the raw materials used in Kazakhstan.

The second chapter is devoted to the analysis of the release of the product concerned in Kazakhstan in 2002-2012. The data on the volume and structure of production, the current conditions of the major manufacturer are presented; its contact information is given.

The third chapter presents data on the dynamics of the domestic prices (in comparison with those in the Russian Federation and Ukraine), and export-import prices on the product.

The fourth chapter of the report analyzes foreign trade operations with phosphorous fertilizers in the considered period of time in physical and monetary terms. It presents the amounts and directions of export-import supplies of various types of fertilizers, and highlights the key trends.

The fifth chapter is devoted to consumption of the considered products in Kazakhstan in 2002-2012. The balance of the production-consumption of fertilizers by types is given, and the current state of the agro-industrial complex of the country is described.

In addition, this section considers the methods of storage and disposal of the primary waste of production of phosphorus fertilizers - phosphogypsum. The environmental problems associated with its storage and prospects of its use are described.
The sixth chapter of the report presents a forecast of development of the Kazakhstan market of phosphorous fertilizers according to the program of development of the chemical industry of Kazakhstan for the period up to 2014.

The target audience of the study:
- Participants in the fertilizer market - producers, consumers, traders;
- Potential investors.

This research claims to be a reference tool for marketing services and for specialists, making management decisions on the fertilizer market.
Introduction

Until relatively recently, the class of phosphorous fertilizers included a number of products, containing in its composition only one kind of nutrients - phosphorus. In this regard, the nomenclature of this kind of production was limited and included only a few items, among them simple and double superphosphate.

However, a few decades ago, in accordance with the requirements of an effective agriculture, interested in using universal brands of fertilizers containing several useful components, there have been developed and put into production a group of products, called double (containing both N and P) and triple (N, P and K) phosphate fertilizers.

To simple phosphorous fertilizers, as already mentioned, belong superphosphate and ground phosphorite. The class of phosphate fertilizers includes ammophos (MAP), diammonium phosphate (DAP), ammonium nitrate phosphate fertilizer (ANP), etc.
1. Technology of production of phosphate fertilizers, raw materials used in Kazakhstan

In general, the raw materials for production of phosphates are natural minerals apatite and phosphorite. **Apatite** is a rock of a volcanic origin, which has a coarse-grained structure and, in addition to fluorine(hydroxyl)apatite, contains non-phosphate minerals, the main of which is nepheline of the composition Na₂O(K₂O)Al₂O₃ 2SiO₂.

**Phosphorites** are sedimentary ores, which are finely-dispersed and contain phosphorus in the form of fluorapatite and apatite-like minerals of variable composition. The content of phosphorus in phosphorites ranges from 11 to 30% P₂O₅.

Phosphates are the only significant source of phosphorus (P₂O₅) for plants. In agriculture, for the production of chemical fertilizers and feed additives about 85% of the produced phosphate is used. The remaining 15% are used in various industries, leaders among which are the production of detergents (12%) and the production of phosphorus (about 3%).

About 30% of extracted phosphate is used directly for the release of the final product - fertilizers and feed additives. The other two-thirds are processed into the intermediate product - phosphoric acid. Phosphoric acid with P₂O₅ of various concentrations is used in the production of fertilizers, fodder additives with a higher content of phosphorus and in the industry (Figure 1).

**Figure 1. The application of phosphates**

Source: review of the technical literature
Methods of processing phosphate materials depend strongly on the composition of the ore and can be mechanical or chemical. By mechanical processing (milling) a simple phosphate fertilizer - *ground phosphorite* - is obtained. The task of the chemical processing of natural phosphates into phosphate fertilizers is the conversion of insoluble tricalcium phosphate into phosphorus compounds, which are easily absorbed by plants and are highly concentrated, i.e. contain the largest possible amount of $P_2O_5$ in digestible form with a minimal amount of ballasts and contaminants.

The most common method of processing phosphate rocks is decomposition by sulfuric, phosphoric or nitric acids. Thus, simple superphosphate is prepared by treating the milled apatite or phosphate rock with sulfuric acid. At this, the decomposition of apatite or phosphorite undergoes with the formation of water-soluble calcium monobasic phosphate $Ca(H_2PO_4)_2$ and gypsum $CaSO_4$, which is insoluble in water:

\[
2Ca_9F(PO_4)_3 + 7H_2SO_4 + 3H_2O = 3Ca(H_2PO_4)_2 \cdot H_2O = HCaSO_42HF;
\]
\[
Ca_3(PO_4)_2 + 2H_2SO_4 + 3H_2O = Ca(H_2PO_4)_3 \cdot H_2O + 2CaSO_4
\]

Gypsum remains in the fertilizer and amounts to about 40% of its weight. Phosphorus in such superphosphate is almost half that of the feedstock. For this reason, low-percentage phosphorites are not used for the production of superphosphate. Digestible phosphorus in superphosphate is only 14-19.5% of the total mass.

With the neutralization of superphosphate with ammonia the *ammoniated superphosphate* is obtained with a nitrogen content of about 1.5-3%.

*Double superphosphate*, unlike simple, has a high content of digestible phosphorus recalculated to $P_2O_5$ - 42-49%, and contains no gypsum. Phosphorus is present therein in the form of water soluble monocalcium phosphate $Ca(H_2PO_4)_2 \cdot H_2O$ and a small amount of free phosphoric acid (2.5-5%). In the production of double superphosphate materials are also treated with sulfuric acid. It is taken in larger amounts than for the production of simple superphosphate, in order to obtain not monocalcium phosphate, but phosphoric acid, which is then treated with a new batch of material to prepare double superphosphate.

The cost of $P_2O_5$ in double superphosphate is by 20% higher than in the production of simple superphosphate. However, this is offset by the savings in transportation, storage and application to the soil of a more concentrated fertilizer - double superphosphate.

All *complex fertilizers* according to the method of their manufacture can be divided into three groups:

- Fertilizers obtained in processing by phosphoric acid (ammophos, diammonium phosphate);

- Fertilizers obtained in processing by a mixture of phosphoric and nitric acids (nitroammophos, ammonium nitrate phosphate fertilizer (ANP) or nitroammophoska);